South Coast
Air Quality Management District
21865 Copley Drive, Diamond Bar, CA 91765
(909) 396-2000, www.aqmd.gov

TECHNOLOGY COMMITTEE MEETING

Committee Members
Council Member Joe Buscaino, Chair
Mayor Larry McCallon
Mayor Pro Tem Judith Mitchell
Supervisor V. Manuel Perez
Council Member Dwight Robinson
Supervisor Hilda L. Solis

October 19, 2018 ♦ 12:00 p.m. ♦ Conference Room CC8
21865 Copley Drive, Diamond Bar, CA 91765

TELECONFERENCE LOCATIONS

Los Angeles City Hall
200 N. Spring Street
Room 410
Los Angeles, CA 90012

73710 Fred Waring Drive
Suite 222
Palm Desert, CA 92260

Hall of Administration
500 W. Temple Street
Room 493A
Los Angeles, CA 90012

(The public may participate at any location listed above.)

Call-in for listening purposes only is available by dialing:
Toll Free: 866-244-8528
Listen Only Passcode: 5821432
In addition, a webcast is available for viewing and listening at:
http://www.aqmd.gov/home/library/webcasts

AGENDA

Members of the public may address this body concerning any agenda item before or during consideration of that item (Gov't. Code Section 54854.3(a)). Please provide a Request to Address the Committee card to the Committee Secretary if you wish to address the Committee on an agenda item. If no cards are available, please notify SCAQMD staff or a Board Member of your desire to speak. All agendas for regular meetings are posted at District 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 – Items 1 through 5
NOVEMBER BOARD AGENDA ITEMS

1. Execute Contract for Expansion of Hydrogen Fueling Station *(Motion Requested)*
Lisa Mirisola
Program Supervisor

The University of California Irvine (UCI) has requested cofunding for the expansion of its hydrogen fueling station to add additional capacity including more fueling positions to serve the increasing number of fuel cell cars and buses utilizing the station. The MSRC has approved $1 million in cost-share and the CEC is considering providing $400,000 in cost-share for this $1.8 million project. This action is to execute a contract with UCI for expansion of their hydrogen fueling station in an amount not to exceed $400,000 from the Clean Fuels Program Fund (31).

2. Adopt Resolution Recognizing Funds for FY 2017-18 Carl Moyer State Reserve Program, Execute Contracts for FY 2017-18 "Year 20" Carl Moyer Program, SOON Provision, and Community Air Protection AB 134 Program, Amend Awards, and Transfer Funds *(Motion Requested))*
Vicki White
Technology Implementation Manager

In June 2018, Program Announcements for the "Year 20" Carl Moyer Program and SOON Provision closed. This year, in addition to the traditional sources of Carl Moyer SB 1107 and AB 923 funds, funding from the Community Air Protection AB 134, State Reserve, FARMER and Voluntary NOx Remediation Measure Programs can also be used to fund Carl Moyer and SOON Provision projects. This action is to adopt a Resolution recognizing up to $3.1 million in Carl Moyer State Reserve funds from CARB with its terms and conditions for FY 2017-18. These actions are to also execute contracts for the "Year 20" Carl Moyer, SOON Provision and Community Air Protection AB 134 Programs totaling $63,541,435, comprising $35,559,645 from the Carl Moyer Program Fund (32) and $27,981,790 from the Community Air Protection AB 134 Fund (77). These actions are to also amend two "Year 19" Carl Moyer awards, adding $117,754 from the Carl Moyer Program SB 1107 Fund (32), and transfer $2 million from the Carl Moyer Program AB 923 Fund (80) to the Voucher Incentive Program Fund (59) for truck replacements.

3. Establish Special Revenue Fund, Recognize Revenue, Execute Agreements for Volkswagen Environmental Mitigation Program and Transfer Funds *(Motion Requested)*
Vicki White

On May 25, 2018, CARB approved the Beneficiary Mitigation Plan for the Volkswagen (VW) Environmental Mitigation Trust. This plan identifies five funding categories for the State's $423 million allocation of the VW Environmental Mitigation Trust. The funded projects are intended to mitigate the excess NOx emissions caused by the VW

vehicles. SCAQMD has been identified by CARB as the administrator of two project funding categories—the Zero Emissions Class 8 Freight and Port Drayage Trucks and the Combustion Freight and Marine Projects. These actions are to establish the VW Mitigation Special Revenue Fund (79), recognize revenue up to $150 million into this special revenue fund, execute an agreement with CARB to administer and implement the two project funding categories, execute a Memorandum(s) of Agreement with other air districts, as needed, to assist in administering this program, and transfer funds from the VW Mitigation Special Revenue Fund (79) to the General Fund to reimburse administrative costs associated with the program.

4. Develop and Demonstrate Zero Emissions Heavy-Duty Trucks, Freight Handling Equipment, EV Infrastructure and Renewable Energy *(Motion Requested)*

Joseph Impullitti
Program Supervisor

SCAQMD received an award of $44,839,686 to develop and demonstrate zero emissions heavy-duty trucks, freight handling equipment, EV infrastructure and renewable energy under CARB's Low Carbon Transportation Greenhouse Gas Reduction Fund (GGRF) Investments. Volvo Group North America and its project partners are providing $41,855,308. These actions are to recognize $44,839,686 and transfer $14,000,000 ($4,000,000 for SCAQMD's project cost-share and $10,000,000 for temporary advance of funds) from the Clean Fuels Program Fund (31) into the GHG Reduction Projects Special Revenue Fund (67). This action is to also execute contracts in an amount not to exceed $46,688,250 to implement this project. Out of the $2,151,436 allocated in CARB's grant for administrative expenses, these actions are to reimburse the General Fund up to $1,972,936 from Fund 67 for administrative costs and transfer $178,500 from Fund 67 to Fund 31 to execute a contract modification for administrative project implementation support. Finally, these actions are to authorize the Executive Officer to execute a contract modification and redistribute administrative funds to augment project funds on an as-needed basis.

5. Approve Awards for Heavy-Duty Diesel Drayage Truck Replacement Projects *(Motion Requested)*

Adewale Oshinuga
Program Supervisor

On November 3, 2017, the Board recognized $1,050,000 from U.S. EPA's 2017 Diesel Emissions Reduction Act (DERA) and issued a Program Announcement to solicit applications for the replacement of heavy-duty diesel drayage trucks with natural gas trucks as well as the transfer of the replaced diesel trucks to Washington State to replace older dirtier diesel trucks, which would then be scrapped. This action is to approve awards to replace 2012 or newer heavy-duty diesel drayage trucks with near-zero NOx emissions natural gas trucks in an amount not to exceed $1,000,000 from U.S. EPA's 2017 DERA Grant in the Advanced Technology, Outreach and Education Fund (17).

6. Recognize Revenue and Execute Agreements for Installation and Maintenance of Air Filtration Systems *(Motion Requested)* — Patricia Kwon, AQ Specialist

SCAQMD has executed a settlement agreement with Rainbow Transfer/Recycling, Inc., to install and maintain air filtration systems at schools. This action is to recognize up to $250,000 into the Air Filtration Fund (75). These actions are to also execute a contract to install and maintain air filtration systems at schools in an amount not to exceed $250,000 from the Air Filtration Fund (75) and execute an agreement with the local school district in Huntington Beach near the transfer facility.

WRITTEN REPORT

7. Clean Fuels Program Draft 2018 Plan Update *(No Motion Required)* — Naveen Berry, Assistant Deputy Executive Officer

Every fall, staff has brought the Clean Fuels Program Draft Plan Update before the Board 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. This item was presented at the October 19, 2018 Technology Committee as a written report.

OTHER MATTERS

8. 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)

9. Public Comment Period

At the end of the regular meeting agenda, an opportunity is also provided for the public to speak on any subject within the Committee's authority. Speakers may be limited to three (3) minutes each.

10. Next Meeting Date – Friday, November 16, 2018 at 12:00 pm

ADJOURNMENT

Americans with Disabilities Act

The agenda and documents in the agenda packet will be made available, upon request, in appropriate alternative formats to assist persons with a disability (Gov't. Code Section

54954.2(a)). Disability-related accommodations will also be made available to allow participation in the Technology Committee meeting. Any accommodations must be requested as soon as practicable. Requests will be accommodated to the extent feasible. Please contact Pat Krayser at 909.396.3248 from 7:30 a.m. to 6:00 p.m., Tuesday through Friday, or send the request to pkrayser@aqmd.gov.

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 prior to the meeting for public review at the South Coast Air Quality Management District, Public Information Center, 21865 Copley Drive, Diamond Bar, CA 91765.

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DRAFT
Technology Committee Agenda#1

BOARD MEETING DATE: November 2, 2018 AGENDA NO.

PROPOSAL: Execute Contract for Expansion of Hydrogen Fueling Station

SYNOPSIS: The University of California Irvine (UCI) has requested cofunding for the expansion of its hydrogen fueling station to add additional capacity including more fueling positions to serve the increasing number of fuel cell cars and buses utilizing the station. The MSRC has approved $1 million in cost-share and the CEC is considering providing $400,000 in cost-share for this $1.8 million project. This action is to execute a contract with UCI for expansion of their hydrogen fueling station in an amount not to exceed $400,000 from the Clean Fuels Program Fund (31).

COMMITTEE: Technology, October 19, 2018; Recommended for Approval

RECOMMENDED ACTION:

Authorize the Chairman to execute a contract with UCI to cost-share construction and operation of the expansion of their hydrogen vehicle fueling station to support fueling fuel cell cars and buses in an amount not to exceed $400,000 from the Clean Fuels Program Fund (31).

Wayne Nastri
Executive Officer

MMM:FM:NB:LHM

Background

The University of California Irvine (UCI) has been and continues to be instrumental in hydrogen related research for more than two decades. The National Fuel Cell Research Center (NFCRC), located at UCI, was dedicated in 1998 by DOE and CEC to: 1) accelerate the development and deployment of fuel cell technology; 2) enable the stationary and mobile fuel cell market; 3) address market hurdles; 4) convene government agencies, businesses and academia to develop effective public-private alliances, and 5) provide leadership in the preparation of educational materials and programs to help develop the national work force in fuel cell technology. The NFCRC

focuses on both mobile and stationary fuel cells, the development of a hydrogen fueling infrastructure, and the interface between stationary fuel cell technology, transportation and the emerging hydrogen economy.

The UCI station has been in operation since January 2003, supporting research and fuel cell vehicle development. In 2007, it became the first dual-pressure station operating in the U.S. with public access for fuel cell vehicle fueling. The station has been upgraded over the years, opening as a retail station for fueling passenger cars in November 2015 and refueling buses at night, including fleet buses for the Orange County Transit Authority (OCTA). For the past year, the station has operated at its design throughput capacity, while customer demand continues to increase, resulting in an urgent need for expansion of capacity and fueling positions. Shifting to liquid hydrogen deliveries will strengthen supply chains, potentially reducing the price of dispensed hydrogen.

On April 6, 2018, the MSRC released Program Opportunity Notice #PON2018-02, "Hydrogen Infrastructure Partnership Program." At its September 20, 2018 meeting, the MSRC approved UCI's funding request for its station expansion project in the amount of $1,000,000. CEC staff is working with UCI on a revenue agreement to fund the project in the amount of $400,000, which the CEC will consider on November 8, 2018. The UCI hydrogen station expansion project provides a unique public-private partnership opportunity to enable ongoing research on a larger capacity retail hydrogen station serving retail and transit customers.

Proposal

This action is to execute a contract with UCI for expansion of their hydrogen fueling station from the current capacity of 180 kilograms per day (kg/day) of delivered gaseous hydrogen to in excess of 800 kg/day of delivered liquid hydrogen and from one to four fueling positions, with both 350 bar and 700 bar hydrogen. On-site storage will also increase, further strengthening the hydrogen supply chain, and limiting impacts to the consumers. Delivered hydrogen is expected to be at least 33 percent renewable, in compliance with SB 1505 requirements.

In addition to serving more light-duty vehicles, buses will continue to be scheduled for fueling at night to minimize impact on light-duty customers. Expansion of the station will enable UCI to increase the number of fuel cell buses serving the campus, as well as provide support, if needed, for the increased number of fuel cell buses planned for deployment by OCTA, leading to a more robust hydrogen fueling network.

UCI will solicit competitive bids and plans to construct the station expansion in 2019. As stations grow in size, continued public research is needed to evaluate multiple aspects. Fueling protocols, dispenser design and station throughput and reliability are just some examples that can be evaluated by UCI. UCI intends to report at least three years of operating data through the National Renewable Energy Laboratory.

Sole Source Justification
Section VIII.B.2. of the Procurement Policy and Procedure identifies provisions under which a sole source award may be justified. This request for sole source award is made under provision B.2.d.: Other circumstances exist which in the determination of the Executive Officer require such waiver in the best interest of the SCAQMD. Specifically, these circumstances are B.2.d.(8): Research and development efforts with educational institutions or nonprofit organizations.

Benefits to SCAQMD
SCAQMD supports hydrogen and fuel cell technologies and recognizes that light-, medium- and heavy-duty vehicles must achieve zero or near-zero emissions for the region to meet state and federal air quality attainment standards. Projects to support implementation of various clean fuel vehicle and infrastructure programs are included in the *Technology Advancement Office Clean Fuels Program 2018 Plan Update* under the category of "Hydrogen and Fuel Cell Technologies and Infrastructure." This project will help ensure that sufficient hydrogen infrastructure is available to support early-market introduction of zero emissions fuel cell vehicles and further study issues related to co-locating hydrogen fueling for light-, medium- and heavy-duty vehicles and larger volume stations supported by gaseous and liquid hydrogen storage.

Resource Impacts
SCAQMD's support of the UCI Hydrogen Station Expansion Project will not exceed $400,000 from the Clean Fuels Program Fund (31). Project partners and proposed funding are as follows:

Project Partner	Proposed Funding	Percent
MSRC	$1,000,000	56
CEC*	$400,000	22
SCAQMD *(requested)*	$400,000	22
Project Total	**$1,800,000**	100

*pending approval at CEC's 11/8/18 Business Meeting

Sufficient funds are available from the Clean Fuels Program Fund, established as a special revenue fund resulting from the state-mandated Clean Fuels Program. The Clean Fuels Program, under Health and Safety Code Sections 40448.5 and 40512 and Vehicle Code Section 9250.11, establishes mechanisms to collect revenues from mobile sources to support projects to increase the utilization of clean fuels, including the development of the necessary advanced enabling technologies. Funds collected from motor vehicles

are restricted, by statute, to be used for projects and program activities related to mobile sources that support the objectives of the Clean Fuels Program.

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Agenda Item #1

Lisa Mirisola

Execute Contract for Expansion of Hydrogen Fueling Station

Background

- Hydrogen station operation at UCI began in 2003, and in 2007 it was the first station upgraded with dual-pressure capability
- Upgraded to retail fueling operation in 2015, with cofunding from CEC and the Clean Fuels Program Fund (31)
- UCI station is operating beyond design capacity and is in urgent need of additional capacity to fuel cars and buses

Proposal

- UCI will solicit competitive bids for the hydrogen fueling station capacity expansion to 800 kg per day with liquid delivery and increased storage
- Fueling positions will be expanded to four
- Public use will continue 24/7, with buses scheduled to refuel at night
- UCI will evaluate this larger capacity station and provide operating data
- Meets SB 1505 requirements for 33% renewable hydrogen

Proposed Cost-Share

Project Partners	Proposed Funding	Percent of Project
MSRC	$1,000,000	56
CEC (anticipated)*	$400,000	22
SCAQMD (*requested*)	$400,000	22
Total Project Costs	**$1,800,000**	100

*pending CEC's 11/8/18 Business Meeting

Recommended Action

Execute contract with UCI to cost-share expansion of hydrogen fueling station to support fuel cell cars and buses in an amount not to exceed $400,000 from the Clean Fuels Program Fund (31)

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DRAFT
Technology Committee Agenda #2

BOARD MEETING DATE: November 2, 2018 AGENDA NO.

PROPOSAL: Adopt Resolution Recognizing Funds for FY 2017-18 Carl Moyer State Reserve Program, Execute Contracts for FY 2017-18 "Year 20" Carl Moyer Program, SOON Provision and Community Air Protection AB 134 Program, Amend Awards and Transfer Funds

SYNOPSIS: In June 2018, Program Announcements for the "Year 20" Carl Moyer Program and SOON Provision closed. This year, in addition to the traditional sources of Carl Moyer SB 1107 and AB 923 funds, funding from the Community Air Protection AB 134, State Reserve, FARMER and Voluntary NOx Remediation Measure Programs can also be used to fund Carl Moyer and SOON Provision projects. This action is to adopt a Resolution recognizing up to $3.1 million in Carl Moyer State Reserve funds from CARB with its terms and conditions for FY 2017-18. These actions are to also execute contracts for the "Year 20" Carl Moyer, SOON Provision and Community Air Protection AB 134 Programs totaling $63,541,435, comprising $35,559,645 from the Carl Moyer Program Fund (32) and $27,981,790 from the Community Air Protection AB 134 Fund (77). These actions are to also amend two "Year 19" Carl Moyer awards, adding $117,754 from the Carl Moyer Program SB 1107 Fund (32), and transfer $2 million from the Carl Moyer Program AB 923 Fund (80) to the Voucher Incentive Program Fund (59) for truck replacements.

COMMITTEE: Technology, October 19, 2018; Recommended for Approval

RECOMMENDED ACTIONS:

1. Adopt the attached Resolution recognizing, upon receipt, up to $3.1 million in State Reserve funds from CARB into the Carl Moyer Program State Reserve Fund (32), and authorize the Executive Officer to accept the terms and conditions of the 2017-18 State Reserve grant award.

2. Authorize the Chairman to execute the Carl Moyer Program contracts as listed in Table 2A, in an amount not to exceed $36,939,058, comprised of $22,066,578 from the Carl Moyer Program SB 1107 Fund (32), $494,006 from interest funds accrued

in the Carl Moyer Program Fund (32), and $14,378,474 from the Community Air Protection AB 134 Fund (77).

3. Authorize the Chairman to execute contracts for infrastructure projects as listed in Table 2B, in an amount not to exceed $13,603,316 from the Community Air Protection AB 134 Fund (77).

4. Authorize the Chairman to execute the SOON Provision contracts as listed in Table 3, in an amount not to exceed $5,904,504 from the Carl Moyer Program SB 1107 Fund (32).

5. Authorize the Chairman to execute the off-road project contracts as listed in Table 4, in an amount not to exceed $7,094,557, comprised of $2,819,261 from the Carl Moyer State Reserve Fund (32), $1,761,375 from the Carl Moyer Program FARMER Fund (32) and $2,513,921 from the Carl Moyer Program NRM Fund (32).

6. Authorize the Executive Officer to redistribute the source of funds between the Carl Moyer Program Fund (32) and the Community Air Protection AB 134 Fund (77), in order to expeditiously meet the program encumbrance and expenditure targets to the extent not in conflict with any applicable guidance or direction from CARB.

7. Authorize the Chairman to execute contracts from the backup projects as listed in Table 5, should any returned funds become available from any of the funding sources approved for projects in this Board letter, or should any additional funds become available under the Community Air Protection AB 134 Program (Fund 77).

8. Amend the following Carl Moyer Program awards:
    1. Pastime Lakes Holdings, LLC, by adding $117,754 to the $30,129 previously awarded for replacement of one off-road equipment from the Carl Moyer Program SB 1107 Fund (32); and
    2. Los Angeles County Sheriff's Department to include the repower of two main engines of a marine vessel instead of one engine at no additional cost.

9. Approve the transfer of $2 million from the Carl Moyer Program AB 923 Fund (80) to the Voucher Incentive Program (VIP) Fund (59) to continue funding truck replacement projects on a first-come, first-served basis under the Carl Moyer VIP.

Wayne Nastri
Executive Officer

MMM:FM:VAW

Background
This is the 20th year of the original Carl Moyer Program and the 14th year of the Carl Moyer Program with a long-term source of funding generated under SB 1107 and AB 923. For FY 2017-18, CARB has allocated $26,332,517 in SB 1107 funds to the SCAQMD, comprised of $24,686,735 in project funds and $1,645,782 in administrative funds. In addition, $3,949,878 is required from SCAQMD as its local match. This year, in addition to these funding sources, other sources of funds are available that can be used to fund projects under the Carl Moyer Program and the SOON Provision. They are the Community Air Protection AB 134, State Reserve, the FARMER, and the Voluntary NOx Remediation Measure (NRM) funds. Except for the State Reserve funds that are being recognized in this Board letter, all the other funds have been recognized by the Board in earlier actions. Table 1 shows a summary of the total available funds including accumulated interest and returned funds.

On June 5, 2018, proposals were received in response to the Program Announcements (PAs) issued for the "Year 20" Carl Moyer Program and SOON Provision. The Program was oversubscribed by more than four times the available funding.

Outreach
In accordance with SCAQMD's Procurement Policy and Procedure, a public notice advertising the PAs and inviting bids was published in the Los Angeles Times, the Orange County Register, the San Bernardino Sun, and Riverside County's Press Enterprise newspapers to leverage the most cost-effective method of outreach to the South Coast Basin.

Additionally, potential bidders may have been notified utilizing SCAQMD's own electronic listing of certified minority vendors. Notice of the PAs was emailed to the Black and Latino Legislative Caucuses and various minority chambers of commerce and business associations, and placed on the Internet at SCAQMD's website (http://www.aqmd.gov).

Proposal
This action is to adopt the attached Resolution recognizing up to $3.1 million in State Reserve funds from CARB into the Carl Moyer Program State Reserve Fund (32), and authorize the Executive Officer to accept the terms and conditions of the 2017-18 State Reserve grant award.

This action is to also execute contracts for the Carl Moyer Program vehicular and infrastructure projects as listed in Tables 2A and 2B, respectively, and for SOON Provision projects as listed in Table 3, in an amount not to exceed $56,446,878, comprised of $27,971,082 from the Carl Moyer Program SB 1107 Fund (32), $494,006 from interest funds accrued in the Carl Moyer Program Fund (32) and $27,981,790 from the Community Air Protection AB 134 Fund (77).

Additionally, this action is to execute off-road project contracts as listed in Table 4, in an amount not to exceed $7,094,557, comprised of $2,819,261 from the Carl Moyer State Reserve Fund (32), $1,761,375 from the Carl Moyer Program FARMER Fund (32), and $2,513,921 from the Carl Moyer Program NRM Fund (32).

Furthermore, in order to meet the State's expenditure deadlines and targets effectively, these actions are to allow the redistribution of the source of funds between the Carl Moyer Program Fund (32) and the Community Air Protection AB 134 Fund (77), to the extent not in conflict with any applicable guidance or direction from CARB, and to execute contracts from the backup projects as listed in Table 5, should any returned funds become available from any of the funding sources approved for projects in this Board letter or should any additional funds become available under the Community Air Protection AB 134 Program. The projects from the backup list will be selected based on cost-effectiveness and the amount of NOx reductions.

All the applications have been evaluated and recommended for funding according to CARB's Carl Moyer Program Guidelines approved in April 2017. For some projects, final CARB approval will be required before contracts can be executed. Due to the overwhelming oversubscription of the Program this year, combined with the funding opportunity for new project categories, staff recommends not funding marine vessel projects during this round of awards. For more than ten years, the marine vessels have been a major funding category for this program, and since the majority of the vessels are fishing vessels, monitoring their operation areas are more complicated than other equipment categories. There will also soon be new funding opportunities for marine vessel projects under the Volkswagen Settlement Program and next year's Carl Moyer Program, under which these projects may be considered. All the other equipment categories have been considered for funding. Since on-road diesel trucks are considered a major category of emissions in the AQMP and they are only at their second year of funding eligibility, all the near-zero emissions natural gas on-road trucks qualifying for incentive funding levels of at least $10,000 have been recommended for funding. Infrastructure projects are also a new funding category under this year's program. Staff has recommended funding all the battery electric charging and renewable natural gas fueling station projects, in addition to those natural gas fueling stations that are in close proximity to sensitive receptors, such as schools and hospitals. In all the remaining categories of SOON Provision, off-road, off-road agriculture and locomotive projects, the most cost effective projects of up to $23,000 per ton have been recommended for funding.

Finally, these actions are to amend two Carl Moyer Program awards previously approved in November 2017--one with no additional cost but to allow the repower of 2 (not 1) main marine vessel engines and one to add an additional $117,754 from the Carl Moyer Program SB 1107 Fund (32)--and to transfer $2 million from the Carl Moyer

Program AB 923 Fund (80) to the VIP Fund (59) to continue funding truck replacement projects on a first-come, first-served basis under the Carl Moyer VIP.

Disadvantaged and Low-Income Communities
Under the Carl Moyer Program and pursuant to AB 1390, there is a goal that at least 50 percent of the selected projects be located in disadvantaged and low-income communities. For the Community Air Protection AB 134 Program, there is a requirement that at least 80 percent of the selected projects be domiciled or in case of drayage trucks provide service in disadvantaged and low-income communities, based on CARB Board decision in April 2018. The status of the projects are determined by using the CalEnviroScreen version 3.0 and the requirements of SB 535 for disadvantaged communities and AB 1550 for low-income communities and those within half a mile of disadvantaged communities.

Since the Program was significantly oversubscribed this year, staff decided to only evaluate those projects that qualified in disadvantaged and low-income communities. Even by doing that, the Program was oversubscribed by twice as much as available funds. Thus, 100 percent of all the projects recommended for funding under the Carl Moyer and the Community Air Protection AB 134 Programs as well as all the recommended projects listed as backup are in disadvantaged and low-income communities. This by far surpasses the requirements of the programs.

Funding Distribution
Funding for projects has been recommended based on the priorities of the "Carl Moyer Program Guideline under SB 1107 & AB 923" adopted by the Board on July 8, 2005. The priorities in the Guideline are:

- Goods Movement (no less than 40%)
- Disadvantaged and low-income communities (no less than 50%)
- Cost-Effectiveness
- Low-Emission Engine/Vehicle Preference
- Early Commercialization of Advanced Technologies/Fuels
- Fleet Rules
- School Buses

Benefits to SCAQMD
The successful implementation of the Carl Moyer Program and SOON Provision will provide direct emissions reductions of both NOx and PM as required by the programs. Total annual NOx and PM emissions reductions for the Carl Moyer Program projects are approximately 239 tons and 7.8 tons, respectively. Total annual NOx emissions reductions from the recommended SOON Provision projects are approximately 118 tons. Since the vehicles and equipment funded under these programs will operate for

the life of the contract and beyond, the emissions reductions will provide long-term benefits.

Resource Impacts
Total funding for projects under the "Year 20" Carl Moyer Program, the SOON Provision and the Community Air Protection AB 134 Program will not exceed $63,541,435, comprised of the following funds:

$27,971,082	Carl Moyer Program SB 1107 Fund (32);
$494,006	Carl Moyer Program accrued interests funds in Fund (32);
$2,819,261	Carl Moyer Program State Reserve Fund (32);
$1,761,375	Carl Moyer Program FARMER Fund (32);
$2,513,921	Carl Moyer Program NRM Fund (32); and
$27,981,790	Community Air Protection AB 134 Fund (77).

The contract amendment from the November 2017 Carl Moyer Program award will not exceed $117,754 from the Carl Moyer Program SB 1107 Fund (32), and the transfer from the Carl Moyer Program AB 923 Fund (80) to the VIP Fund (59) will not exceed $2 million.

Attachments
1. Resolution
2. Funding Tables (Tables 1 - 5)

ATTACHMENT 1

RESOLUTION NO. 18-XXX

A Resolution of the South Coast Air Quality Management District Board Recognizing Funds and Accepting the Terms and Conditions of the FY 2017-18 Carl Moyer State Reserve Grant Award

WHEREAS, under Health & Safety Code §40400 et seq., the South Coast Air Quality Management District (SCAQMD) is the local agency with the primary responsibility for the development, implementation, monitoring and enforcement of air pollution control strategies, clean fuels programs and motor vehicle use reduction measures; and

WHEREAS, the SCAQMD is authorized by Health & Safety Code §§40402, 40440, and 40448.5 as well as the Carl Moyer Memorial Air Quality Standards Attainment Program (§44275, et seq.) to implement programs to reduce transportation emissions, including programs to encourage the use of alternative fuels and low-emission vehicles; to develop and implement other strategies and measures to reduce air contaminants and achieve the state and federal air quality standards; and

WHEREAS, the Governing Board has adopted several programs to reduce emissions from on-road and off-road vehicles, as well as emissions from other equipment, including the Carl Moyer Program; and

WHEREAS, the SCAQMD is designated as an extreme non-attainment area for ozone and as such is required to utilize all feasible means to meet national ambient air quality standards.

THEREFORE, BE IT RESOLVED that the Governing Board, in regular session assembled on November 2, 2018, does hereby authorize the Executive Officer to accept the terms and conditions of the FY 2017-18 Carl Moyer State Reserve grant award and recognize up to $3.1 million from CARB in Carl Moyer State Reserve funds.

BE IT FURTHER RESOLVED that the Executive Officer is authorized and directed to take all steps necessary to carry out this Resolution.

_____ _____

Date Denise Garzaro, Clerk of the Boards

ATTACHMENT 2

Table 1: Total Amount of Available Funds

Funding Source	Funds Required to be Encumbered	Comment
SB 1107	$27,971,082	From $26,332,517 "Year 20" funds allocated by CARB: less $1,645,782 in administration funds; plus $3,284,347 in returned projects.
Carl Moyer Fund Interest	$494,006	Total unobligated interest funds in Fund 32 as of 6/30/18.
Match Funds	0	The amount of $3,949,878 is the required match amount for "Year 20", less 15% as SCAQMD's in-kind contribution allowed under the Program. However, the SCAQMD has already met its local match requirement through funding of eligible projects.
AB 134	$27,981,790	From $107.5 million allocated by CARB: less $6,718,750 in administrative funds; less $72,799,460 obligated in earlier Board actions.
State Reserve	$2,819,261	From $3,007,212 allocated by CARB: less $187,951 in administrative funds.
FARMER	$1,761,375	From $1,878,800 allocated by CARB: less $117,425 in administrative funds.
NRM	$2,513,921	From $2,674,384 allocated by CARB: less $160,463 in administrative funds.
Total	**$63,541,435**	

Table 2A: Recommended Carl Moyer Program Awards with SB 1107, AB 134 and Carl Moyer Accrued Interest Funds

Applicant	Category	Project Type	No. of Engines	Recommended Award Amount
Airport Mobile, Inc.	On-Road	Optional Low NOx Replacement	4	$154,607
American Pacific Forwarders Inc.	On-Road	Optional Low NOx Replacement	2	$200,000***
Calmet Services Inc.	On-Road	Optional Low NOx Replacement	9	$586,402
Carolina Trucking, Inc.	On-Road	Optional Low NOx Replacement	23	$2,300,000
City of Arcadia	On-Road	Optional Low NOx Replacement	1	$11,263
Coachwest Transportation, Inc.	On-Road	Optional Low NOx Replacement	5	$224,462
CSC Logistics Inc.	On-Road	Optional Low NOx Replacement	1	$77,535
Fred Martinez	On-Road	Optional Low NOx Replacement	1	$62,612
Green Fleet Systems, LLC	On-Road	Optional Low NOx Replacement	19	$1,854,647***
Jose Adan Flores	On-Road	Optional Low NOx Replacement	1	$53,575
Joshua Rodriguez	On-Road	Optional Low NOx Replacement	1	$56,173
JPA Construction Clean Up Services Inc.	On-Road	Optional Low NOx Replacement	3	$237,905
Juan Norio DBA Norio Trucking	On-Road	Optional Low NOx Replacement	1	$75,552
Luis Manuel Calderon Perez	On-Road	Optional Low NOx Replacement	1	$66,373

Martin H. Karam	On-Road	Optional Low NOx Replacement	1	$73,647
MC EXPRESS TRUCKING LLC	On-Road	Optional Low NOx Replacement	10	$551,497
MLI Leasing, LLC	On-Road	Optional Low NOx Replacement	7	$181,595
National Ready Mix Concrete Company	On-Road	Optional Low NOx Replacement	29	$1,664,528
Nestle Waters North America	On-Road	Optional Low NOx Replacement	18	$236,637
Omnitrans	On-Road	Optional Low NOx Repower	21	$301,412
Pacifica Trucks, LLC	On-Road	Optional Low NOx Replacement	11	$693,384
Plain Leasing, Inc., dba. Ktrans Inc.	On-Road	Optional Low NOx Replacement	9	$422,860
Ralphs Grocery Company	On-Road	Zero-Emission Replacement	5	$726,767
Moris Musharbash I, Inc., dba San Gabriel Valley Towing	On-Road	Optional Low NOx Replacement	1	$46,729
Southern Counties Express, Inc.	On-Road	Optional Low NOx Replacement	1	$35,292
Supra National Express Inc.	On-Road	Optional Low NOx Replacement	11	$812,447
TKS Leasing, LLC	On-Road	Optional Low NOx Replacement	1	$100,000***
Toll Global Forwarding SCS (USA), Inc.	On-Road	Optional Low NOx Replacement	45	$1,580,473***
Tricon Transportation, Inc.	On-Road	Optional Low NOx Replacement	2	$114,195***
Ventura Transfer Company	On-Road	Optional Low NOx Replacement	4	$375,122
Willian A. De Leon dba Willian A. De Leon Trucking	On-Road	Optional Low NOx Replacement	1	$100,000

AAA Farm, Inc.	Off-Road Ag	Replacement	3	$173,457
Alexandra Dates, Inc.	Off-Road Ag	Replacement	1	$111,797
Anthony Vineyards, Inc.	Off-Road Ag	Replacement	2	$230,160
Conejo Dates, Inc.	Off-Road Ag	Replacement	1	$40,283
Cottonwood Dairy	Off-Road Ag	Replacement	2	$149,268
Desert Empire Homes dba Desert Empire Palms	Off-Road Ag	Replacement	3	$345,096
Desert Mist Farms	Off-Road Ag	Replacement	3	$401,116
Emerald Acres LLC	Off-Road Ag	Replacement	2	$1,950,000*
Gary McMillan dba McMillan Farm Management	Off-Road Ag	Replacement	2	$134,616
Hollandia Farms North	Off-Road Ag	Replacement	2	$128,428
J & L Properties	Off-Road Ag	Replacement	1	$60,167
Jorge Fuentes Trucking	Off-Road Ag	Replacement	1	$107,296
Long Life Farms, Inc.	Off-Road Ag	Replacement	13	$793,178
Quality Turf, Inc.	Off-Road Ag	Replacement	6	$353,382
Regents of the University of California, Riverside	Off-Road Ag	Replacement	2	$81,087
Robert McGinty	Off-Road Ag	Replacement	1	$67,669
Rocket Farm Herbs, Inc.	Off-Road Ag	Replacement	4	$153,118
Sun World International, LLC	Off-Road Ag	Replacement	1	$70,335
SunWest Farms	Off-Road Ag	Replacement	1	$108,921
T & R Nurseries, Inc.	Off-Road Ag	Replacement	8	$608,873
Van Drunen Farms/Golden State Herbs, Inc.	Off-Road Ag	Replacement	4	$785,855
Altfillisch Contractors, Inc.	Off-Road	Repower	2	$445,086
Bill Higgins, Inc.	Off-Road	Repower	1	$44,528**
Cal Cartage Warehouse & Transloading LLC	Off-Road	Replacement	3	$231,696
Ernesto Medrano dba. CM Backhoe Service	Off-Road	Replacement	2	$185,032
James McMinn, Inc.	Off-Road	Replacement	2	$1,559,840
RRM Properties	Off-Road	Replacement	2	$376,993
Sharma Contractors	Off-Road	Replacement	1	$527,370
Sukut Equipment Inc.	Off-Road	Repower	4	$855,284***
Trench Shoring Company	Off-Road	Replacement	2	$347,936
BNSF Railway Company	Locomotive	Replacement	6	$11,533,500***
		Total	**337**	**$36,939,058**

*This project will be funded with $1,828,699 in SB 1107 funds and $121,301 in FARMER Program funds for a total amount not to exceed $1,950,000.

**This project will be funded with $44,528 in SB 1107 funds and $102,579 in State Reserve funds for a total amount not to exceed $147,107.

***This project is pending CARB case-by-case approval and/or SCAQMD qualification check.

Table 2B: Recommended Infrastructure Projects with AB 134 Funds

Applicant	Project Type	Recommended Award Amount
AJR Trucking, Inc. (2 locations)	Renewable Natural Gas	$1,279,800
Banning Unified School District	Battery-Electric	$122,500
City of Commerce Transportation	Renewable Natural Gas	$866,305
City of Lawndale	Natural Gas*	$343,218
Clean Energy Fuels	Renewable Natural Gas	$4,042,689
CR&R Inc.	Renewable Natural Gas	$223,901
Food Express, Inc.	Renewable Natural Gas	$525,849
National Ready Mixed Concrete Co.	Renewable Natural Gas	$1,113,794
Newport-Mesa Unified School District	Natural Gas*	$198,575
Placentia-Yorba Linda Unified School District	Natural Gas*	$695,990
RF Dickson Co., Inc.	Renewable Natural Gas	$548,492
Superior Ready Mix (5 locations)	Renewable Natural Gas	$3,642,203
Total	**17 Stations**	**$13,603,316**

*These projects will operate near or sensitive receptor (i.e., school, hospital, etc.) areas.

Table 3: Recommended SOON Provision Awards with SB 1107 Funds

Applicant	Category	Project Type	No. of Engines	Recommended Award Amount
Peed Equipment Company	SOON	Repower	21	$5,275,540
Ralph D. Mitzel, Inc.	SOON	Repower	3	$628,964*
		Total	**24**	**$5,904,504**

*This project will also be funded with $2,513,921 in NRM funds for a total of $3,142,885.

Table 4: Recommended Off-Road Project Awards with State Reserve, FARMER and NRM Funds

State Reserve Funds				
Applicant	**Category**	**Project Type**	**No. of Engines**	**Recommended Award Amount**
Bill Higgins, Inc.	Off-Road	Repower	1	$102,579*
Cal Cartage Warehouse & Transloading LLC	Off-Road	Replacement	3	$231,696
California Waste Services LLC	Off-Road	Replacement	3	$119,190
MBA Grading and Demolition, Inc.	Off-Road	Repower	1	$168,206
Recycled Wood Products	Off-Road	Replacement	1	$44,408
SA Recycling, LLC	Off-Road	Replacement	4	$374,594
Skip Edmunson, Inc.	Off-Road	2-for-1 Replacement	4	$1,147,254
Sukut Equipment Inc.	Off-Road	Repower	2	$341,757
TIPCO Engineering Inc.	Off-Road	Repower	1	$165,846
Tony R. Crisalli Inc.	Off-Road	Repower	1	$123,731
		Total	**21**	**$2,819,261**
FARMER Program Funds				
AAA Farm, Inc.	Off-Road Ag	Replacement	1	$32,721
Earth & Ag LLC	Off-Road Ag	Replacement	1	$1,000,000
Emerald Acres LLC	Off-Road Ag	Replacement	1	$121,301**
Quality Turf, Inc.	Off-Road Ag	Replacement	1	$57,463
Robert McGinty	Off-Road Ag	Replacement	1	$44,949
Rocket Farm Herbs, Inc.	Off-Road Ag	Replacement	1	$23,682
Sun World International, LLC	Off-Road Ag	Replacement	2	$140,670
SunWest Farms	Off-Road Ag	Replacement	2	$114,926
T & R Nurseries, Inc.	Off-Road Ag	Replacement	7	$225,663
		Total	**17**	**$1,761,375**
NRM Funds				
Ralph D. Mitzel, Inc.	SOON	Repower	13	$2,513,921***
		Total	**13**	**$2,513,921**
		Grand Total	**51**	**$7,094,557**

*This project will be funded with $102,579 in State Reserve funds and $44,528 in SB 1107 funds for a total amount not to exceed $147,107.

**This project will be funded with $121,301 in FARMER Program funds and $1,128,699 in SB 1107 funds for a total amount not to exceed $1,250,000.

***This project will be funded with $2,513,921 in NRM funds and $628,964 in SB 1107 funds under SOON for a total amount not to exceed $3,142,885.

Table 5: Recommended List of Backup Projects

Applicant	Category	Project Type	No. of Engines	Recommended Award Amount
Calmet Services Inc	On-Road	Optional Low NOx Replacement	1	$2,487
Coachwest Transportation Inc.	On-Road	Optional Low NOx Replacement	3	$24,433
MLI Leasing	On-Road	Optional Low NOx Replacement	3	$15,272
Nestle Waters North America	On-Road	Optional Low NOx Replacement	43	$313,492
Omnitrans	On-Road	Optional Low NOx Repower	6	$49,274
Pacifica Trucks, LLC	On-Road	Optional Low NOx Replacement	2	$1,927
Southern Counties Express, Inc.	On-Road	Optional Low NOx Replacement	2	$7,131
Toll Global Forwarding SCS (USA), Inc.	On-Road	Optional Low NOx Replacement	4	$31,300
Tricon Transportation Inc	On-Road	Optional Low NOx Replacement	1	$5,389
Desert Empire Homes dba Desert Empire Palms	Off-Road Ag	Replacement	1	$138,385
Hollandia Farms North	Off-Road Ag	Replacement	1	$158,433
Long Life Farms, Inc.	Off-Road Ag	Replacement	4	$414,350
Quality Turf, Inc.	Off-Road Ag	Replacement	1	$120,415
Regents of the University of California, Riverside	Off-Road Ag	Replacement	1	$78,521
Rocket Farm Herbs, Inc.	Off-Road Ag	Replacement	10	$389,377
Stephen Wesselink Farms, Inc.	Off-Road Ag	Replacement	3	$749,615
Calmat CO. dba Vulcan Materials Company	Off-Road (SOON)	Replacement	7	$3,201,289
Peed Equipment Company	Off-Road (SOON)	Repower	25	$5,118,854
Three Peaks Corp	Off-Road (SOON)	Replacement	1	$33,995
Altfillisch Contractors, Inc.	Off-Road	Repower	6	$1,166,587
Becker Pipeline Company	Off-Road	Replacement	2	$175,439
Bill Higgins, Inc.	Off-Road	Repower	2	$421,084
California Waste Services LLC	Off-Road	Replacement	2	$448,346
City of Burbank	Off-Road	Replacement	2	$42,053
Gateway Concrete Inc.	Off-Road	Replacement	2	$66,036

Jacobsson Engineering Construction, Inc.	Off-Road	Replacement	3	$135,629
Kirtley Construction Inc., dba TK Construction	Off-Road	Replacement	5	$233,297
KLM Engineering	Off-Road	Replacement	3	$493,686
Kramar's Iron & Metal, Inc.	Off-Road	Replacement	2	$319,162
L & S Construction, Inc.	Off-Road	Replacement	4	$698,061
L&S Development, Inc.	Off-Road	Replacement	1	$27,071
Master Landscape	Off-Road	Replacement	1	$1,350
MBA Grading and Demolition, Inc.	Off-Road	Repower	1	$76,578
Peterson Pipeline, Inc.	Off-Road	Replacement	2	$63,100
Post Bros Construction Company	Off-Road	Replacement	1	$388,343
Powerland Equipment, Incorporated	Off-Road	Replacement	2	$161,818
Recycled Wood Products	Off-Road	Replacement	6	$971,512
RRM Properties	Off-Road	Replacement	42	$6,398,878*
SA Recycling, LLC	Off-Road	Replacement	15	$2,865,992*
Sharma Contractors	Off-Road	Replacement	4	$490,410
Sukut Equipment Inc.	Off-Road	Replacement/Repower	93	$27,417,819*
The J.V. Land Clearing Company, Incorporated	Off-Road	Replacement	1	$416,155
Whittier Fertilizer Company	Off-Road	Replacement	5	$162,341*
BNSF Railway Company	Locomotive	Replacement	3	$5,766,750*
Metropolitan Stevedore dba Metro Ports	Locomotive	Replacement	3	$925,041*
City of South Gate	Infrastructure	Natural Gas	NA	$398,909
Albertsons LLC (2 locations)	Infrastructure	TRU Charger	NA	$2,725,500
Convoy Solutions LLC dba IdleAir (2 locations)	Infrastructure	Electric Charger (TRU and TSE)	NA	$407,721
		Total	**332**	**$64,718,607**

*This project is pending CARB case-by-case approval.

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Agenda Item #2

Vicki White

Adopt Resolution Recognizing Funds for FY 2017-18 Carl Moyer State Reserve Program, Execute Contracts for FY 2017-18 “Year 20” Carl Moyer Program, SOON Provision and Community Air Protection AB 134 Program, Amend Awards and Transfer Funds

Background

- In June 2018, Program Announcements for “Year 20” Carl Moyer Program and SOON Provision closed
- This year, in addition to the Carl Moyer Program funds, other funding sources are available:
  - Community Air Protection AB 134
  - State Reserve
  - FARMER
  - Voluntary NOx Remediation Measure

Total Project Funds Available for “Year 20”

Funding Source	Available Funds
SB 1107 Project Funds	$27,971,082
Carl Moyer Fund Interest	$494,006
AB 134	$27,981,790
State Reserve*	$2,819,261
FARMER	$1,761,375
NOx Remediation Measure	$2,513,921
Total	**$63,541,435**

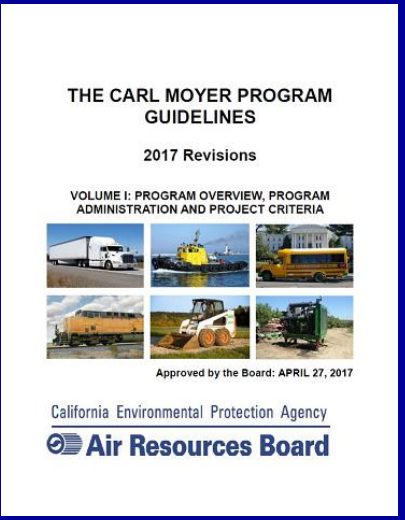
*Revenue from all categories except the State Reserve have been recognized by the Board in prior actions.

Proposal

- Adopt Resolution and accept terms and conditions for State Reserve Funds
- Fund projects under the Carl Moyer Program, SOON Provision and Community Air Protection AB 134 Program
- Amend two Carl Moyer Program awards
- Transfer funds to the Voucher Incentive Program to continue the truck replacement program on a first-come, first-served basis

Project Selection Criteria

- Staff only evaluated the projects that qualified in disadvantaged and low-income communities (DAC)
  - AB 1390 specifies a goal of at least 50% of Moyer funds to be used in DAC
  - CARB requires at least 80% of the Community Air Protection
  - AB 134 funds to be used in DAC
- The projects were evaluated according to the Carl Moyer Program Guidelines approved by CARB in April 2017



Project Selection Criteria (cont'd)

Due to heavy oversubscription and opportunity to fund new project categories, staff recommends not funding marine vessels:

- Marine vessels have been a major funding category in the past 15 years
- Majority of vessels are fishing vessels, which are more complicated to monitor compared to other equipment categories
- New funding opportunities for marine vessels in 2019 (VW Mitigation, Carl Moyer)

Project Selection Criteria (cont'd)

- As on-road diesel trucks are a major category of emissions in the AQMP, all near-zero emissions natural gas trucks qualifying for at least $10,000 per truck are recommended
- Infrastructure is a new category, and all battery electric charging, renewable natural gas and natural gas fueling stations located near sensitive receptors are recommended
- For the remaining categories of SOON Provision (off-road construction, off-road agriculture and locomotives), projects not exceeding $23,000 per ton are recommended

Proposed Awards

Category	No. of Engines	Total Awards
On-Road	249	$13,977,691
Off-Road - Construction	40	$7,393,026
Off-Road – Ag	80	$8,615,477
Locomotive	6	$11,533,500
Infrastructure	17 stations	$13,603,316
Off-Road (SOON)	37	$8,418,425
Total	**412 & 17 stations**	**$63,541,435**

Project Benefits

- Overall emissions reductions achieved:
  - Carl Moyer Program

    NOx = 239 tons/yr PM = 7.8 tons/yr
  - SOON Provision

    NOx = 118 tons/yr
- 100% of recommended and backup projects are in DAC

Recommended Actions

- Recognize $3.1 million and accept terms and conditions of State Reserve Funds
- Execute Carl Moyer Program contracts up to $36,939,058:
  - $22,066,578 from the Carl Moyer Program SB 1107 Fund (32)
  - $494,006 from interest accrued in the Carl Moyer Program Fund (32)
  - $14,378,474 from the Community Air Protection AB 134 Fund (77)
- Execute contracts for infrastructure projects up to $13,603,316 from the Community Air Protection AB 134 Fund (77)
- Execute SOON Provision contracts up to $5,904,504 from the Carl Moyer Program SB 1107 Fund (32)

Recommended Actions (cont'd)

- Execute off-road project contracts up to $7,094,557:
  - $2,819,261 from Carl Moyer State Reserve Fund (32)
  - $1,761,375 from Carl Moyer Program FARMER Fund (32)
  - $2,513,921 from Carl Moyer Program NRM Fund (32)
- Redistribute source of funds between Carl Moyer Program and AB 134 – Community Air Protection, as needed, to meet program requirements
- Execute contracts from backup list with any returned funds or additional AB 134 funds, and amend two Carl Moyer Program awards: 1) Pastime Lakes Holdings by adding $117,754, and 2) Los Angeles County Sheriff's Department for repower of two main engines on a marine vessel
- Transfer $2 million from the Carl Moyer Program AB 923 Fund (80) to the VIP Fund (59) to continue funding truck replacements

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DRAFT
Technology Committee Agenda #3

BOARD MEETING DATE: November 2, 2018 AGENDA NO.

PROPOSAL: Establish Special Revenue Fund, Recognize Revenue, Execute Agreements for Volkswagen Environmental Mitigation Program and Transfer Funds

SYNOPSIS: On May 25, 2018, CARB approved the Beneficiary Mitigation Plan for the Volkswagen (VW) Environmental Mitigation Trust. This plan identifies five funding categories for the State's $423 million allocation of the VW Environmental Mitigation Trust. The funded projects are intended to mitigate the excess NOx emissions caused by the VW vehicles. SCAQMD has been identified by CARB as the administrator of two project funding categories—the Zero Emissions Class 8 Freight and Port Drayage Trucks and the Combustion Freight and Marine Projects. These actions are to establish the VW Mitigation Special Revenue Fund (79), recognize revenue up to $150 million into this special revenue fund, execute an agreement with CARB to administer and implement the two project funding categories, execute a Memorandum(s) of Agreement with other air districts, as needed, to assist in administering this program, and transfer funds from the VW Mitigation Special Revenue Fund (79) to the General Fund to reimburse administrative costs associated with the program.

COMMITTEE: Technology, October 19, 2018; Recommended for Approval

RECOMMENDED ACTIONS:

1. Establish the VW Mitigation Special Revenue Fund (79) and recognize revenue, upon receipt, up to $150 million into this fund to administer and implement two project funding categories identified in CARB's Beneficiary Mitigation Plan for the VW Environmental Mitigation Trust.
2. Transfer up to 10 percent of the total cost of the eligible mitigation actions from the VW Mitigation Special Revenue Fund (79) to the General Fund (01) to reimburse administrative costs associated with implementing the program.
3. Authorize the Executive Officer to execute the following:

a. An agreement with CARB to administer and implement the Zero Emissions Class 8 Freight and Port Drayage Trucks and the Combustion Freight and Marine Projects funding categories for the VW Environmental Mitigation Program; and
b. A Memorandum(s) of Agreement with other air districts, as needed, to assist in administering and implementing the Program.

Wayne Nastri
Executive Officer

MMM:FM:VW

Background

On May 25, 2018, CARB approved the Beneficiary Mitigation Plan for the Volkswagen (VW) Environmental Mitigation Trust. This plan identifies five funding categories for the State's $423 million allocation of the VW Environmental Mitigation Trust. The funded projects are intended to mitigate the excess NOx emissions caused by the VW vehicles. SCAQMD has been identified by CARB as the administrator of two project funding categories—the Zero Emissions Class 8 Freight and Port Drayage Trucks and the Combustion Freight and Marine Projects. The Beneficiary Mitigation Plan allocates $90 million and $60 million, respectively, for these two categories for a total of $150 million. The other three project funding categories in the Beneficiary Mitigation Plan will be administered by the San Joaquin Valley APCD and Bay Area AQMD. Staff has been coordinating with CARB and the other air districts to implement the Program including identifying statewide tasks that are needed to conduct effective outreach throughout the state of California.

Funding through the VW Mitigation Program will be available for mostly "scrap and replace" projects in the heavy-duty sector, including on-road freight trucks, transit and shuttle buses, school buses, forklifts, port cargo handling equipment, commercial marine vessels and freight switcher locomotives.

Proposal

These actions are to establish the VW Mitigation Special Revenue Fund (79) and recognize revenue up to $150 million into this fund to administer and implement two project funding categories--the Zero Emissions Class 8 Freight and Port Drayage Trucks and the Combustion Freight and Marine Projects. This action is to also authorize the Executive Officer to execute an agreement with CARB to administer and implement these two funding categories for the VW Mitigation Program. This is a ten-year grant program with the first installment of funding anticipated in 2019. For the first installment, staff plans to release two solicitations, including a first-come, first-served announcement for the Zero Emissions Class 8 Freight and Port Drayage Trucks

category and a competitive solicitation for the Combustion Freight and Marine Projects category.

SCAQMD will assist the other two air districts in implementing their assigned project funding categories, including but not limited to: program development, outreach, project evaluations, inspections and other tasks necessary to implement this program statewide. It is anticipated that SCAQMD will also need to seek assistance from other air districts to conduct outreach and perform inspections in locations that are outside SCAQMD's jurisdiction. This will require significant collaboration and shared administrative costs with the other air districts. Therefore, this action is to also authorize the Executive Officer to execute a Memorandum(s) of Agreement with other air districts, as needed, to assist in administering and implementing this statewide program. Finally, this action is to transfer up to 10 percent of the total cost of the eligible mitigation actions from the VW Mitigation Special Revenue Fund (79) to the General Fund (01) to reimburse administrative costs associated with implementing the program.

Benefits to SCAQMD

The successful implementation of this program will provide direct reductions in NOx emissions from vehicles and equipment, which are intended to fully mitigate the excess NOx emissions caused by the VW vehicles. Over the ten-year life of this program, CARB estimates a reduction of 10,000 tons of NOx emissions. The projects funded through this program will also reduce emissions of other criteria air pollutants, toxic air contaminants and greenhouse gases. At least 50% of the projects will benefit disadvantaged and low-income communities by reducing NOx emissions and other air pollutants in these communities, as specified in the Beneficiary Mitigation Plan for the VW Environmental Mitigation Trust. This program will also accelerate the deployment of new commercially available near-zero emissions heavy-duty natural gas trucks, which is a key strategy to reducing NOx emissions identified in the 2016 AQMP.

Resource Impacts

Revenue up to $150 million will be recognized into the VW Mitigation Special Revenue Fund (79) to administer and implement two project funding categories identified in CARB's Beneficiary Mitigation Plan for the VW Environmental Mitigation Trust. Ten percent of revenue received will be transmitted into the General Fund (01) to reimburse administrative costs.

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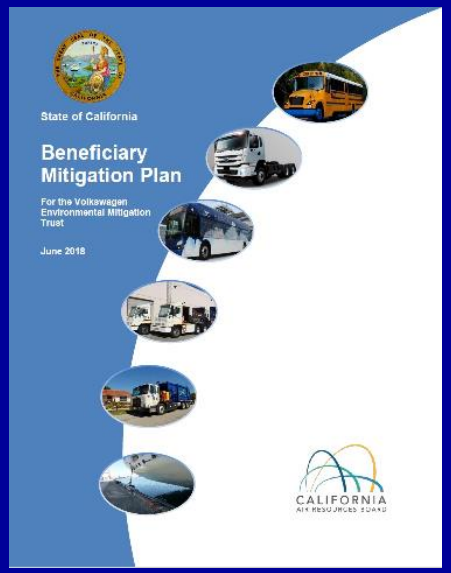
Agenda Item #3

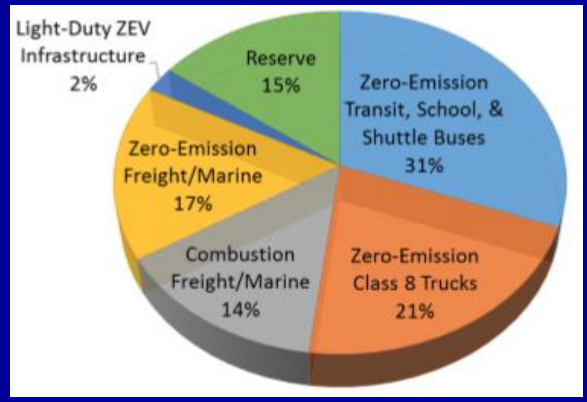
Vicki White

Establish Special Revenue Fund, Recognize Revenue, Execute Agreements for the VW Environmental Mitigation Program and Transfer Funds

Background

- Volkswagen settlement
  - Environmental Mitigation Trust (Appendix D)
  - $423 million for California
- Beneficiary Mitigation Plan
  - Approved on May 25, 2018
  - Five eligible mitigation actions
  - Mostly scrap and replace for heavy-duty sector
  - 10,000 tons of NOx reductions over 10-year period
  - Funds available starting in 2019





Background (cont'd)

Project Category	Technology	Allocation (millions)	Air District
Zero Emissions Transit, School and Shuttle Buses	Battery electric or fuel cell	$130	SJVAPCD
Zero Emissions Class 8 Freight and Port Drayage Trucks	Battery electric or fuel cell	$ 90	**SCAQMD**
Zero Emissions Freight and Marine Projects (airport GSE, forklifts, port cargo handling equipment, shore power at port terminals)	Battery electric or fuel cell	$ 70	BAAQMD
Combustion Freight and Marine Projects (waste haulers, dump trucks, concrete mixers, switcher locomotives, ferries, tug boats)	Low NOx engine, Tier 4 or Tier 4 equivalent	$ 60	**SCAQMD**
Light-Duty Zero Emissions Vehicle Infrastructure	Electric charger or hydrogen fueling station	$ 10	BAAQMD
	TOTAL	**$360**	

Proposal

- Establish the VW Mitigation Special Revenue Fund (79)
- Recognize revenue up to $150 million for two funding categories
  - Zero Emissions Class 8 Freight and Port Drayage Trucks ($90 million)
  - Combustion Freight and Marine Projects ($60 million)
- Execute an agreement with CARB to administer and implement
- Execute a MOA with other air districts, as needed
  - Assistance to implement the program statewide
  - Outreach
- Transfer funds for reimbursement of administrative costs

Proposed Timeline

- Implemented over a ten-year period
- First installment of program funds anticipated in 2019
  - $27 million for Zero Emissions Class 8 Freight and Port Drayage Trucks
  - $30 million for Combustion Freight and Marine Projects
- Two solicitations planned in mid-2019
  - Zero Emissions Class 8 Freight and Port Drayage Trucks: first-come, first-served
  - Combustion Freight and Marine Projects: competitive solicitation
- At least 50% of funds for projects benefiting disadvantaged and low-income communities

Funding Summary

Project Category	Total Program Funding		First Installment (2019)	
	Project Funds	Admin Funds	Project Funds	Admin Funds
Zero Emissions Class 8 Freight and Port Drayage Trucks	$90,000,000	$9,000,000	$27,000,000	$2,700,000
Combustion Freight and Marine Projects	$60,000,000	$6,000,000	$30,000,000	$3,000,000
Total	**$150,000,000**	**$15,000,000**	**$57,000,000**	**$5,700,000**

Recommended Actions

- Establish the VW Mitigation Special Revenue Fund (79) and recognize revenue up to $150M into this fund to administer and implement two project funding categories identified in CARB's Beneficiary Mitigation Plan for the VW Environmental Mitigation Trust
- Authorize the Executive Officer to execute:
  - An agreement with CARB to administer and implement the Zero Emissions Class 8 Freight and Port Drayage Trucks and the Combustion Freight and Marine Projects funding categories for the VW Environmental Mitigation Program
  - MOAs with other air districts, as needed, to assist in administering and implementing the Program
- Transfer up to 10 percent of the total cost of eligible mitigation actions to reimburse administrative costs

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DRAFT
Technology Committee Agenda #4

BOARD MEETING DATE: November 2, 2018 AGENDA NO.

PROPOSAL: Develop and Demonstrate Zero Emissions Heavy-Duty Trucks, Freight Handling Equipment, EV Infrastructure and Renewable Energy

SYNOPSIS: SCAQMD received an award of $44,839,686 to develop and demonstrate zero emissions heavy-duty trucks, freight handling equipment, EV infrastructure and renewable energy under CARB's Low Carbon Transportation Greenhouse Gas Reduction Fund (GGRF) Investments. Volvo Group North America and its project partners are providing $41,855,308. These actions are to recognize $44,839,686 and transfer $14,000,000 ($4,000,000 for SCAQMD's project cost-share and $10,000,000 for temporary advance of funds) from the Clean Fuels Program Fund (31) into the GHG Reduction Projects Special Revenue Fund (67). This action is to also execute contracts in an amount not to exceed $46,688,250 to implement this project. Out of the $2,151,436 allocated in CARB's grant for administrative expenses, these actions are to reimburse the General Fund up to $1,972,936 from Fund 67 for administrative costs and transfer $178,500 from Fund 67 to Fund 31 to execute a contract modification for administrative project implementation support. Finally, these actions are to authorize the Executive Officer to execute a contract modification and redistribute administrative funds to augment project funds on an as-needed basis.

COMMITTEE: Technology, October 19, 2018; Recommend for Approval

RECOMMENDED ACTIONS:

1. Recognize revenue, upon receipt, from CARB up to $44,839,686 ($42,688,250 for project costs and $2,151,436 for administrative costs) into the GHG Reduction Projects Special Revenue Fund (67) for a zero and near-zero emissions freight facilities (ZANZEFF) project to develop and demonstrate zero emissions heavy-duty trucks, freight handling equipment, EV infrastructure and renewable energy.

2. Transfer $4,000,000 from the Clean Fuels Program Fund (31) into the GHG Reduction Projects Special Revenue Fund (67) for SCAQMD's project cost-share.
3. Authorize the Chairman to execute contracts from the GHG Reduction Projects Special Revenue Fund (67) with the following entities:
   a. Volvo Group North America, LLC, to develop and demonstrate zero emissions trucks, freight handling equipment, EV infrastructure and renewable energy in an amount not to exceed $45,591,592; and
   b. University of California Riverside (UCR) CE-CERT to perform data collection, analysis and reporting in an amount not to exceed $1,096,658.
4. Transfer up to $10,000,000 as a temporary advance of funds, as needed, subject to availability of funds, from the Clean Fuels Program Fund (31) to the GHG Reduction Projects Special Revenue Fund (67).
5. Reimburse the General Fund up to $1,972,936 from the GHG Reduction Projects Special Revenue Fund (67) for administrative costs necessary to implement the above-referenced project.
6. Transfer $178,500 of administrative funds from the GHG Reduction Projects Special Revenue Fund (67) into the Clean Fuels Program Fund (31), returning any unused funds after project completion, and authorize the Executive Officer to amend a Clean Fuels Connection, Inc., contract in an amount not to exceed $178,500 for administrative project implementation support necessary to carry out the above-referenced project.
7. Authorize the Executive Officer to redistribute administrative funds to augment project funds with Volvo Group North America, on an as-needed basis, to meet project goals, contingent upon CARB approval if necessary.

Wayne Nastri
Executive Officer

MMM:FM:NB:JI

Background

On July 19, 2018, SCAQMD submitted a proposal in response to CARB's solicitation under the Low Carbon Transportation Greenhouse Gas Reduction Fund (GGRF) Investments for zero and near-zero emissions freight facilities (ZANZEFF) projects. On September 6, 2018, CARB advised thatSCAQMD had received a $44,839,686 ZANZEFF award. SCAQMD has partnered with Volvo Group North America, LLC, (Volvo) to conduct a freight facility project that will realize commercialization and market penetration of heavy-duty battery electric vehicles (HDBEVs) in California and throughout North America. Volvo, a major heavy-duty original equipment manufacturer, will be partnering with some of the top fleet and industry leaders to

reduce emissions at warehouses and freight facilities in some of the state's most disadvantaged communities using zero emissions on- and off-road equipment and warehouse energy efficiency improvements. This project is scalable and replicable to reduce emissions throughout the goods movement system. The project seeks to achieve emissions reductions and deploys both pre-commercial and commercial zero emissions technologies, including Volvo's North American market introduction of Class 8 battery electric trucks.

Proposal

These actions are to recognize revenue from CARB up to $44,839,686 ($42,688,250 for project costs and $2,151,436 for administrative costs) for a ZANZEFF award and to transfer $4,000,000 for SCAQMD's project cost-share from the Clean Fuels Program Fund (31) into the GHG Reduction Projects Special Revenue Fund (67) to develop and demonstrate zero emissions heavy-duty trucks, freight handling equipment, EV infrastructure and renewable energy. This action is to also execute contracts with Volvo and UCR CE-CERT for the following:

Volvo Zero Emissions Truck and Facilities Project

The project described below is based on Volvo's proposal and the specifications as outlined below may change as the designs are finalized. The Volvo Low Impact Green Heavy Transport Solutions (LIGHTS) project will develop and demonstrate the following for deployment at up to five sites, currently being considered within the cities of Chino, Fontana, La Mirada, Ontario and Placentia:

- Up to 23 on-road pre-commercial and commercial HDBEVs operating in and around disadvantaged communities;
- Up to 29 off-road BEVs used to load and unload containers and freight at warehouses and freight facilities;
- Up to 58 nonproprietary chargers both DC fast charging and Level 2 electric vehicle supply equipment (EVSE) with SAE approved connectors; and
- Approximately 1,860,462 watts of solar power.

The LIGHTS project includes a total of up to 23 HDBEVs and will begin with up to 8 multiple-configuration, pre-commercial truck deployments. The first three demonstration trucks will not be fully approved for U.S. operation and will therefore operate under CARB exemption waivers. The subsequent 5 demonstration units as well as up to 15 commercial/pre-commercial vehicles, will be approved for the U.S. market. Volvo will begin commercial introduction of the HDBEV rigid trucks and use mobile fast charging for fleets throughout the state to gain freight experience with battery electric trucks.

Based on Volvo's proposal, the three electric truck configurations delivered are anticipated to be equipped with the following driveline items:

- Two electric motors with 370 kW max power (260 kW continuous power) with a Volvo two-speed transmission.
- Average electric range is 170 miles depending on drive cycle. Throughout the course of this project, vehicles will be able to go 150-350 miles.
- Lithium-ion batteries for energy storage will have a minimum capacity of 200 kWh for the first two demonstrators, later increasing to four and then six battery pack configurations for a capacity of 320 kWh.

Volvo will deliver new lithium-ion battery chemistries for increased electrical energy densities at reduced cost; self-learning control algorithms which optimize energy usage in EVs; smart technologies to improve vehicle uptime and deployment of long-term rentals of HDBEVs to fleets throughout the state to accelerate adoption. Additionally, Volvo will coordinate the development of energy management systems to optimize vehicle charging by balancing the requirements of the vehicle, facility and grid. Vehicle charging will use SAE J1772 connectors for Level 2 charging and SAE J3068 or SAE CCS connectors for fast charging. Charging infrastructure includes 150 kW DC or 22 kW AC for the first two demonstration units and 250kW DC or 44 kW AC for subsequent and commercialized units. The freight facility sites will each feature standards-based, open architecture and interoperable charging infrastructure for off-road electric equipment, on-road electric trucks and employee workplace charging. Two standards-based, open architecture and interoperable charging stations along a key freight corridor for use by project fleets and the public will also be deployed. Up to 58 chargers will be installed ranging from 7.2 kW up to 150 kW.

<u>UCR CE-CERT Data Collection Project</u>

UCR CE-CERT will deploy a multiple-method approach to ensure all project data collection, which includes mobile logging, stationary logging, emissions testing and innovation analysis, is performed to CARB requirements. This will be done via hand recording and photos, data loggers, fleet and vehicle data records, testing results and interviews with end users. UCR CE-CERT will enhance its HDBEV guidance document to include tests targeted for Class 8, 60,000 pound gross vehicle weight rating and heavy-duty trucks utilized for warehouse operations. Performance testing will utilize UCR CE-CERT's heavy-duty chassis dynamometer for evaluation of two test vehicles (Class 8, rigid and tractor). To set a baseline and establish the benefit of the new vehicles, UCR CE-CERT will also collect emissions data from three conventional Volvo heavy-duty diesel trucks during normal in-service operation for up to three months using data loggers and the portable emissions measurement system (PEMS). Similarly, using the heavy-duty Hioki power meter system, UCR CE-CERT will verify power measurement system performance. Other responsibilities include quality assurance and control, secure and sanitize vehicle data, and conduct independent evaluations of truck electric range and battery degradation. UCR CE-CERT will oversee data collection of all other equipment, including off-road equipment, charging infrastructure and solar arrays.

Contract Amendment

Science & Technology Advancement occasionally contracts with experts and in-the field practitioners for technical and project implementation support. One contractor chosen through a competitive process is Clean Fuel Connection, Inc. (CFCI). This action is to transfer $178,500 from the GHG Reduction Projects Special Revenue Fund (67) into the Clean Fuels Program Fund (31) and authorize the Executive Officer to amend a contract with CFCI for technical and project implementation support necessary to implement the above-referenced project.

Finally, these actions are to transfer up to $10 million as a temporary advance of funds from the Clean Fuels Program Fund (31) to the GHG Reduction Projects Special Revenue Fund (67) to provide cash flow for contractor payments given CARB's cost-reimbursement process; to reimburse the General Fund up to $1,972,936 from the GHG Reduction Projects Special Revenue Fund (67) for administrative costs necessary to implement the above-referenced projects; and to authorize the Executive Officer to redistribute administrative funds to augment project funds with Volvo Group North America, on an as-needed basis, to meet project goals, contingent upon CARB approval if necessary.

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 that are needed to successfully complete this project. The manufacturer will utilize their proprietary technologies in the development of pre-commercial and commercial heavy-duty trucks to improve system reliability, efficiency and costs over previous generations. This demonstration project will be cost-shared by Volvo and other project partners as discussed in the Resource Impacts section. The request for sole source award for the UCR CE-CERT contract is made under the provisions B.2.d.(6): Projects requiring compatibility with existing specialized equipment; and B.2.d.(8): Research and development efforts with educational institutions or nonprofit organizations. UCR CE-CERT, an educational institution, will utilize its heavy-duty chassis dynamometer for evaluation of test vehicles.

Benefits to SCAQMD

Projects to support development and demonstration of various electric container and freight transport technologies are included in the *Technology Advancement Office Clean Fuels Program 2018 Plan Update* under the categories of "Develop and Demonstrate Electric and Hybrid Vehicles" and "Develop and Demonstrate Electric Container

Transport Technologies". This project is to develop and demonstrate zero emissions heavy-duty trucks, freight handling equipment, EV infrastructure and renewable energy. Successful demonstration 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, off road freight handling equipment and EV infrastructure powered by renewable energy.

Resource Impacts
CARB's GGRF award to SCAQMD in the amount of $44,839,686 is broken down into $42,688,250 for project expenses and $2,151,436 for administrative expenses. SCAQMD's project cost-share will not exceed $4,000,000. Further, SCAQMD's contract with Volvo will not exceed $45,591,592 and the contract with UCR CE-CERT will not exceed $1,096,658 from the GHG Reduction Projects Special Revenue Fund (67). Reimbursement of the General Fund for administrative costs will not exceed $1,972,936. The transfer from Fund 67 to Fund 31 for the contract amendment with CFCI will not exceed $178,500 (any unused funds will returned) and will be taken from the $2,151,436 for administrative expenses provided under the ZANZEFF Grant.

The funding sources and amounts for each project are detailed in the following table:

Proposed Volvo Project Costs

Source	Amount	Percent
CARB	$41,591,592	49%
Volvo and partners (cash & in-kind)	$41,655,308	46%
SCAQMD *(requested)**	$4,000,000	5%
Total	**$87,246,900**	**100%**

*If SCE's Make Ready Project funds are approved by the CPUC, this amount may be reduced.

Proposed UCR CE-CERT Project Costs

Source	Amount	Percent
CARB	$1,096,658	85%
UCR CE-CERT	$200,000	15%
Total	**$1,296,658**	**100%**

Sufficient funds are available in the Clean Fuels Program Fund (31). The Clean Fuels Program Fund was established as a special revenue fund resulting from the state-mandated Clean Fuels Program. The Clean Fuels Program, under Health and Safety Code Sections 40448.5 and 40512 and Vehicle Code Section 9250.11, establishes mechanisms to collect revenues from mobile sources to support projects to increase the utilization of clean fuels, including the development of the necessary advanced enabling technologies. Funds collected from motor vehicles are restricted, by statute, to be used

for projects and program activities related to mobile sources that support the objectives of the Clean Fuels Program.

Sufficient funds will be available in GHG Reduction Projects Special Revenue Fund (67) to execute the Volvo and UCR CE-CERT contracts once the CARB funds in the amount of $44,839,686 are recognized into Fund 67, along with the transfer of $4,000,000 from the Clean Fuels Program Fund (31) for SCAQMD's project cost-share. The transfer of up to $10,000,000 as a temporary advance of funds from the Clean Fuels Program Fund (31) to the GHG Reduction Projects Special Revenue Fund (67) is to provide cash flow due to CARB's cost-reimbursement process.

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Agenda Item #4

Joseph Impullitti

Develop and Demonstrate Zero Emissions Heavy-Duty Trucks, Freight Handling Equipment, EV Infrastructure and Renewable Energy

Background

- In July 2018, SCAQMD submitted a proposal for CARB's solicitation under the Low Carbon Transportation Greenhouse Gas Reduction Fund Investments
  - Volvo Group North America (Volvo) – to introduce heavy-duty battery electric vehicles (HDBEVs) in California
  - Deploy pre-commercial and commercial zero emissions technologies, including Class 8 battery electric trucks
- In September 2018, CARB announced a preliminary award of $44,839,686
  - Develop and demonstrate zero emissions heavy-duty trucks
  - Freight handling equipment
  - EV infrastructure
  - Renewable energy

Proposal

Volvo's Low Impact Green Heavy Transport Solutions (LIGHTS) project

- Up to 23 HDBEVs – within South Coast Air Basin
- Up to 29 off-road BEVs - load and unload containers and freight at warehouses and freight facilities
- Up to 58 nonproprietary chargers both Level 2 and DC fast chargers with SAE approved connectors
- ~1.9 MWs of solar power
- Up to five demonstration sites, currently proposed in Chino, Fontana, La Mirada, Ontario and Placentia

Proposal (cont'd)

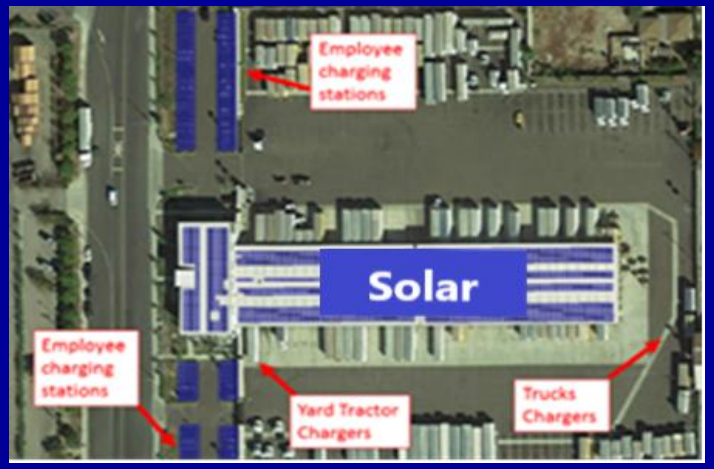
Truck Rollout Plan

- Three chassis configurations for up to 8 demonstration and 15 commercial & pre-commercial trucks
- Freight haul demonstration with rental and dedicated fleets:
  - Distribution
  - Short regional haul
  - Drayage
- From ports to Inland Empire warehouse locations through disadvantaged communities in and around the ports and I-710 corridor

Proposal (cont'd)

Unique Aspects of Innovation and Market initiatives

- Commercial introduction of class 8 HDBEVs
- Performance-based testing and data collection from UCR CE-CERT
- Networked chargers powered by solar utilizing load management strategies:
  - Prioritize charging and energy use based on vehicle needs
  - Pricing
  - Facility needs
  - Time of day
  - Utility status



The Volvo LIGHTS Project

Proposed Project Costs

Volvo Project Costs

Source	Amount	Percent of Project
CARB	$41,591,592	49
Volvo and partners (cash & in-kind)	$41,655,308	46
SCAQMD (*requested*)	*$4,000,000	5
Total	**$87,246,900**	**100**

* If SCE's Make Ready Project funds are approved by the CPUC, this amount may be reduced.

UCR CE-CERT Project Costs

Source	Amount	Percent of Project
CARB	$1,096,658	85
UCR CE-CERT	$200,000	15
Total	**$1,296,658**	**100**

In addition, staff proposes to amend the current technical assistance contract with Clean Fuel Connection, Inc., (CFCI), adding $178,500 from administrative funds provided in the CARB grant, to provide technical and project implementation support necessary to implement this project.

Recommended Actions

- Recognize CARB revenue up to $44,839,686 into the GHG Reduction Projects Special Revenue Fund (67)
- Transfer $14M from the Clean Fuels Fund (31) into the GHG Reduction Projects Special Revenue Fund (67) - $4M for SCAQMD's project cost-share and $10M as a temporary advance of funds pending receipt of revenue
- Execute contracts from the GHG Reduction Projects Special Revenue Fund (67) with the following entities:
  - Volvo in an amount not to exceed $45,591,592; and
  - UCR CE-CERT in an amount not to exceed $1,096,658

Recommended Actions (cont'd)

- Reimburse the General Fund up to $1,972,936 from the GHG Reduction Projects Special Revenue Fund (67) for administrative costs
- Transfer $178,500 from the GHG Reduction Projects Special Revenue Fund (67) into the Clean Fuels Fund (31) and authorize the Executive Officer to amend a CFCI contract adding $178,500
- Redistribute administrative funds to augment project funds with Volvo, on an as-needed basis, to meet project goals, contingent upon CARB approval if necessary

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DRAFT
Technology Committee Agenda #5

BOARD MEETING DATE: November 2, 2018 AGENDA NO.

PROPOSAL: Approve Awards for Heavy-Duty Diesel Drayage Truck Replacement Projects

SYNOPSIS: On November 3, 2017, the Board recognized $1,050,000 from U.S. EPA's 2017 Diesel Emissions Reduction Act (DERA) and issued a Program Announcement to solicit applications for the replacement of heavy-duty diesel drayage trucks with natural gas trucks as well as the transfer of the replaced diesel trucks to Washington State to replace older dirtier diesel trucks, which would then be scrapped. This action is to approve awards to replace 2012 or newer heavy-duty diesel drayage trucks with near-zero NOx emissions natural gas trucks in an amount not to exceed $1,000,000 from U.S. EPA's 2017 DERA Grant in the Advanced Technology, Outreach and Education Fund (17).

COMMITTEE: Technology, October 19, 2018; Recommended for Approval

RECOMMENDED ACTION:
Authorize the Executive Officer to execute contracts with one or more of the following entities to replace up to ten 2012 or newer on-road heavy-duty diesel drayage trucks with near-zero heavy-duty natural gas drayage trucks in an amount not to exceed $100,000 for each truck replaced for a total of up to $1,000,000 from U.S. EPA's 2017 DERA Grant in the Advanced Technology, Outreach and Education Program Fund (17):

a. National Freight Industries LLC;
b. MDB Transportation Inc.; and
c. Westcoast Warehousing & Trucking Inc.

Wayne Nastri
Executive Officer

MMM:FM:NB:AAO

Background
SCAQMD needs mass introduction of near-zero and zero emissions truck technologies in the South Coast Air Basin (Basin) to achieve significant progress towards the Basin's

air quality goals. The Puget Sound Clean Air Agency (PSCAA) also needs to continue to aggressively reduce diesel particulate emissions from heavy-duty diesel trucks (HDDTs) operating in its region. Consequently, both agencies as well as CARB, U.S. EPA, the Clean Cities Coalition and other stakeholders established a diesel emissions reduction strategy to accelerate truck turnover by providing incentives and encouraging the Basin and Washington fleets to replace their older and dirtier HDDTs with newer and cleaner trucks across each other's geographical locations.

On November 3, 2017, the Board recognized $1,050,000 from U.S. EPA's 2017 Diesel Emissions Reduction Act (DERA) into the Advanced Technology, Outreach and Education Fund (17) and issued a Program Announcement (PA) to solicit applications for the replacement of 2012 or newer HDDTs in the Basin with new near-zero NOx emission natural gas heavy-duty trucks as well as to transfer the replaced 2012 or newer HDDTs to Washington State to displace Model Year 1995-2006 HDDTs, which would then be scrapped.

Outreach

In accordance with SCAQMD's Procurement Policy and Procedure, a public notice advertising the PA and inviting bids was published in the Los Angeles Times, the Orange County Register, the San Bernardino Sun, and the Riverside County's Press Enterprises newspapers to leverage the most cost-effective method of outreach to the entire South Coast Basin.

Additionally, potential bidders may have been notified utilizing SCAQMD's own electronic listing of certified minority vendors. Notice of the PA was emailed to the Black and Latino Legislative Caucuses and various minority chambers of commerce and business associations, and placed on the Internet at SCAQMD's website (http://www.aqmd.gov).

Proposal

This project is a two-step HDDT replacement project involving two public agencies--the SCAQMD and PSCAA--and fleets in both agencies' respective geographic boundaries. The first step involves replacement of 2012 or newer HDDTs operating in the Basin with 2017 or newer near-zero NOx emission natural gas trucks. In the final step, the replaced 2012 or newer HDDTs will be transferred and sold to fleets in Washington State to replace 1995–2006 HDDTs, which would then be scrapped. As part of the condition of sale and as an incentive for Washington fleets to participate, the purchase price of each replaced 2012 or newer HDDT will not exceed $30,000 per truck.

Three applications with a total of twenty 2012 or newer HDDTs were received from three Basin fleets in response to the PA. Staff reviewed the applications and sent a list of thirteen 2012 or newer HDDTs to PSCAA to locate potential buyers in Washington

State. The remaining seven trucks were excluded from the list because of high maintenance and operating costs and market values less than $30,000.

This action is to execute contracts with one or more of the following fleet contractors--National Freight Industries LLC, MDB Transportation Inc. and Westcoast Warehousing & Trucking Inc. [1]--for the replacement of up to ten 2012 or newer HDDTs with near-zero NOx emissions natural gas trucks in an amount not to exceed $100,000 per replaced truck. A maximum of $1,000,000 from U.S. EPA's 2017 DERA Grant in the Advanced Technology, Outreach and Education Program Fund (17) will be awarded for truck replacements.

SCAQMD will reimburse Basin fleets a total of $100,000 per each near-zero NOx emissions natural gas truck as each new near-zero emissions natural gas truck is purchased and placed into service, as well as confirmation by PSCAA that the replaced 2012 or newer HDDT has been received by a Washington fleet and each replaced 1995–2006 HDDT with its engine has been destroyed or rendered useless. Additionally, Washington fleets will pay Basin fleets up to $30,000 for the sale of the 2012 or newer HDDT. The Basin and Washington fleets will execute an agreement with each other delineating, at a minimum, terms of bill of sale and purchase price, transfer of ownership, truck conditions, maintenance records and insurance as well as a signed statement that the replaced 2012 HDDTs will never re-enter the SCAQMD's jurisdiction.

Benefits to SCAQMD

Successful implementation of the HDDT replacement project will provide reductions of NOx, PM and GHG emissions. The HDDTs funded under this program are expected to operate for many years providing long-term emissions reduction benefits. In addition, the replaced 2012 HDDTs will never re-enter the SCAQMD's jurisdiction.

The proposed project is included in the *Technology Advancement Office Clean Fuels Program 2018 Plan Update* under the category "Fueling Infrastructure and Deployment (NG/RNG)".

Resource Impacts

Total funding for the recommended truck replacement awards will not exceed $1,000,000 from U.S. EPA's 2017 DERA Grant in the Advanced Technology, Outreach and Education Program Fund (17). Of the remaining $50,000 from the DERA Grant, the Board previously awarded $25,000 to PSCAA to implement the replacement

[1] National Freight Industry, which has bought Cal Cartage (which is alleged to have used lease-to-own contracts), has confirmed that all their trucks are company-owned and they do not do lease-to-own contracts. It is our understanding that the other two companies do not have recent truck-driver related adjudications against them, and do not do lease-to-own contracts.

projects in Washington State and approved reimbursement of the General Fund up to $25,000 for administrative costs.

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Agenda Item #5

Adewale Oshinuga

Approve Awards for Heavy-Duty Diesel Drayage Truck Replacement Projects

Background

- In November 2017, the Board
  - Recognized $1,050,000 from U.S. EPA DERA for heavy-duty diesel truck replacement project
  - Issued a Program Announcement for:
    - Replacement of ten heavy-duty diesel drayage trucks with near-zero CNG trucks
    - Sell the ten replaced diesel trucks to Washington fleets to displace older dirtier diesel trucks for no more than $30,000
    - Scrap the ten displaced diesel trucks in Washington State
  - Awarded $25,000 to Puget Sound Clean Air Agency to implement project in Washington State
- PA closed on February 28, 2018

1995-2006 diesel trucks (scrapped)

2012 or newer diesel trucks

Near Zero CNG trucks

Proposal

- Replace ten 2012 or newer diesel trucks in the SCAB with near-zero CNG trucks
- Transfer and sell the ten replaced 2012 or newer trucks to Washington fleets to displace 1995-2006 diesel trucks
- Limit sale price of each 2012 and newer truck to $30,000
- Scrap displaced 1995-2006 diesel trucks in Washington State
- SCAB fleets will receive:
  - $100,000 per truck from DERA funds
  - Up to additional $30,000 from Washington fleet per truck sold
- Require legally binding agreement between fleets

Selection Process

- Three SCAB fleets responded to PA by closing date
- Twenty replacement projects were submitted, including

Fleets	# of Truck Project
MDB Transportation Inc.	10
National Freight Industries	9
Westcoast Warehousing & Trucking Inc.	1

- Thirteen truck projects from all the fleets were sent to PSCAA to locate potential buyers
- Remaining seven trucks projects were excluded due to:
  - High truck maintenance and operating costs
  - Truck market values are less than $30,000

Proposed Project Funding

Partners	Cash
U.S. EPA	$1,050,000
Fleets	$1,000,000
Total	$2,050,000

Recommended Action

Authorize the Execute Officer to execute contracts with one or more of the following entities to replace ten heavy-duty diesel trucks for a total of up to $1 million in DERA funds from Fund 17:

- MDB Transportation Inc.
- National Freight Industries LLC
- Westcoast Warehousing & Trucking Inc.

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DRAFT
Technology Committee Agenda #6

BOARD MEETING DATE: November 2, 2018 AGENDA NO.

PROPOSAL: Recognize Revenue and Execute Agreements for Installation and Maintenance of Air Filtration Systems

SYNOPSIS: SCAQMD has executed a settlement agreement with Rainbow Transfer/Recycling, Inc., to install and maintain air filtration systems at schools. This action is to recognize up to $250,000 into the Air Filtration Fund (75). These actions are to also execute a contract to install and maintain air filtration systems at schools in an amount not to exceed $250,000 from the Air Filtration Fund (75) and execute an agreement with the local school district in Huntington Beach near the transfer facility.

COMMITTEE: Technology, October 19, 2018; Recommended for Approval

RECOMMENDED ACTIONS:

1. Recognize up to $250,000 from a settlement with Rainbow Transfer/Recycling, Inc., (Rainbow) into the Air Filtration Fund (75).
2. Authorize the Executive Officer to execute an agreement with the local school district in Huntington Beach near the transfer facility to implement the Rainbow settlement agreement.
3. Authorize the Chairman to execute a contract with IQAir North America for installation and maintenance of air filtration systems at schools in an amount not to exceed $250,000 from the Air Filtration Fund (75).

Wayne Nastri
Executive Officer

MMM:FM:NB:PSK

Background

SCAQMD has executed a settlement agreement with Rainbow Transfer/Recycling, Inc., (Rainbow) to install and maintain air filtration systems at schools in a geographical target area identified by the settlement agreement.

IQAir North America (IQAir) was previously selected through two separate competitive bid processes in 2011 and 2013 for air filtration projects, and staff subsequently performed a technology status check to ensure no new technologies had come on the market. IQAir is the only qualified manufacturer of high performance panel filters and stand-alone units which meet the performance standards in SCAQMD's 2009 air filtration pilot study as well as through a national testing opportunity conducted in 2010 by the University of California Riverside's College of Engineering/Center for Environmental Research and Technology. These performance standards include an average removal efficiency of at least 90 percent for ultrafine PM, black carbon and PM2.5, and noise level below 45 decibels for stand-alone units. To date, SCAQMD has installed air filtration systems at approximately 80 schools and community centers.

Proposal

SCAQMD and Rainbow staff have requested that schools receiving air filtration systems be located in Huntington Beach in close proximity to the transfer facility and that project completion occur by July 2019. Staff will work with the local school district to negotiate access to three schools that will receive air filtration systems for a period of five years. For this project, gas phase filtration is also included to provide odor control for the schools. The proposed schedule for installation and maintenance of air filtration systems is as follows:

Date	Event
November 2018	Board Approval
November 2018	Anticipated Execution of Contracts
November 2018	Site Assessments
November 2018–July 2019	Installation
November 2018–November 2023	Maintenance (varies by school)
July 2019	Final Report

These actions are to: 1) recognize up to $250,000 from the settlement agreement with Rainbow into the Air Filtration Fund (75); 2) authorize the Executive Officer to execute an agreement with the local school district for implementing the settlement agreement; and 3) execute a contract with IQAir North America for installation and maintenance of air filtration systems at schools in an amount not to exceed $250,000 from the Air Filtration Fund (75).

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. This request for a sole source award is made under provision B.2.c (1): The desired services are available from only the sole-source based upon the unique experience and capabilities of the proposed contractor or contractor team. IQAir remains the only manufacturer of

high performance panel filters, stand-alone and gas phase filtration units identified by SCAQMD and CARB staff that meet the performance standards required to complete the work.

Benefits to SCAQMD

This project will reduce children's exposure to criteria and toxic pollutants and ultrafine PM. Health studies have determined that fine and ultrafine PM, including diesel PM, present the greatest air pollution health risk to sensitive receptors in geographical target communities identified in the settlement agreement.

Resource Impacts

The new contract with IQAir will not exceed $250,000, the amount of the settlement agreement.

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Agenda Item #6

Patricia Kwon

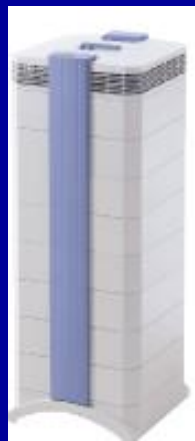
Recognize Revenue and Execute Agreements for Installation and Maintenance of Air Filtration Systems

Background

- SCAQMD executed settlement with Rainbow Transfer/Recycling, Inc. (Rainbow) to install and maintain air filtration systems at schools
- IQAir North America, previously selected through competitive bid processes, has installed air filtration systems at approximately 80 schools

Proposal

- Work with local school district in Huntington Beach near transfer facility for three schools to receive air filtration systems as well as filter replacements for five years
- Air Filtration Technologies
  - High performance panel filters + stand-alone units for ultrafine PM, gas phase filtration for odor control
  - 90% average removal efficiency ultrafine PM, odor control using activated carbon
  - Noise level below 45 dB(A) for stand-alone units



Schedule

Date	Task
Nov 2018	Board approval
Nov 2018	Anticipated contract awards
Nov 2018	Site assessments
Nov – Dec 2018	Project implementation
July 2019	Final report

Recommended Actions

- Recognize up to $250,000 in settlement funds from Rainbow Transfer/Recycling, Inc., into the Air Filtration Fund (75)
- Execute agreement with local school district in Huntington Beach near the transfer facility to implement Rainbow settlement agreement
- Execute contract with IQAir North America for installation and maintenance of air filtration systems at schools in an amount not to exceed $250,000 from the Air Filtration Fund (75)

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DRAFT
Technology Committee Agenda #7

PROPOSAL: Clean Fuels Program Draft 2019 Plan Update
[Written Report Only]

SYNOPSIS: Every fall, staff has brought the Clean Fuels Program Draft Plan Update before the Board 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. This item was presented at the October 19, 2018 Technology Committee as a written report.

Background
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 staff has brought the Clean Fuels Program Draft Plan Update before the Board as a separate item to solicit 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 2019, staff has prepared a Clean Fuels Program Draft 2019 Plan Update which proposes continued support for a wide portfolio of technologies. This Draft Update continues to have particular emphasis on 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 SCAQMD's FY 2018-19 Goals and Priority Objectives and assists in achieving goals outlined in the 2016 AQMP, which calls for a significant reduction in NOx emissions by 2031. The portfolio is also designed to leverage funds from other state programs such as the Greenhouse Gas Reduction Fund Program and Volkswagen Settlement Fund.

Proposal
The attached Clean Fuels Program Draft Plan Update identifies potential projects to be considered for funding during 2019. The proposed projects reflect promising low, near-zero and zero emissions 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 2019 include but are not limited to: 1) zero emissions container truck development; 2) medium- and heavy-duty fuel cell vehicle demonstrations; 3) hydrogen and EV charging infrastructure demonstrations for medium- and heavy-duty vehicles; 4) development and demonstration of cleaner advanced engines; 5) large-scale production and demonstration of renewable fuels; and 6) freight efficiency studies. Projects not funded in 2018 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 SCAQMD. These high priority areas are listed below based on the proposed funding distribution shown in Figure 1:

- Hydrogen and Fuel Cell Technologies and Infrastructure;
- Electric and Hybrid Vehicle Technologies (including charging infrastructure);
- Engine Systems (particularly in the heavy-duty vehicle sector);
- Infrastructure and Deployment (compressed and liquid natural gas);
- Fuel and Emissions Studies;
- Stationary Clean Fuels Technologies (including renewables);
- Emissions Control Technologies;
- Health Impacts Studies; and
- Technology Transfer/Assessment and Outreach.

It should be noted that these priorities represent the areas where SCAQMD 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 SCAQMD's jurisdiction.

Figure 1 graphically depicts the potential distribution of SCAQMD Clean Fuels funds, based on projected program costs of $16.9 million for the nine project areas discussed previously. The expected actual project expenditures for 2019 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 SCAQMD funding. Specific contract awards throughout 2019 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 SCAQMD'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.

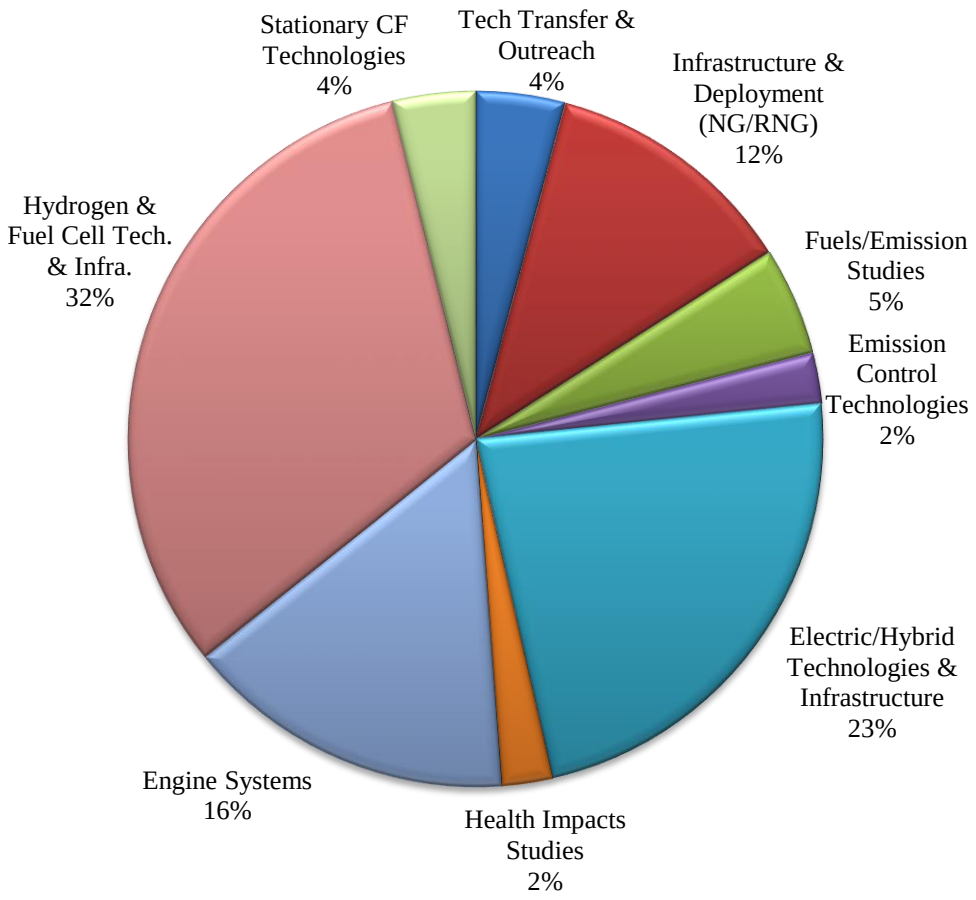

Figure 1: Projected Funding Distribution for Potential Projects in 2019 ($16.9M)

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 2018-2019 Funding Plan and proposed rules, such as the innovative clean transit rule. 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 2019 and beyond, to CARB's climate strategies. The Governor's Executive Order issued in January 2018 setting a target of 200 hydrogen stations by 2025 (double the original 2023 target) and 5 million ZEVs by 2030 as well as the 100 Percent Clean Energy Act of 2019, which requires California to be carbon free by 2045, are good examples. As part of this process, staff hosted two advisory group meetings in January and September 2018 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 2019 Plan Update and discussed near-term and long-term technologies as potential projects.

Discussions from the review process and advisory meetings, where appropriate, have been and will continue to be fashioned 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. Overall, the Draft Plan attempts to maintain flexibility to address dynamically evolving technologies and incorporate new research and data.

The major areas of focus are proposed in the following areas:

- Hydrogen and fuel cell technology and infrastructure;
- Electric and hybrid technologies and infrastructure;
- Near-zero emissions engine systems; and
- Infrastructure and deployment.

The relative changes in funding allocation are a result of recent and anticipated opportunities to partner with other agencies on projects and studies. For example, the 2019 Plan Update increases the allocation for electric and hybrid technologies and infrastructure, which is in line with the $44.8 million Greenhouse Gas Reduction Fund grant the SCAQMD and its partners were awarded by CARB in September 2018 for a wide-scale Volvo battery electric truck and off-road vehicle and infrastructure project. The Draft 2019 Plan Update has a particular focus on hydrogen and fuel cell vehicles and infrastructure to meet current and projected auto manufacturer roll outs of fuel cell vehicles, as well as the need for large-scale fueling stations necessary to support medium- and heavy-duty fuel cell vehicles anticipated to be in demonstration service over the next few years. 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. While this Draft Update reflects a modest increase in anticipated funding for hydrogen and fuel cells and for electric/hybrid technologies in 2019, the emphasis on heavy-duty truck technologies with zero and near-zero emissions for goods movement applications remains to continue to lay a pathway towards achieving 2023 and 2031 attainment goals. Emphasis will continue on near-zero larger displacement engine system development and demonstration 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.

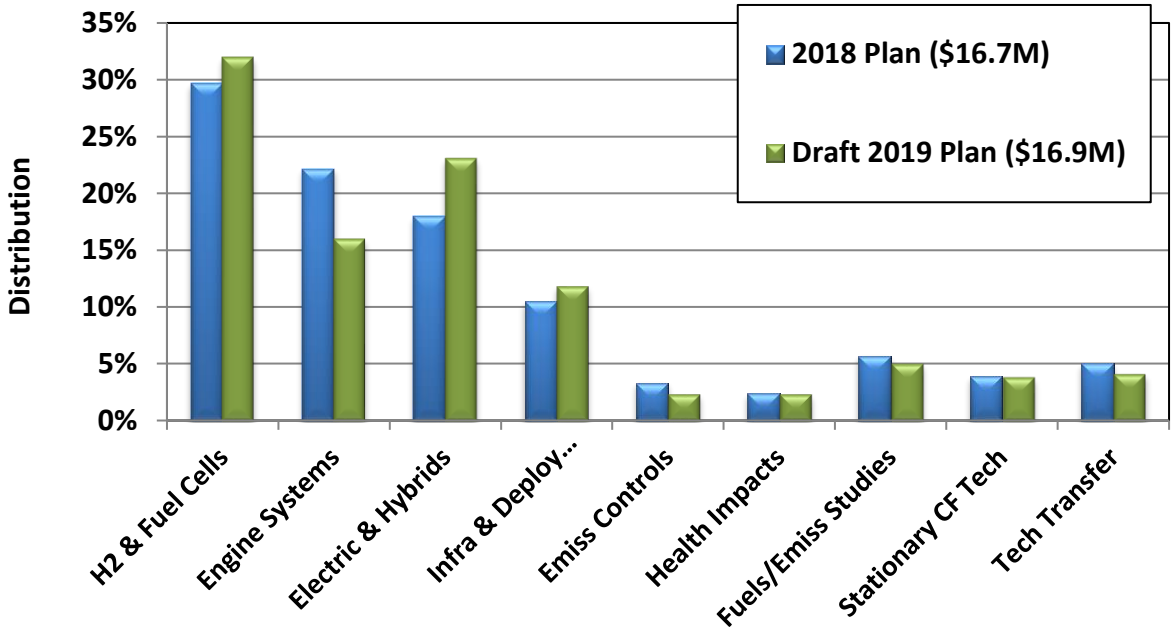

Figure 2: Plan Update Comparison

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 2019 Plan Update

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DRAFT
Technology Committee Agenda #7

TECHNOLOGY ADVANCEMENT OFFICE
CLEAN FUELS PROGRAM
DRAFT 2019 PLAN UPDATE

South Coast Air Quality Management District
October 2018

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EXECUTIVE SUMMARY

Introduction

The South Coast Air Quality Management District (SCAQMD) 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 all of the South Coast Air Basin plus 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.

Calendar Year 2018 marked the 30th anniversary of the Clean Fuels Program. It was in September 1988 that SB 2297 (Rosenthal) was signed into law (Chapter 1546). Subsequent legislation established the Technology Advancement Office (TAO) to administer what was initially a "five-year program to increase the use of clean fuels." The Clean Fuels Program, which became a permanent program in 2008 when the sunset clause was removed, affords the SCAQMD the ability to fund research, development, demonstration and accelerated deployment of clean fuels and 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, natural gas engines and infrastructure, 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 the Clean Fuels funding (typically $3-$4 to every $1 of Clean Fuels funds), is its public-private partnership with private industry, technology developers, academic institutions, research institutions and government agencies. From 1988 to 2018, the Clean Fuels Program provided $320.5 million towards projects totaling $1.5 billion.

Further, while SCAQMD aggressively seeks to leverage funds to accomplish more with every dollar, it also strives to be a leader in technology development and commercialization to accelerate the reduction of criteria pollutants. As a result, the TAO Clean Fuels Program has traditionally supported a portfolio of technologies, in different stages of maturity, to provide a continuum of emission reductions and health benefits over time. This approach provides the greatest flexibility and optimizes the region's ability to achieve the National Ambient Air Quality Standards (NAAQS).

Health & Safety Code (H&SC) 40448.5.1 requires the SCAQMD to prepare, and submit to the Legislative Analyst each year, 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, essentially re-calibrating the technical emphasis of the Program. Preliminary review and comment by SCAQMD's Governing Board, advisory groups, technical experts and other interested parties are incorporated into the final Plan Update, along with the Clean Fuels Annual Report, which are due to the Legislative Analyst by March 31 of every year.

Setting the Stage

The overall strategy of TAO's Clean Fuels Program is based, in large part, on emissions reduction technology needs identified through the Air Quality Management Plan (AQMP) process and the SCAQMD Governing Board's directives to protect the health of the approximately 17 million residents (nearly half the population of California) in the South Coast Basin. The AQMP, which is updated approximately every four years, is the long-term regional "blueprint" that relies on fair-share emissions

reductions from all jurisdictional levels (e.g., federal, state and local). The 2016 AQMP, which was adopted by the SCAQMD Governing 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 reductions from federally regulated sources (e.g., aircraft, locomotives and ocean-going vessels).

The emissions 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 lower-emitting mobile and stationary advanced technologies in the Basin to achieve health-based air quality standards. The 2016 AQMP projects that an approximate 45 percent reduction in NOx is required by 2023 and an additional 55 percent reduction by 2031. Figure 1 illustrates these needed NOx reductions in the South Coast Basin. The majority of these NOx reductions must come from mobile sources, both on- and off-road. Notably, the SCAQMD is currently only one of two regions in the nation designated as an extreme ozone nonattainment area (the other is San Joaquin Valley). 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 especially noteworthy because in the South Coast Air Basin the primary driver for ozone formation is NOx emissions, and mobile sources contribute approximately 88 percent of the NOx emissions in this region, as shown in Figure 2. 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 ($\mu g/m^3$)].

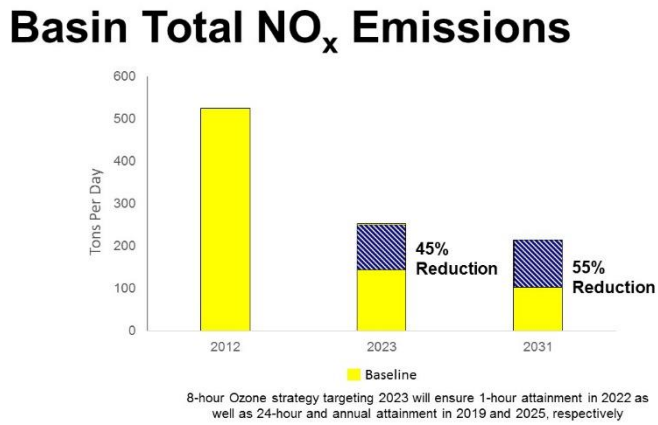


Figure 1: Total NOx Reductions Needed

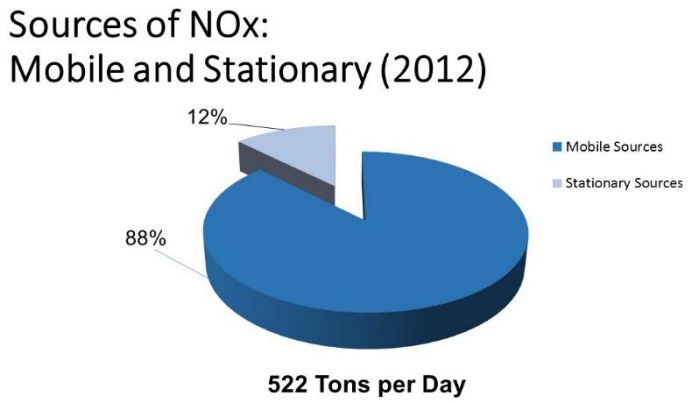


Figure 2: Sources of NOx 2012 Base Year

On a positive note, the 2016 AQMP for the first time envisions Southern California achieving attainment through regulations and incentives and identifies the clean technologies to be deployed that were formerly undefined as "blackbox" measures. This is due, in part, because the needed zero and near-zero technologies are being commercialized or nearing commercialization, albeit with deployment pathways that still require more specificity and scalability. Also, additional NOx and VOC emission reduction co-benefits are expected from carbon dioxide (CO2) reductions resulting from California's climate change policies, together with funding to incentivize the deployment of these cleaner technologies. There are significant challenges to attaining the air quality standards, however, including the need for the U.S. Environmental Protection Agency (U.S. EPA) and California Air Resources Board (CARB) to lower the heavy-duty engine exhaust NOx standard from 0.2 grams per brake horsepower-hour

(g/bhp-hr) to an already commercially achievable (by natural gas powered engines) 0.02 g/bhp-hr. Finally, some additional financial resources have been identified to offset the higher procurement costs of these emerging clean technologies, but significant additional resources are still needed for the scale necessary to achieve the air quality standards for this region.

Clean Fuels Program

Due to these daunting challenges to reduce NOx and PM2.5 to meet health-based air quality standards, the Clean Fuels Program is more important than ever to encourage and accelerate the advancement and commercialization of clean fuel and transportation technologies.

Below is a brief summary of the contents of the Draft 2019 Plan Update. Every new Plan Update is reviewed by two advisory groups--the Clean Fuels Advisory Group and the Technology Advancement Advisory Group. These two groups meet approximately every six months to provide expert analysis and feedback on potential projects and areas of focus.

2019 Plan Update

Every year, staff re-evaluates the Clean Fuels Program to develop a Plan Update based on a reassessment of the technology progress and direction for the agency. The Program continually seeks to support the development and deployment of lower-emitting technologies. The design and implementation of the Program Plan must balance the needs in the various technology sectors with technology readiness, emissions reduction potential and cofunding opportunities. As the state has turned a great deal of its attention to climate change and petroleum reduction goals, the SCAQMD has necessarily remained committed to developing, demonstrating and commercializing technologies that reduce criteria pollutants, specifically NOx. Fortunately many, if not the majority, of these technologies that address the Basin's need for NOx reductions also garner reductions in greenhouse gases (GHG) and petroleum use. Due to these "co-benefits," the SCAQMD has been successful in partnering with the state, which allows the Clean Fuels Program to leverage its funding extensively.

To identify technology and project opportunities where funding can make a significant difference in deploying progressively cleaner technologies in the Basin, the SCAQMD employs a number of outreach and networking activities. These activities range from close involvement with state and federal collaboratives, partnerships and industrial coalitions, to the issuance of Program Opportunity Notices to solicit project ideas and concepts as well as issuance of Requests for Information (RFIs) to determine the state of various technologies and the development and commercialization challenges faced by those technologies. For example, an RFI released in 2016 to identify ultra-low NOx emissions technology strategies resulted in the development and demonstration and ultimately certification of 6-7 liter and 12 liter optional low NOx engines, capable of using renewable diesel for on-road heavy-duty vehicles, thus achieving emissions levels 90% below the current 2010 emission standards for NOx. Potential development, demonstration and certification projects resulting from these outreach and networking activities are included conceptually within the Draft 2019 Plan Update.

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 solutions to the emission control needs 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 equipment and container movement technologies, including demonstration and deployment of cargo

container movement systems with zero emission range;
- developing and demonstrating ultra-low emissions liquid fuel larger displacement engines and zero emission heavy-duty vehicles;
- developing, demonstrating and deploying advanced natural gas engines and zero emission technologies for high horsepower applications;
- mitigating criteria pollutant increases from renewable fuels, such as renewable natural gas, diesel and hydrogen as well as other renewable fuels and waste streams;
- developing and demonstrating electric-drive (fuel cell, battery, plug-in hybrid and hybrid) technologies across light-, medium- and heavy-duty platforms;
- producing transportation fuels and energy from renewable and waste stream sources; and
- establishing large-scale hydrogen refueling and EV charging infrastructures to help accelerate the introduction zero emission vehicles into the market.

Table 1 (page 15) lists the potential projects across nine core technologies by funding priority:

1. Hydrogen and Mobile Fuel Cell Technologies and Infrastructure;
2. Electric and Hybrid Vehicle Technologies and Related Infrastructure (emphasizing electric and hybrid electric trucks and container transport technologies with zero emission operations);
3. Engine Systems/Technologies (emphasizing alternative and renewable fuels for truck and rail applications);
4. Fueling Infrastructure and Deployment (predominantly natural gas and renewable fuels);
5. Fuel and Emissions Studies;
6. Technology Transfer/Assessment and Outreach;
7. Stationary Clean Fuels Technologies (including renewables);
8. Emissions Control Technologies; and
9. Health Impacts Studies.

These potential projects for 2019 total $16.9 million, with anticipated leveraging of more than $4 for every $1 of Clean Fuels funding for total project costs of $73.7 million. Some of the proposed projects may also be funded by revenue sources other than the Clean Fuels Program, especially VOC and incentive projects.

CLEAN FUELS PROGRAM
2019 Plan Update

As noted earlier, 2018 marked the 30th year of the SCAQMD's Clean Fuels Program. The funding source for the Clean Fuels Program is a $1 motor vehicle registration surcharge that, like the Program, 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 has continued to fund a broad array of technology applications spanning near- and long-term implementation. More recently, the focus has been and will continue to be to support the development and deployment of zero and near-zero emission technologies. Similarly, planning has been and will remain an ongoing activity for the Program, which must remain flexible to address evolving technologies as well as the latest progress in the state-of-technologies, new research areas and data.

Every year the SCAQMD re-evaluates the Clean Fuels Program to develop a Plan Update based on a reassessment of the technology progress and direction of the SCAQMD's Board. This Plan Update for CY 2019 targets several near-term projects to help achieve emissions reductions needed for the South Coast to meet health-based air quality standards.

Overall Strategy

The overall strategy of the TAO's Clean Fuels Program is based, in large part, on emissions reduction technology needs identified through the AQMP process and the SCAQMD Board's directives to protect the health of the approximately 17 million residents (nearly half the population of California) in the South Coast 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 SCAQMD Governing 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 reductions from federally regulated sources (e.g., aircraft, locomotives and ocean-going vessels).

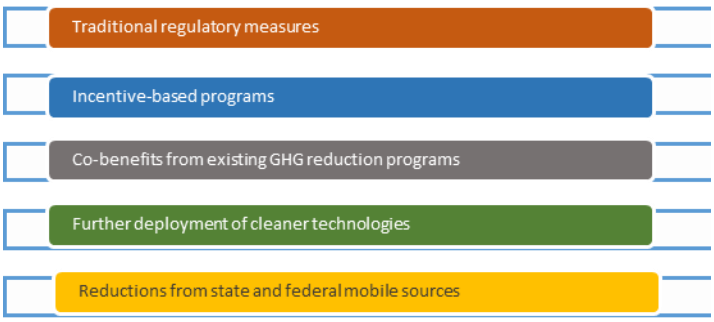


Figure 1: 2016 AQMP Components

The emissions 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 lower-emitting mobile and stationary advanced technologies in the Basin to achieve air quality standards. The 2016 AQMP projects that an approximate 45 percent reduction in NOx is required by 2023 and an additional 55 percent reduction by 2031. The majority of these NOx reductions must come from mobile sources, both on- and off-road. Notably, the SCAQMD is currently only one of two regions in the nation designated as an extreme ozone nonattainment area (the other is San Joaquin Valley). 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 especially noteworthy because in the South Coast Air Basin the primary driver for ozone formation is NOx emissions, and mobile sources contribute approximately 88 percent of the NOx emissions in this region. 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 (µg/m^3)].

The 2016 AQMP includes integrated strategies and measures to demonstrate attainment of the following National Ambient Air Quality Standards (NAAQS):

- 8-hour Ozone (75 parts per billion or ppb) by 2031
- Annual PM2.5 (12 µg/m^3) by 2025
- 24-hour PM2.5 (35 µg/m^3) by 2019
- 8-hour Ozone (80 ppb) by 2023 (updated from the 2012 AQMP)
- 1-hour Ozone (120 ppb) by 2022 (updated from the 2012 AQMP)

On a positive note, the 2016 AQMP for the first time envisions Southern California achieving attainment through regulations and identifies the clean technologies to be deployed that were formerly undefined as "blackbox" measures. This is due, in part, because the needed zero and near-zero technologies are being commercialized or nearing commercialization, albeit with deployment pathways that still require more specificity and scalability. Also, additional NOx and VOC emissions reduction co-benefits are expected from carbon dioxide (CO2) reductions resulting from California's climate change policies, together with funding to incentivize the deployment of these cleaner technologies. There are significant challenges to getting there, however, including the need for the U.S. EPA and CARB to lower the heavy-duty engine exhaust NOx standard from 0.2 grams per brake horsepower-hour (g/bhp-hr) to an already commercially achievable (by natural gas powered engines) 0.02 g/bhp-hr.

In June 2016, SCAQMD and 10 co-petitioners requested the U.S. EPA Administrator to undertake rulemaking to revise the national on-road heavy-duty engine exhaust NOx emission standard from 0.2 g/bhp-hr to 0.02 g/bhp-hr. It was recommended that the regulation be implemented by January 2022 or if not feasible, by January 2024, with a phase-in starting in January 1, 2022. A national standard (as opposed to only a California standard) is estimated to result in NOx emission reductions from this source category from 70 to 90 percent in 14 to 25 years, respectively. Given that the Basin must attain the 75 ppb ozone NAAQS by 2031 (within the next 13 years), a new on-road heavy-duty engine exhaust emissions standard for NOx is critical given the time needed for such standards to be adopted, for manufacturers to develop and produce compliant vehicles, and for national fleet turnover to occur.

This chart here shows the difference in NOx reductions from heavy-duty trucks between baseline (no new regulations) emissions (in blue), a low NOx standard adopted only in California (yellow) and reductions if the same

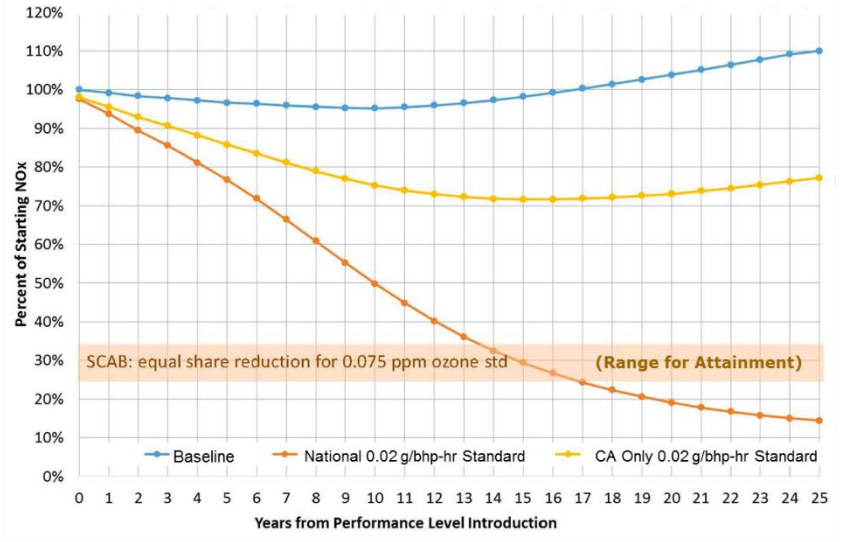


Figure 2: NOx Reduction Comparison: No New Regulations vs Low NOx Standard in California only vs National Standard

low NOx standard is implemented nationally (orange).

The findings from the MATES IV[1] (released May 2015), which included local scale studies near large sources such as ports and freeways, reinforce the importance of these impacts and the need for transformative transportation technologies, especially near the goods movement corridor. In recognition of these impacts, the SCAQMD added as a key element to its strategy a concerted effort to develop and demonstrate zero and near-zero emissions' goods movement technologies, including electric trucks, plug-in hybrid trucks with all-electric range, zero emission container transport technologies, trucks operating from wayside power including catenary technology. In 2017, as noted earlier in this report, SCAQMD initiated MATES V 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. CARB is also in the processing of updating its EMFAC model, which assesses emissions from on-road vehicles including cars, trucks and buses.

Some additional financial resources have recently been identified to offset the higher procurement costs of emerging clean technologies (i.e., Volkswagon Environmental Mitigation Trust which allocated $423 million to California), but significant additional resources are still needed for the scale necessary to achieve the air quality standards for this region. This is where the Clean Fuels Program can help make a significant impact. A key strategy of the Clean Fuels Program is its public-private partnership with private industry, technology developers, academic institutions, research institutions and government agencies. This public-private partnership has allowed the Program to leverage its funding on average with $3-$4 of spending on R&D projects to every $1 of SCAQMD funds. The SCAQMD aggressively seeks leverage funds to accomplish more with every dollar. Over its 30-year life, from 1988 to 2018, the Clean Fuels Program provided $320.5 million toward projects totaling $1.5 billion. The SCAQMD will continue to seek such funding opportunities in 2019.

CY 2018 also marked another hallmark in TAO – the 20th year of the Carl Moyer Program. The Carl Moyer Program (CMP) provides partial funding to owners of diesel engines and equipment to go beyond regulatory requirements by retrofitting, repowering or replacing their engines with newer and cleaner models. The CMP has been a successful and popular statewide air pollution reduction program enacted through legislation and plays a complementary role to California's regulatory program by providing incentives to expedite the transition to cleaner technology to obtain early or extra NOx, PM and ROG emissions reductions. The Carl Moyer Program provides the necessary incentives to push market penetration of the technologies developed and demonstrated by the Clean Fuels Program. Together these two synergistic programs allow the SCAQMD to be a leader in technology development and commercialization to accelerate the reduction of criteria pollutants.

As the state government continues to turn much of their attention to climate change (CO2 reductions), the SCAQMD remains committed to developing, demonstrating and commercializing zero and near-zero emission technologies and renewable fuels. Fortunately many of the technologies that address the South Coast Basin's needed NOx reductions also enable GHG reductions. Because of these "co-benefits," the SCAQMD has successfully partnered with the state and federally funded projects that promise emission reductions.

[1] 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

Program and Funding Scope

This 2019 Plan Update includes projects to develop, demonstrate and commercialize a variety of technologies, from near-term to long-term, that are intended to address the increasing challenges this region is facing to meet air quality standards, including:

1) implementation of new and changing federal requirements, such as the 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 getting ready for commercialization and deploying ready technologies; and
3) continued development of cost-effective approaches.

The overall scope of projects in the 2019 Plan Update also needs to remain sufficiently flexible to address new challenges and measures that are identified in the 2016 AQMP, consider dynamically evolving technologies, and take into account new research and data. The latter, for example, might include initial findings from MATES V and models generated using EMFAC 2017.

The Clean Air Act, in addition to providing for specific control measures based on known technologies and control methods, has provisions for more general measures based on future, yet-to-be-developed technologies. These "black box" measures are identified under Section 182(e)(5) of the Clean Air Act for regions that are extreme non-attainment areas, such as the South Coast Basin. In the past, some of the technologies that have been developed and demonstrated in the Clean Fuels Program may have served as guidance for the "black box." However, as noted above, the 2016 AQMP calls for elimination on the reliance of these "black box" (future technologies) to the maximum extent possible.

Within the core technology areas defined later in this section, project objectives range from near-term to long-term. However, the SCAQMD 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 the Program's projects is described below, from near-term to longer-term.

- *Deployment* or technology commercialization efforts focus on increasing the utilization of clean technologies in conventional applications, promising immediate and growing emissions reduction benefits. It is often difficult to transition users to a non-traditional technology or fuel due to higher costs or required changes to user behaviors, even if such a technology or fuel offers significant societal benefits. As a result, in addition to government's role to reduce risk by funding technology development and testing, one of government's roles is to support and offset any incremental cost through incentives to help accelerate the transition and use of the cleaner technology. The increased use and proliferation of these cleaner technologies often depends on this initial support and funding as well as efforts intended to increase confidence of stakeholders that these technologies are real, cost-effective in the long term and will remain applicable.
- Technologies ready to begin field *demonstration* in 2019, are expected to result in a commercial product in the 2022-2024 timeframe, and technologies being field demonstrated generally are in the process of being certified. The field demonstrations provide a controlled environment for manufacturers to gain real-world experience and address any end-user issues that may arise prior to the commercial introduction of the technology. Field demonstrations provide real-world evidence of a technology's performance to help allay any concerns by potential early adopters.
- Finally, successful technology *development* projects are expected to begin during 2019 with durations of at least two or more years. Additionally, field demonstrations to gain longer-term verification of performance may also be needed prior to commercialization. Certification and ultimate commercialization would be expected to follow. Thus, development projects identified

in this plan may result in technologies ready for commercial introduction as soon as 2023-2025. Projects are also proposed that may involve the development of emerging technologies that are considered longer term and, perhaps higher risk, but with significant emission reduction 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 largest potential and best prospects to enable the emissions reductions needed to achieve NAAQS and thus form the core of the Program.

Not all project categories will be funded in 2019 due to funding limitations, and focus will remain on control measures identified in the 2016 AQMP, with consideration for availability of suitable projects. The technical areas 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 SCAQMD to leverage its funds with other funding agencies to expedite the implementation of cleaner alternative technologies in the Basin. A concerted effort is continually made to form private partnerships to leverage Clean Fuels funds. Two prime examples of this effort in 2018 are projects with Daimler and Volvo. The first is a $31.3 million project with Daimler, with Clean Fuels providing 28 percent of the cost-share, to develop 20 heavy-duty electric trucks with EV infrastructure that includes energy storage systems to demonstrate the trucks in real-world commercial fleet operations in and around environmental justice communities. The second is a $44.8 million award from CARB's Greenhouse Gas Reduction Fund (GGRF) Program to conduct a wide-scale Volvo battery electric truck and off-road vehicle and infrastructure demonstration; Clean Fuels is providing $4 million in cost-share for this nearly $90 million project.

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. The core hybrid electric technologies overlap with each other.

Priorities may shift during the year in keeping with the diverse and flexible "technology portfolio" approach. Priorities may also shift to address specific technology issues which affect residents within the SCAQMD's jurisdiction. AB 617, signed by the Governor in mid-2017, will require planning initially focused on three disadvantaged communities in our region, and additional flexibility will be needed to develop new strategies and technologies. Changes in priority may also occur to leverage opportunities such as cost-sharing by the state government, the federal government or other entities.

The following nine core technology areas are listed by current SCAQMD priorities based on the goals for 2019.

Hydrogen & Fuel Cell Technologies & Infrastructure

The SCAQMD supports hydrogen infrastructure and fuel cell technologies as one option in our technology portfolio and is dedicated to assisting federal and state government programs to deploy light-duty fuel cell vehicles (FCVs) by supporting the required refueling infrastructure.

Calendar Years 2015-2019 have been 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; and in December 2016, Honda started delivering its 2017 Honda Clarity Fuel Cell. Hyundai announced plans for a new 2019 model, Nexo, and other OEMS, such as the Mercedes-Benz announcement of the EQC platform GLC F-cell plug-in hybrid fuel cell, have similarly disclosed plans to introduce FCVs in 2019 and beyond. Since hydrogen

fueling stations need 18-36 month lead times for permitting, construction and commissioning, plans for stations need to be implemented now. While coordination efforts 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 to general consumers are still needed. In addition, SCAQMD continues to review the market to understand new business models and new sources of funding besides grants for construction necessary to enable the station operations to remain solvent during the early years until vehicle numbers ramp up. Lastly, a deliberate and coordinated effort is necessary to ensure that the retail hydrogen stations are developed with design flexibility to address specific location limitations, robust hydrogen supply, and with refueling reliability matching those of existing gasoline and diesel fueling stations.

In January 2018, 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. This is double the current target in Assembly Bill 8 (Perea), chaptered in September 2013, but set its target goal for only two years earlier (end of 2023). 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; FCEVs are expected to comprise a significant portion of this future ZEV fleet.

Fuel cells can also play a role in medium- and heavy-duty applications where battery recharging time is insufficient to meet operational requirements. The California Fuel Cell Partnership's (CaFCP) 2030 Vision 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 focuses on Class 4 parcel delivery trucks and Class 8 drayage trucks with infrastructure development and establishes metrics for measuring progress. Toyota Motors has displayed a second Class 8 fuel cell truck prototype with planned demonstrations at Port of Long Beach, fueling at a new 1,000 kg/day truck fueling station with Equilon, cofunded by CEC and SCAQMD, using hydrogen produced by a new tri-generation system under development.

The 2019 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, including energy stations with electricity and hydrogen co-production and higher pressure (10,000 psi) hydrogen dispensing and scalable/higher throughput;
- 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 marine applications;
- 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; and
- coordination with fuel cell vehicle OEMs to develop an understanding of their progress in overcoming the barriers to economically competitive fuel cell vehicles and develop realistic scenarios for their large scale introduction.

Electric/Hybrid Technologies & Infrastructure

If the region expects to meet the federal standards for PM2.5 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. With that in mind, the SCAQMD supports projects to address the main concerns regarding cost, battery lifetime, travel range, charging infrastructure and original equipment manufacturer (OEM) commitment. Integrated transportation systems can encourage

further reduction of emissions by matching the features of electric vehicles (zero emissions, zero start-up emissions, all electric range) to typical consumer demands for mobility by linking them to transit. Additionally, the impact of fast charging on battery life and infrastructure costs needs to be better understood. This is especially important today when every month roughly 36,000 new plug-in vehicles are sold or leased in the U.S., and this number may increase significantly with the introduction of vehicles with anticipated 200+ mile ranges, such as the Chevy Bolt for which U.S. sales launched in December 2016 and the more affordable Tesla Model 3 which came out in mid-2017.

The development and deployment of zero emission goods movement systems remains one of the top priorities for the SCAQMD to support a balanced and sustainable growth in the port complex. The SCAQMD continues to work with our regional partners, in particular the Ports of Los Angeles and Long Beach, the Southern California Association of Governments (SCAG) and Los Angeles County Metropolitan Transportation Authority (Metro) to identify technologies that could be beneficial to all stakeholders. Specific technologies include zero emissions trucks (using batteries and/or fuel cells), or plug-in hybrid powertrains, locomotives with near-zero emissions (e.g., 90% below Tier 4), electric locomotives using battery tender cars and catenary, 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 more economical one than it is today, including a call for a zero and near-zero emissions vehicle pilot project in Southern California. The Port of Los Angeles's Sustainable City Plan corroborates this effort, setting a goal of 15 percent of zero emission goods movement trips by 2025 and 35 percent by 2035. More recently, the Clean Air Action Plan 2017 Update adopted by Ports of Los Angeles and Long Beach call for zero emissions cargo handling equipment by 2030 and zero emissions drayage trucks by 2035. In addition to Cummins and Tesla, Daimler and Volvo have recently partnered with the SCAQMD and others to demonstrate zero emissions heavy-duty trucks, including commercial plans for heavy-duty vehicle electrification.

There are now over 14 light-duty PHEVs certified to California's cleanest ATPZEV or TZEV standard and 16 pure battery electric vehicles (BEVs) commercially available in California. All of these vehicles offer the benefits of higher fuel economy and range, as well as lower emissions. Continued technology advancements in the light-duty infrastructure, particularly in the arena of codes and standards, have helped facilitate the development of corresponding codes and standards for medium- and heavy-duty vehicle infrastructure. Additional traction may be gained in this area as a result of the Transportation Electrification Partnership release in September 2018 of their Zero Emissions 2028 Roadmap, which sets a goal to move toward an additional 25 percent reduction in GHGs and air pollution beyond current commitments through accelerating transportation electrification.

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

- demonstration of electric and fuel cell electric technologies for cargo container transport operations, e.g., heavy-duty battery electric or plug-in electric drayage trucks with all electric range;
- demonstration of medium-duty electric and fuel cell electric vehicles in package delivery operations, e.g., electric walk-in vans with fuel cell or CNG range extender;
- development and demonstration of CNG hybrid vehicle technology;
- development of hybrid vehicles and systems for ocean-going vessels and other off-road vehicles;
- 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 electric vehicles and mass transit, and rideshare services that cater to multiple users;

- development of eco-friendly intelligent transportation system (ITS) strategies, demonstrations that encourage electric drive vehicle deployment in autonomous applications, optimized load-balancing strategies 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 currently on the roads or soon entering the market, and to reduce cost, improve convenience and integrate with battery energy storage, renewable energy and building demand management strategies (e.g., vehicle-to-grid or vehicle-to-building functionality, demand response, load management);
- repurpose of EV batteries for other or second third energy storage uses, as well as reusing battery packs and approaches to recycle lithium, cobalt and other metals;
- development of a methodology to increase understanding of the capability to accept fast-charging and the resultant life cycle and demonstration of the 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, and open standards and demand response protocols for EV chargers to communicate across charging networks.

Engine Systems

Natural gas engines are experiencing market growth due to the low cost of fuel. In order to achieve the emissions reductions required for the South Coast Air Basin, the internal combustion engines (ICEs) used in the heavy-duty sector will require emissions that are 90% lower than the 2010 standards. In 2016, commercialization of the Cummins 8.9L natural gas engine achieving 90% 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 SCAQMD and other project partners achieved certification of the 12-liter natural gas engine. The 12-L 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 NOx. The Plan Update continues to incorporate pursuit of cleaner engines for the heavy-duty sector. Future projects will support the development, demonstration and certification of engines that can achieve these massive emission reductions using an optimized systems approach. Specifically, these projects are expected to target the following:

- development of ultra-low emission, natural gas engines for heavy-duty vehicles and high horsepower applications;
- 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 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

The National Highway Traffic Safety Administration's finalized standards to improve fuel efficiency of medium- and heavy-duty vehicles for model year 2018 and beyond should spur further interest by manufacturers to partner on engine system development. The EPA's recent initiation to create a rule for a national low NOx standard for all on highway heavy duty engines will require all manufacturers to participate by 2024.

Fueling Infrastructure and Deployment (NG/RNG)

The importance of natural gas, renewable natural gas (RNG) and related refueling infrastructure cannot be overemphasized for the realization of large deployment of alternative fuel technologies. 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 South Coast Air 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 establishes a target to double the energy efficiency in electricity and natural gas end uses by 2030.

Active participation in the development of National Fire Protection Association (NFPA) fire and safety codes and standards, evaluation of the cost and economics of the new fuels, public education and training and emergency response capability are just a few areas of the funded efforts that have helped overcome public resistance to these new technologies. 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.

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 the potential health risks). In fact, studies indicate that smoggy areas can produce irreversible damage to children's lungs. This information highlights the need for further emissions and health studies to identify the emissions from high polluting sectors as well as the health effects resulting from these technologies.

Over the past few years, the SCAQMD has funded emission studies to evaluate the impact of tailpipe emissions of biodiesel and ethanol fueled vehicles mainly focusing on criteria pollutants and greenhouse gas (GHG) emissions. These studies showed that biofuels, especially biodiesel in some applications and duty cycles, can contribute to higher NOx emissions while reducing other criteria pollutant emissions. 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. SCAQMD funded studies in 2015 to further investigate the toxicological potential of emissions, such as ultrafine particles and vapor phase substances, and to

determine whether or not other 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% of all vehicle sales in the U.S. in 2009 to 38% in 2014, with an expectation to top 60% by 2016, it is important to understand the impact on air quality from these vehicles. As such, SCAQMD 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, SCAQMD initiated an in-use real-world emissions study, including fuel usage profile characterization as well as an assessment of the impact of current technology and alternative fuels on fuel consumption.

In recent years, there has also been an increased interest both at the state and national level on the use of alternative fuels including biofuels 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, based on higher average summer temperatures noted over the past few years, there is interest on how the higher temperatures are impacting ozone formation.

Some areas of focus include:

- demonstration of remote sensing technologies to target different high emission applications and sources;
- studies to identify the health risks associated with ultrafine and ambient particulate matter including their composition to characterize their 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 the impact of new technologies, in particular PEVs on local air quality as well as the benefit of telematics on emissions reduction strategies;
- lifecycle energy and emissions analyses to evaluate conventional and alternative fuels;
- analysis of fleet composition and its associated impacts on criteria pollutants; and
- evaluate the impact of higher temperatures on emissions of primary and secondary air pollutants.

Stationary Clean Fuel Technologies

Although stationary source emissions are small compared to mobile sources in the South Coast Air Basin, there are applications where cleaner fuel technologies or processes can be applied to reduce NOx, VOC and PM emissions. For example, a recent demonstration project funded in part by the SCAQMD 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 NOx, VOC and CO emissions. This project demonstrated that cleaner, more robust renewable distributed generation technologies exist that could be applied to not only improve air quality, but enhance power quality and reduce electricity distribution congestion.

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. The University of California (U.C.) Riverside's Sustainable Integrated Grid Initiative and U.C. Irvine's Advanced Energy and Power Program, funded in part by the SCAQMD, 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 NOx 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; and
- vehicle-to-grid or vehicle-to-building, or other stationary energy demonstration projects to develop sustainable, low emission energy storage alternatives.

Emissions Control Technologies

Although engine technology and engine systems research is required to reduce the emissions at the combustion source, dual fuel technologies and post-combustion cleanup methods are also needed to address the current installed base of 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 catalysts, 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. 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 diesel particulate traps and selective catalytic reduction catalysts); and non-thermal regen technology
- development and demonstration of low-VOC and PM lubricants for diesel and natural gas engines.

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 as needed, efforts to expedite the implementation of low emissions and clean fuels technologies, coordination of these activities with other organizations and information dissemination to educate the end user. Technology transfer efforts include support for various clean fuel vehicle incentive programs as well, in addition to cosponsorship of technology related conferences and workshops.

Target Allocations to Core Technology Areas

Figure 3 below presents the potential allocation of available funding, based on SCAQMD projected program costs of $16.7 million for all potential projects. The expected actual project expenditures for 2019 will be less than the total SCAQMD 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 SCAQMD funding. Specific contract awards throughout 2019 will be based on this proposed allocation, the quality of proposals received and evaluation of projects against standardized criteria and ultimately SCAQMD Governing Board approval.

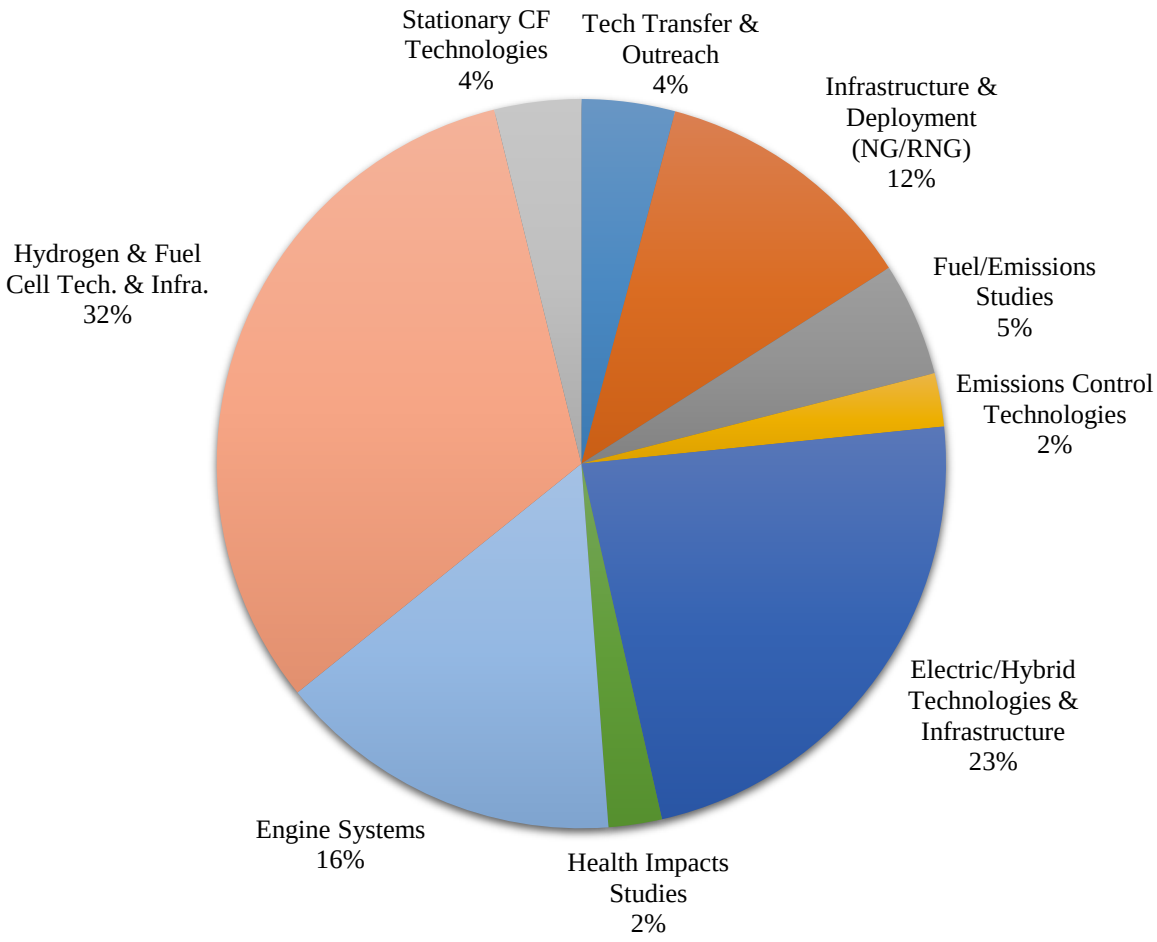


Figure 3: Projected Cost Distribution for Potential SCAQMD Projects in 2019 ($16.9M)

CLEAN FUELS PROGRAM
Program Plan Update for 2019

This section presents the Clean Fuels Program Plan Update for 2019. The proposed projects are organized by program areas and described in further detail, consistent with the SCAQMD budget, priorities and the best available information on the state-of-the-technology. Although not required, this Plan also includes proposed projects that may be funded by revenue sources other than the Clean Fuels Program, specifically related to VOC and incentive projects.

Table 1 (page 15) summarizes potential projects for 2019 as well as the distribution of SCAQMD costs in some areas as compared to 2018. The funding allocation continues the focus on development and demonstration of zero and near-zero emission technologies including the infrastructure for such technologies. For the 2019 Draft Plan, there is a small increasefor hydrogen and fuel cell technologies to incentivize large-scale hydrogen infrastructure projects at the Ports and in the Inland Empire and in light of current and projected roll out of fuel cell vehicles in 2016-2019. The SCAQMD shifted some resources toelectric and hybrid-electric technologies in light of two large projects and grant awards the SCAQMD received in mid-July 2018 for a Daimler project and in September 2018 for Volvo's project which includez $44.8 million from the GGRF Program to demonstrate vehicles in this technology area. ASmall funding shifts for Engine Systems and Fueling Infrastructure and Deployment (natural gas and renewable fuels) are also recommended in light of large projects last year and for biogas production, respectively. The other areas will continue with similar allocations for 2019. As in prior years, the funding allocations again align well with the SCAQMD's FY 2018-19 Goals and Priority Objectives. Overall, the Program is designed to ensure a broad portfolio of technologies and leverage 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 SCAQMD Governing Board for approval prior to contract initiation. This development reflects the maturity of the proposed technology and identifies contractors to perform the projects, participating host sites, and securing sufficient cost-sharing needed to complete the project and other necessary factors. Recommendations to the SCAQMD Governing Board will include descriptions of the technology to be demonstrated and in what application, the proposed scope of work of the project and the capabilities of the selected contractor and project team, in addition to the expected costs and expected 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 15).

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

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

Expected Total Cost: The estimated total project cost including the SCAQMD 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 SCAQMD 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 2019

Proposed Project	Expected SCAQMD Cost $	Expected Total Cost $
Hydrogen and Fuel Cell Technologies and Infrastructure		
Develop and Demonstrate Operation and Maintenance Business Case Strategies for Hydrogen Stations	300,000	3,500,000
Develop and Demonstrate Hydrogen Production and Fueling Stations	2,000,000	6,000,000
Develop and Demonstrate Medium- and Heavy-Duty Fuel Cell Vehicles	3,000,000	12,000,000
Demonstrate Light-Duty Fuel Cell Vehicles	100,000	100,000
Subtotal	$5,400,000	$21,600,000
Electric/Hybrid Technologies & Infrastructure		
Develop and Demonstrate Electric and Hybrid Vehicles	2,000,000	8,000,000
Develop and Demonstrate Electric Charging Infrastructure	500,000	3,000,000
Demonstrate Alternative Energy Storage	200,000	1,500,000
Develop and Demonstrate Electric Container Transport Technologies	1,200,000	4,000,000
Subtotal	$3,900,000	$16,500,000
Engine Systems/Technologies		
Develop and Demonstrate Advanced Gaseous- and Liquid-Fueled Medium- and Heavy-Duty Engines and Vehicle Technologies to Achieve Ultra-Low Emissions	2,000,000	8,000,000
Develop and Demonstrate Alternative Fuel and Clean Conventional Fueled Light-Duty Vehicles	200,000	1,000,000
Develop and Demonstrate Low Load and Cold-Start Technologies	200,000	1,000,000
Develop and Demonstrate Low Emissions Locomotive Technologies	200,000	1,000,000
Subtotal	$2,600,000	$11,000,000
Fueling Infrastructure and Deployment (NG/RNG)		
Deploy Natural Gas Vehicles in Various Applications	500,000	2,000,000
Develop, Maintain & Expand Natural Gas Infrastructure	500,000	2,000,000
Demonstrate Natural Gas Manufacturing and Distribution Technologies Including Renewables	1,000,000	10,000,000
Subtotal	$2,000,000	$14,000,000
Fuel/Emissions Studies		
Conduct In-Use Emissions Studies for Advanced Technology Vehicle Demonstrations	300,000	800,000
Conduct Emissions Studies on Biofuels, Alternative Fuels and Other Related Environmental Impacts	300,000	1,000,000
Identify and Demonstrate In-Use Fleet Emissions Reduction Technologies & Opportunities	250,000	1,000,000
Subtotal	$850,000	$2,800,000

Table 1: Summary of Potential Projects for 2019 (cont'd)

Proposed Project	Expected SCAQMD Cost $	Expected Total Cost $
Stationary Clean Fuel Technologies		
Develop and Demonstrate Reliable, Advanced Emission Control Technologies, and Low Emission Monitoring Systems and Test Methods	100,000	250,000
Develop and Demonstrate Clean Stationary Technologies	250,000	750,000
Develop and Demonstrate Renewables-Based Energy Generation Alternatives	300,000	1,000,000
Subtotal	$650,000	$2,000,000
Emissions Control Technologies		
Develop and Demonstrate Advanced Aftertreatment Technologies	200,000	2,000,000
Demonstrate On-Road Technologies in Off-Road and Retrofit Applications	200,000	800,000
Subtotal	$400,000	$2,800,000
Health Impacts Studies		
Evaluate Ultrafine Particle Health Effects	100,000	1,000,000
Conduct Monitoring to Assess Environmental Impacts	150,000	500,000
Assess Sources and Health Impacts of Particulate Matter	150,000	300,000
Subtotal	$400,000	$1,800,000
Technology Assessment & Transfer/Outreach		
Assess and Support Advanced Technologies and Disseminate Information	400,000	800,000
Support Implementation of Various Clean Fuels Vehicle Incentive Programs	300,000	400,000
Subtotal	$700,000	$1,200,000
TOTALS FOR POTENTIAL PROJECTS	**$16,900,000**	**$73,700,000**

Technical Summaries of Potential Projects

Hydrogen and Fuel Cell Technologies & Infrastructure

Proposed Project: Develop and Demonstrate Operation and Maintenance Business Case Strategies for Hydrogen Stations

Expected SCAQMD Cost: $300,000

Expected Total Cost: $3,500,000

Description of Technology and Application:

California regulations require automakers to place increasing numbers of zero emission vehicles into service every year. By 2050, CARB projects that 87% of light-duty vehicles on the road will be zero emission battery and fuel cell vehicles with fuel cell electric becoming the dominant powertrain.

In 2013, cash-flow analysis resulting in a Hydrogen Network Investment Plan and fuel cell vehicle development partnership announcements by major automakers enabled the passage of AB 8 which provides $20 million per year for hydrogen infrastructure cofunding through the CEC. This resulted in fuel cell vehicle production announcements by Hyundai, Toyota and Honda in 2014-2015.

In October 2016, the CaFCP released its Medium- and Heavy-Duty Fuel Cell Electric Truck Action Plan focusing on Class 4 parcel delivery trucks and Class 8 drayage trucks with infrastructure development and establishing metrics for measuring progress. Additionally, the CaFCP released a Vision 2030 document establishing a roadmap for future fuel cell vehicle and hydrogen refueling stations, including barriers that need to be overcome.

In 2015, Hyundai and Toyota introduced fuel cell vehicles, with Honda initiating delivery in 2016 and others following in 2017 or soon thereafter. Government actions over the last couple of years, coupled with early adopter response, is helping to establish demand and thus a business case model for hydrogen stations.

Additional work in this project category includes (1) developing a plan to secure long-term funding to complete the hydrogen fueling network build-out; (2) providing details how funding can be invested; (3) assessing alternative revenue streams such as renewable incentives; (4) proposing alternative financing structures to leverage/extend CEC funding; and (5) supporting station operation during the transition to commercial viability, including optimizing designs with flexibility to address individual site characteristics, as well as ensuring higher levels of dispensing availability and reliability.

Furthermore, in the next couple of years an evaluation of actual market penetration of FCVs should be conducted to guide and protect local and state investments in the hydrogen market.

Potential Air Quality Benefits:

The 2016 AQMP identifies the use of alternative fuels and zero emission transportation technologies as necessary to meet federal air quality standards. One of the major advantages of Fuel Cell vehicles (FCEVs) 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 FCEVs are available now. The deployment of large numbers of FCEVs, which is an important strategy to attain air quality goals, requires a well-planned and robust hydrogen fueling infrastructure. This SCAQMD project, with significant additional funding from other governmental and private entities, will provide the hydrogen fueling infrastructure that is necessary in the South Coast Air Basin. The deployment of FCEVs and the development of the necessary fueling infrastructure

Proposed Project: Develop and Demonstrate Distributed Hydrogen Production and Fueling Stations

Expected SCAQMD Cost: $2,000,000

Expected Total Cost: $6,000,000

Description of Technology and Application:

Alternative fuels, such as hydrogen and the use of advanced technologies, such as fuel cell vehicles, 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 major challenge to the entry and acceptance of direct-hydrogen fuel cell vehicles 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 and increased dispensing pressure of 10,000 psi and compatibility with existing CNG stations may be considered.

Energy Stations: Multiple-use energy stations that can produce hydrogen for fuel cell vehicles 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 determine the viability of this strategy for hydrogen fueling infrastructure deployment and as a means to produce power and hydrogen from renewable feedstocks (e.g., biomass, digester gas).

Innovative Refueling Appliances: Home or small scale refueling/recharging is an attractive advancement for alternative clean fuels due to the limited conventional refueling infrastructure. 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 FCEV counts now exceed 23,000 in 2021 and 47,000 in 2024 in California and the majority of these vehicles will be in the South Coast Air Basin. To provide fuel for these vehicles, the hydrogen fueling infrastructure needs to be significantly increased and become more reliable in terms of availability. SCAQMD 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.

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 SCAQMD 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. Fuel cell vehicles constitute some of the cleanest alternative-fuel vehicles today. Since hydrogen is a key fuel for fuel cell vehicles, 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 NOx, VOC, CO, PM and toxic compound emissions from vehicles.

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

Expected SCAQMD Cost: $3,000,000

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 being mentioned by battery experts as a way of reducing costs and enhancing performance of fuel cell vehicles.

The California ZEV Action Plan specifies actions to help deploy an increasing number of zero emission vehicles, including medium- and heavy-duty ZEVs. 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 fuel cell vehicles 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 SCAQMD funds to demonstrate Zero Emission Container Transport (ZECT) technologies. In 2015, the DOE awarded SCAQMD additional funds to develop and demonstrate additional fuel cell truck platforms and vehicles under ZECT II.

This category may include projects in the following applications:

On-Road:	**Off-Road:**
Transit Buses	Vehicle Auxiliary Power Units
Shuttle Buses	Construction Equipment
Medium- & Heavy-Duty Trucks	Lawn and Garden Equipment
	Cargo Handling Equipment

Potential Air Quality Benefits:

The 2016 AQMP identifies the need to implement zero emission vehicles. SCAQMD 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 fuel cell vehicles. 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 zero emission fuel cell vehicles 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.

Proposed Project: Demonstrate Light-Duty Fuel Cell Vehicles
Expected SCAQMD 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 fuel cell passenger vehicles using gaseous hydrogen with proton exchange membrane (PEM) fuel cell technology, mainly through showcasing this technology. Recent designs of light-duty fuel cell vehicles 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 fuel cell limited-production vehicles are planned for retail deployment in early commercial markets near hydrogen stations by several automakers. 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. SCAQMD has included fuel cell vehicles as part of its demonstration fleet since our first hydrogen station began operation in 2005; strengthening support, education, and outreach regarding fuel cell vehicle technology on an on-going 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 fuel cell vehicles in California, but the first commercial FCV leases are ending, and solo carpool lane access extends only for MY 2017 and later, encouraging new replacements. Mercedes-Benz announced its pre-production of GLC F-Cell plug-in fuel cell model to be introduced at the end of 2019. Hyundai also has announced its Nexo, their next-Generation Fuel Cell SUV, which it plans to introduce in late 2018. Innovative strategies and demonstration of dual fuel, zero emission vehicles could expand the acceptance of battery electric vehicles and accelerate the introduction of fuel cells in vehicle propulsion.

Potential Air Quality Benefits:

The 2016 AQMP identifies the need to implement zero emission vehicles. SCAQMD 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 fuel cell vehicles. Expected immediate benefits include the deployment of zero-emission vehicles in SCAQMD's demonstration fleet. Over the longer term, the proposed projects could help foster wide-scale implementation of zero emission fuel cell vehicles 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.

Electric/Hybrid Technologies & Infrastructure

Proposed Project: Develop and Demonstrate Electric and Hybrid Vehicles

Expected SCAQMD Cost: $2,000,000

Expected Total Cost: $8,000,000

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 the United States, the EPA estimated that in 2015, transportation was responsible for about 28% of the nation's carbon emissions, second only to power plants at 31%.

The global light-duty vehicle market is changing rapidly in response to government-led initiatives to improve fuel economy and market demand for alternative transportation options. These changes are being driven primarily by the adoption of vehicles with various levels of drivetrain electrification. The SCAQMD has long supported the concept of using increased battery power to allow a portion of the driving cycle to occur in all-electric mode for true zero emission miles. This battery dominant strategy is accomplished by incorporating an advanced battery pack initially recharged from the household grid or EV chargers. This "plug-in" hybrid EV strategy allows reduced emissions and improved fuel economy. In 2009, CARB adopted Plug-In Hybrid Electric Vehicle Test Procedure Amendments and Aftermarket Parts Certification. Most automobile manufacturers have announced production plans for a range of electrified vehicle powertrains, including "blended" plug-in hybrid electric, extended-range electric vehicles (E-rEV), or battery electric vehicles (BEVs). Electric utilities refer to PHEVs, E-rEVs and BEVs as plug-in electric drive vehicles (PEVs) and are working with automakers to support PEVs. Long-range BEVs are now becoming price competitive after subsidies and affordable 200+ mile BEVs should have a big impact on the vehicle market. Plug-in hybrids (PHEVs) are also making significant advances. Continued market expansion is likely to result from expanding OEM applications of the powertrain in new, larger vehicle body types, and most large OEMs have made statements regarding a path towards electrification of their vehicle models.

The SCAQMD has long been a leader in promoting early demonstrations of next generation light-duty vehicle propulsion technologies (and fuels). However, given the current and planned market offerings in this category, priorities have shifted. Nevertheless, the SCAQMD will continue to evaluate market offerings and proposed technologies in light-duty vehicles to determine if any future support is required.

Medium- and heavy-trucks make up 4.3% of vehicles in the United States and drive 9.3% of all miles driven each year, yet are responsible for more than 25% of all the fuel burned annually. Hybrid technologies have gained momentum in the light-duty sector with commercial offerings by most of the automobile manufacturers. Unfortunately, the medium- and heavy-duty platforms are where most emissions reductions are required, especially for the in-use fleet due to low turnover.

CARB's Low Carbon Transportation programs, local support and federal funds have collectively accelerated the development and demonstration of medium-duty plug-in hybrid electric truck platforms. Analysis of project data and use profiles will help optimize drive systems, target applications for early commercialization and fill gaps in product offerings.

The SCAQMD has investigated the use of hybrid technologies to achieve similar performance as the conventional-fueled counterparts while achieving both reduced emissions and improved fuel economy. Development and validation of emission test procedures is needed, but is complicated due to the low volume and variety of medium- and heavy-duty vehicles.

Platforms to be considered include utility trucks, delivery vans, shuttle buses, transit buses, waste haulers, construction equipment, cranes and other off-road vehicles. Innovations that may be

considered for demonstration include: advancements in the auxiliary power unit, either ICE or other heat engine; battery-dominant hybrid systems utilizing off-peak re-charging, with lithium-ion phosphate or lithium nickel cobalt manganese battery technologies where applicable. 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, clean diesel, or even biodiesel may be considered if the emissions benefits can be demonstrated as equivalent or superior to alternative fuels. Both new designs and retrofit technologies and related charging infrastructure will be considered.

This project category is to develop and demonstrate:

- various PEV architectures;
- anticipated costs for such architectures;
- customer interest and preferences for each alternative;
- integration of the technologies into prototype vehicles and fleets;
- evaluation of any new promising light-duty vehicle propulsion technologies or fuels; and
- electric and hybrid-electric medium- and heavy-duty vehicles (e.g., utility trucks, delivery vans, shuttle buses, transit buses, waste haulers, construction equipment, cranes and other off-road vehicles)

Potential Air Quality Benefits:

The 2016 AQMP identifies zero or near-zero emitting vehicles as a key attainment strategy. Plug-in HEV technologies have the potential to achieve near-zero emissions while retaining the range capabilities of a conventionally gasoline-fueled combustion engine vehicle, a key factor expected to enhance broad consumer acceptance. Given the variety of PEV systems under development, it is critical to determine the true emissions and performance utility compared to conventional vehicles. Successful demonstration of optimized prototypes would promise to enhance the deployment of near-ZEV and ZEV technologies.

Expected benefits include the establishment of criteria for emissions 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 emitting vehicles in the South Coast Basin, which is a high priority of the AQMP.

Proposed Project: Develop and Demonstrate Electric Charging Infrastructure

Expected SCAQMD Cost: $500,000

Expected Total Cost: $3,000,000

Description of Technology and Application:

There is a critical need to address gaps in EV charging infrastructure which has resulted in a deficiency of public EV charging infrastructure availability. Almost half (48%) of the 679,592 EVs sold in the U.S. since 2011 were in California, and of those sales in California, it is estimated that almost half (43%) received CA rebate incentives in SCAQMD. In addition, the California ZEV Action Plan, which was updated in 2018, calls for 5 million ZEVs and supporting infrastructure by 2030.

The recent adoption of revised recommended practice SAE J1772 enables passenger vehicles to charge from 240V AC (Level 2) and 480V DC charging using a common conductive connector in 30 minutes for 90 miles of range (50 kW fast charger) or 40 minutes for 200 miles of range (135 kW Tesla fast charger). Together with the growing adoption of long range EVs above 200 mile electric range, the technology and infrastructure of three fast charging systems (CCS, CHAdeMO and Tesla) are developing as well, although China recently adopted a standard based on CHAdeMO. Technological developments improving the driving range of EVs, as well as increasing availability and speed of charging infrastructure, could change the need for charging infrastructure in the future. However, a study of fast-charging impact on battery life and degradation is very limited. The research and demonstration to increase understanding of the degradation effects of fast-charging will have implications on what types of charging EV owners will leverage and what EVSE stakeholders will bring to market. SCAQMD is committed to continuing to support the successful deployment of EV charging infrastructure as well as demonstration of fast-charging effect on battery life, leveraging funds from the state and the Volkswagen settlement.

The SCAQMD is actively pursuing development of intelligent transportation systems to improve traffic efficiency of battery electric and fuel cell electric cargo container trucks. This system provides truck drivers real-time vehicle operation advice based on changing traffic and road conditions where trucks can dynamically change their speed to better flow through intersections. A truck eco-routing system can provide the most eco-friendly 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.

This project category is one of SCAQMD's continued efforts to:

- deploy a network of DC fast charging infrastructure and rapidly expand the existing network of public plug-in EV charging stations;
- 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 emissions 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 petroleum-fueled vehicles to battery and fuel cell electric vehicles. In addition, this project will assist in achieving improved fuel economy and lower tailpipe emissions, further helping the region to achieve federal ambient air quality

standards and protect public health. Expected benefits include the establishment of criteria for emissions evaluations, performance requirements and customer acceptability of the technology. This will help both regulatory agencies and OEMs to expedite introduction of zero emissions vehicles in the South Coast Basin, which is a high priority of the AQMP.

Proposed Project: Demonstrate Alternative Energy Storage

Expected SCAQMD Cost: $200,000

Expected Total Cost: $1,500,000

Description of Technology and Application:

The SCAQMD 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 cheaper 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 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 vehicles. This effort will support several projects for development and demonstration of different types of low emission hybrid 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 repurposing 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 low emission 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 and other applications. Benefits will include proof of concept for the new technologies, diversification of transportation fuels and lower emissions of criteria, toxic pollutants and greenhouse gases.

Proposed Project: Develop and Demonstrate Electric Container Transport Technologies

Expected SCAQMD Cost: $1,200,000

Expected Total Cost: $4,000,000

Description of Technology and Application:

Advanced transportation systems can be used to transfer cargo containers from ports to both local and "distant" intermodal facilities, thereby significantly reducing emissions from on-road trucks and locomotives and also reducing traffic congestion in local transportation corridors. Some solutions involve using wayside power such as fixed dedicated guideways to move containers powered by magnetic levitation or catenary electric lines. While these types of solutions are elegant and futuristic, they are expensive and difficult to implement in industrial urban environments where they are needed. We have learned from our project with Siemens eHighway catenary hybrid truck system the complications of building a new infrastructure within an existing infrastructure. Wayside power systems are not excluded in the solutions for addressing the air quality issues we face, though until cost and implementation challenges are addressed, there are more viable technologies that exist and are being pursued. Going forward, we are investing in electric technologies for heavy-duty trucks transporting containers that are mobile and not tethered to a defined route.

SCAQMD has been administering two DOE-funded projects to develop and demonstrate zero emissions drayage trucks for goods movement operations, consisting of three different battery electric truck technologies and a fuel cell hybrid electric truck platform. These projects are funded by two awards totaling $14.2 million from DOE and $10 million from partners to promote the deployment of zero emissions cargo transport technologies. In January 2017, CARB awarded SCAQMD more than $23 million towards the development, demonstration and deployment of up to 43 trucks for goods movement, either with all electric operation or all electric range within disadvantaged communities. The total project cost is approximately $40 million, with the remainder of funds cost-shared between five sister air quality agencies, OEMs and demonstration sites.

Two new projects in the area of electric container transport were recently awarded to SCAQMD. First, a project with Daimler Trucks North America (DTNA) to develop and demonstrate electric medium and heavy-duty trucks, both Class 6 and 8 for goods movement. The SCAQMD Board awarded the DTNA project $1.5 million and it was cofounded by DTNA with $15 million for a total of $30 million. The project will include EV infrastructure supported by a battery energy storage system (ESS) utilizing grid-aware scheduling algorithms. The ESS will charge from the grid during low-cost periods and over extended periods of time. This allows the ESS to recharge from the grid at a much lower peak power demand, reducing utility and facility infrastructure requirements and reducing or eliminating utility demand charges. Second, CARB awarded SCAQMD $44.8 million from its Low Carbon Transportation Greenhouse Gas Reduction Fund for its proposal with partner Volvo Group North America and its Low-Impact Green Heavy Transport Solutions (LIGHTS) project. The total cost of the LIGHTS project is $90 million. The Volvo LIGHTS project will include up to 23 on-road pre-commercial and commercial heavy-duty battery electric vehicles, up to 29 off-road battery electric vehicles used to load and unload containers and freight at warehouses and freight facilities; up to 58 nonproprietary chargers, both DC fast charging and Level 2 electric vehicle supply equipment with SAE-approved connectors; and approximately 1.8 MW of solar power. Volvo will develop smart technologies to improve electric vehicle uptime and deployment of long-term rentals heavy-duty battery electric vehicles to fleets throughout the State to accelerate reduction.

In addition to these technologies, there are other options for electric container applications such as dual-mode locomotives, hybrid electric technologies with battery storage, a battery tender car, fuel cell propulsion systems. This technical review will evaluate all available technology options to determine

whether their systems can be successfully developed and deployed, financially viable, and reliably operated on a long-term basis.

Potential Air Quality Benefits:

On-road heavy-duty diesel truck travel is an integral part of operations at the ports moving cargo containers into the Basin and beyond. The 2016 AQMP proposes to reduce emissions from this activity by modernizing the fleet and retrofitting NOx and PM emission controls on older trucks. To modernize the fleet, SCAQMD's approach is to engage OEMs to develop advanced heavy-duty trucks with battery electric, fuel cell electric and hybrid electric propulsion for transporting containers on roadways. The emissions benefits have not yet been estimated because the fate of the displaced trucks has not been determined.

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 SCAQMD Cost: $2,000,000

Expected Total Cost: $8,000,000

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 and integration and demonstration of these technologies in on-road vehicles. The NOx emissions target for this project area is 0.02 g/bhp-hr and lower and the PM emissions target is below 0.01 g/bhp-hr. To achieve these targets, an effective emission control strategy must employ advanced fuel system and engine design features, aggressive engine calibration and improved thermal management, improved exhaust gas recirculation 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 applications;
- development of durable and reliable retrofit technologies to partially or fully convert engines and vehicles from petroleum fuels to alternative fuels; and
- 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, emulsified diesel, dimethyl ether and gas-to-liquid fuels. The project proposes to expand field demonstration of these advanced technologies in various vehicle fleets operating with different classes of vehicles.

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 horsepower engines. Higher horsepower 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 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 would increase availability to end-users and provide additional emission reductions.

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 in California, both in the Basin and in intrastate operation. The emission reduction benefit 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 NOx. A heavy-duty 8.9L engine using natural gas and achieving NOx emissions of 0.02 g/bhp-hr has been certified and commercialized, with larger displacement engines expected to be certified in early 2018. Further, neat or blended alternative fuels can also reduce heavy-duty engine particulate emissions by over 90 percent compared to current diesel technology. 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 SCAQMD fleet regulations and towards implementation of the 2016 AQMP control measures.

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

Expected SCAQMD Cost: $200,000

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, bio-diesel 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 SCAQMD 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 SCAQMD Cost: $200,000

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. The thermal efficiency of the internal combustion engine is significantly lower at cold-starts and lower laods. Exhaust aftertreatment systems require a temperature of 250 degrees Celsius or higher to operate at the highest level of emissions reduction efficiency. Diesel engines at cold start increase emissions as much as 10%. At low loads an aftertreatment system often may operate at 150 degrees Celsius. It is also now known that the smaller hybrid engines are experiencing similar warm-up issues due to the on-off drive cycles. 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 deactiviation,EGR fraction, turbo control, lubrication warming, SCR pre-heaters andclose coupled catalysts can be used to keep the catalyst at the correct operating temperature. Emissions reductions can be gained and fuel economy improved. 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. The following items are the most recently developed best practices with respect to cost and functionality. Emphasis should be on steady temperature control at optimal degrees already proven and established through significant research.

- Design and prove cylinder activation technology.
- Develop control algorithms to ensure the catalyst maintains temperature throughout the duty cycle.

The project should be implemented, and fleet tested, and recorded over a minimum twelve month period. Further projects can develop from this technology and should be tested in regards 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 to heavy duty engines in long haul trucks. The advancement in this technology will directly contribute toward the ultra-low NOx reductions soon to be required by manufacturers through a national EPA air quality 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 SCAQMD Cost: $200,000

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 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 RPM 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 at or below the current 0.02 optional low NOx 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 NOx for each locomotive. The reduction of PM and CO2 also shows great potential mitigation in environmental justice communities.

Fueling Infrastructure and Deployment (NG/RNG)

Proposed Project: Deploy Natural Gas Vehicles in Various Applications

Expected SCAQMD Cost: **$**500,000

Expected Total Cost: $2,000,000

Description of Technology and Application:

Natural gas vehicles (NGVs) have been very successful in reducing emissions in the South Coast Air Basin due to the deployment of fleets and heavy-duty vehicles utilizing this clean fuel. In order to maintain the throughput, utility and commercial potential of the natural gas infrastructure and the corresponding clean air benefits, deploying additional models of NGVs in existing applications are needed. This technology category seeks to support the implementation of early-commercial vehicles in a wide variety of applications, such as taxis, law enforcement vehicles, shuttle buses, delivery vans, transit buses, waste haulers, class 8 tractors and off-road equipment such as construction vehicles and yard hostlers. It also seeks to deploy low-emission natural gas vehicles using renewable fuels to achieve further emission reductions.

Potential Air Quality Benefits:

Natural gas vehicles have inherently lower engine criteria pollutant emissions than conventional vehicles, especially in the heavy-duty applications where older diesel engines are being replaced. Incentivizing these vehicles in city fleets, goods movement applications and transit bus routes help to reduce the local emissions and exposure to nearby residents. Natural gas vehicles also can have lower greenhouse gas emissions and increase energy diversity depending on the feedstock and vehicle class. Deployment of additional NGVs is in agreement with SCAQMD's AQMP as well as the state's Alternative Fuels Plan as part of AB 1007 (Pavley).

Proposed Project: Develop, Maintain & Expand Natural Gas Infrastructure

Expected SCAQMD Cost: $500,000

Expected Total Cost: $2,000,000

Description of Technology and Application:

This project supports the development, maintenance and expansion of natural gas fueling station technologies to increase the overall number of such fueling stations in strategic locations throughout the Basin including the Ports. The intent is to develop and demonstrate advanced technologies to reduce the cost of natural gas equipment, develop and demonstrate closed loop systems for dispensing and storage, standardize fueling station design and construction and help with the implementation of SCAQMD's fleet rules. As natural gas fueling equipment begins to age or has been placed in demanding usage, components will deteriorate. This project offers an incentive to 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. NGVs have significantly lower emissions than gasoline vehicles 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, besides improving the refueling time. While new or improved NGV stations have an indirect emissions reduction benefit, they help facilitate the introduction of low emission, NGVs in private and public fleets in the area, which have a direct emissions reduction benefit. The increased exposure and fleet and consumer acceptance of NGVs would lead to significant and direct reductions in NOx, VOC, CO, PM and toxic compound emissions from mobile sources. Such increased penetration of NGVs will provide direct emissions reductions of NOx, VOC, CO, PM and air toxic compounds throughout the Basin.

Proposed Project: Demonstrate Natural Gas Manufacturing and Distribution Technologies Including Renewables

Expected SCAQMD Cost: $1,000,000

Expected Total Cost: $10,000,000

Description of Technology and Application:

Lack of sufficient statewide LNG production results in increased fuel costs and supply constraints. The cost of transporting LNG from out-of-state production facilities increases the fuel cost from 15 to 20 cents per gallon of LNG and subjects users to the reliability of a single supply source. High capital costs prevent construction of local, large-scale liquefaction facilities. Small-scale, distributed LNG liquefaction systems may provide 25 percent lower capital costs than conventional technology per gallon of LNG produced. Because these smaller plants can be sited near fleet customers, costs for transporting the LNG to end-users are much lower than those for remote larger plants. Beyond these cost reductions, the smaller plants offer key benefits of much smaller initial capital investment and wider network of supply than the larger plant model.

The project category will also consider the development and demonstration of technologies for the production of Renewable Natural Gas (RNG) from various feed stocks including landfill gas, green waste, and anaerobic digester gases.

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

- commercially viable methods for converting renewable feed stocks into CNG or LNG (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 LNG and L/CNG refueling facilities; and
- strategic placement of LNG storage capacity sufficient to provide supply to users in the event of a production outage.

Potential Air Quality Benefits:

The SCAQMD relies on a significant increase in the penetration of zero- and low-emission vehicles in the South Coast Basin to attain federal clean air standards by 2014, 2023 and 2032. This project would help develop a number of small-scale liquefaction technologies that can reduce LNG costs to be competitive with diesel fuel. Such advances are expected to lead to greater infrastructure development. This would make LNG fueled heavy-duty vehicles more available to the commercial market leading to direct reductions in NOx, PM and toxic compound emissions.

Fuel/Emissions Studies

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

Expected SCAQMD Cost: $300,000

Expected Total Cost: $800,000

Description of Technology and Application:

Hybrid electric, hybrid hydraulic, plug-in electric hybrid and pure EVs will all play a unique 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.

The environmental benefit for each technology class will be highly 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. These positive results 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 SCAQMD's air quality goals.

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

Expected SCAQMD Cost: $300,000

Expected Total Cost: $1,000,000

Description of Technology and Application:

The use of biofuels can be an important strategy to reduce petroleum dependency, air pollution and greenhouse gas emissions. 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 on 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 has recently amended the 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.

Furthermore, 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.

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.

Lastly, in an effort to evaluate the contribution of meteorological factors to high ozone and PM2.5 episodes occurring in the South Coast air 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 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 SCAQMD 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 SCAQMD Cost: $250,000

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, marine vessels 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.

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; and
- development, deployment and demonstration of smart vehicle telematic systems

Potential Air Quality Benefits:

Many of the technologies identified can be applied to light-duty 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.

Stationary Clean Fuel Technologies

Proposed Project: Develop and Demonstrate Reliable, Advanced Emission Control Technologies, and Low-Emission Monitoring Systems and Test Methods

Expected SCAQMD Cost: $100,000

Expected Total Cost: $250,000

Description of Technology and Application:

Currently, the inability of air/fuel ratio control (AFRC) systems to keep rich-burn engines in compliance contributes significantly to air pollution in the basin. Reliable, low-cost emission monitoring systems are needed for small-to-intermediate size combustion devices, including stationary engines, boilers, heaters, furnaces and ovens that are not large enough to justify a continuous emission monitoring system (CEMS). This class of combustion device is often permitted on the basis of a single demonstration or periodic demonstrations of NOx and CO emissions meeting SCAQMD rule requirements or a RECLAIM concentration limit. However, SCAQMD-unannounced tests on engines and boilers have found that in many cases NOx and/or CO levels have increased significantly above levels that have been initially or periodically demonstrated due to equipment malfunction and/or inadequate operator attention. It is suspected that the same may be true of heaters, furnaces and ovens.

A demonstration project funded in part by the SCAQMD consisted of retrofitting a biogas engine with a digester gas clean up system and catalytic oxidizer at the exhaust followed by SCR which resulted in significant reductions of NO_x, VOC and CO. Based on the successful deployment of this project, further emission reductions may be achieved by other biogas combustion sources such as gas turbines and boilers by the continued development of specialized low cost biogas clean up systems that will allow for the use of catalytic after control systems.

Demonstrations of newer technologies in recent years could result in a commercially viable alternative to CEMS that is both reliable and feasible in terms of lower costs. For example, manufacturers of flue gas analyzers have, in recent years, developed low-cost multi-gas analyzers suitable for portable or stack-mounted use. Some preliminary testing of a new type of AFRC, which uses a different type of O2 sensor known as a wide-band O2 sensor, is another alternative that can be analyzed. Another technical approach might be to deploy technology utilizing the O2 signature of a post-catalyst O2 sensor and additional control concepts being developed by manufacturers. Since an underlying problem has been that engine, catalyst and AFRC manufacturers have developed systems independently, a system being co-developed to perform continuous diagnostics to assist operators in keeping rich-burn engines in compliance is possibly another alternative for demonstration.

Potential Air Quality Benefits:

Stationary engines, boilers, heaters, furnaces and ovens account for approximately 11 percent of total NO_x emissions and about 6 percent of total CO emissions. There has been a long-standing compliance problem with rich-burn IC engines in the basin and evidence indicates that many of these devices are operating with NOx and/or CO emissions above levels required in their permits. 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 SCAQMD's ability to enforce full-time compliance.

Proposed Project: Develop and Demonstrate Clean Stationary Technologies

Expected SCAQMD Cost: $250,000

Expected Total Cost: $750,000

Description of Technology and Application:

Stationary sources, including VOC sources such as large printing facilities and furniture manufacturers, have become cleaner and cleaner due to the regulatory requirements for low emissions and the advancements in technology to meet those requirements. Best Available Control Technology (BACT) regulations, however, are only required for new, modified, or relocated sources that may result in an emissions increase of a non-attainment air contaminant, any ozone depleting compound or ammonia. This project category is to develop and demonstrate new technologies that can provide emissions reductions in new installations or as retrofit modifications. Possible technology examples include:

- low NOx technologies (burners, thermal and ICEs);
- low-Btu gas technologies (e.g., digester, landfill, or diary gases);
- alternative fuels and hydrogen blends;
- alternative diesel fuels (emulsified, gas-to-liquids, biodiesel with aftertreatment);
- low emission refinery flares;
- catalytic combustion;
- cost-effective fuel cell and fuel cell hybrid distributed generation;
- fumes-to-fuel technology to replace thermal oxidizers and capture VOC emissions for electricity generation while ensuring no emission of air toxics; and
- boiler optimization design and strategies to improve efficiencies.

Depending on the technology, a proof-of-concept project, demonstration, or pre-commercial deployment would be considered to garner further information on the technology. Issues to investigate include viability (reliability, maintainability and durability) of the technology, cost-effectiveness and operator ease-of-use in order to assess commercialization.

Potential Air Quality Benefits:

The SCAQMD has a substantial number of older, small, stationary source technologies within its jurisdiction. Since these devices are not subject to continuous emissions monitoring system requirements, evidence suggests that these devices may not be operating at their permitted NOx, CO, hydrocarbon and PM emissions levels. Replacing these devices with cleaner and more reliable technologies or technology/fuel combinations can have dramatic reductions in all of these criteria pollutants. VOC emission reductions may also be achieved at larger stationary VOC sources to achieve the new federal ozone and PM2.5 standards.

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

Expected SCAQMD Cost: $300,000

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.

Emissions Control Technologies

Proposed Project: Develop and Demonstrate Advanced Aftertreatment Technologies

Expected SCAQMD Cost: $200,000

Expected Total Cost: $2,000,000

Description of Technology and Application:

There are a number of aftertreatment technologies which have shown substantial emission reductions in diesel engines. These technologies include diesel particulate filters (DPFs), oxidation catalysts, selective catalytic reduction (SCR) systems and NOx adsorbers. 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 emission 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 retrofit applications such as heavy-duty line-haul diesel engines, street sweepers, waste haulers and transit buses. Applications for non-road may include construction equipment, yard hostlers, gantry cranes, locomotives, marine vessels, 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 SCR and NOx adsorbers, could also have NOx reductions of up to 90%.

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

Expected SCAQMD Cost: $200,000

Expected Total Cost: $800,000

Description of Technology and Application:

Heavy-duty on-road engines have demonstrated progress in meeting increasingly stringent Federal and state requirements. New heavy-duty engines have progressed from 2 g/bhp-hr NOx in 2004 to 0.2 g/bhp-hr NOx 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 NOx. 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, marine vessels 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 non-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 SCAQMD Cost: $100,000

Expected Total Cost: $1,000,000

Description of Technology and Application:

Reducing diesel exhaust from vehicles has become a high priority in the South Coast Air Basin since CARB identified the particulate phase of diesel exhaust as a surrogate for all of the toxic air contaminant emitted from diesel exhaust. Additionally, health studies indicate that the ultrafine portion of particulate matter 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 ultrafine particles 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 the new technologies and the health effects of these emissions, an evaluation and comparison of ultrafine particulate matter and the potential impacts on community exposures are necessary.

In this project, measurements and chemical composition of ultrafine particulates will be done, as well as studies conducted to characterize their toxicity. The composition of the particulates 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 ultrafine particulate matter, 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 and new engines 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 this 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 particulate 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 amount of ultrafine particulates generated by different types of fuels and advanced control technologies as well as provide information on potential health effects of ultrafine particles. 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 SCAQMD Cost: $150,000

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, distribution centers and freeways is important to identify the emissions exposure to the surrounding communities and provide the data to then conduct the health impacts due to these sources. This project category would identify areas of interest and conduct ambient air monitoring, conduct emissions monitoring, analyze the data and assess the potential health impacts from mobile sources. The projects would need to be at least one year in duration in order to properly assess the air quality impacts in the area.

Potential Air Quality Benefits:

The proposed project will assist in the 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; 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 Particulate Matter

Expected SCAQMD Cost: $150,000

Expected Total Cost: $300,000

Description of Technology and Application:

Previous studies of ambient levels of toxic air contaminants, such as the MATES series of studies, have found that diesel exhaust is the major contributor to health risk from air toxics. Analyses of diesel particulate matter in ambient samples have been based on measurements of elemental carbon. While the bulk of particulate elemental carbon in the South Coast Air 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 South Coast Air Basin. Analysis of particulate bound organic compounds was utilized as tracers to estimate levels of ambient diesel particulate matter as well as estimate levels of particulate matter 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, an updated emissions inventory of toxic air contaminants and a regional modeling effort to characterize risk across the Basin. In addition to air toxics, MATES IV also measured ultrafine particle concentrations and black carbon at the monitoring sites as well as near sources such as airports, freeways, rail yards, busy intersections and 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 ultrafine particle concentrations typically emitted or converted from vehicle exhaust. Based on preliminary results of MATES V, further assessment may need to be performed.

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 the health effects and potential community exposures. 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 diesel particulate matter as well as levels of particulate matter from other significant combustion sources, including gasoline and diesel generated VOCs. This will allow a better estimation of potential exposures to and health effects from toxic air contaminants from diesel exhaust in the South Coast Air Basin. This information in turn can be used to determine the health benefits of promoting clean fuel technologies.

Technology Assessment and Transfer/Outreach

Proposed Project: Assess and Support Advanced Technologies and Disseminate Information

Expected SCAQMD Cost: $400,000

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 SCAQMD's outreach efforts to expedite the implementation of low emission and clean fuels technologies and to coordinate these activities with other organizations.

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;
- emissions studies and assessments of zero emission alternatives;
- advanced technology vehicle demonstrations;
- preparation of reports, presentations at conferences, improved public relations and public communications of successful demonstrations of clean technologies;
- participation in and coordination of workshops and various meetings;
- support for training programs related to fleet operation, maintenance and refueling of alternative fuel vehicles;
- publication of technical papers, reports and bulletins; and
- production and dissemination of information, including web sites.

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 and associated infrastructure.

Potential Air Quality Benefits:

SCAQMD adopted fleet regulations requiring public and private fleets within the Basin to acquire alternatively fueled vehicles when making new purchases. Expected benefits of highlighting success stories in the use of advanced alternatively fueled vehicles could potentially expedite the acceptance and commercialization of advanced technologies by operators seeking to comply with the provisions of the recently adopted SCAQMD fleet rules. The resulting future emissions benefits will contribute to the goals of the AQMP.

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

Expected SCAQMD Cost: $300,00

Expected Total Cost: $400,000

Description of Project:

This project supports the implementation of zero emission vehicle incentive programs, the Carl Moyer incentives program and the school bus incentives program. Implementation support includes application approval, grant allocation, documentation to the CARB, verification of vehicle registration and other support as needed. Information dissemination is critical to successful implementation of a coordinated and comprehensive package of incentives. Outreach will be directed to vehicle dealers, individuals and fleets.

Potential Air Quality Benefits:

As described earlier, the SCAQMD will provide matching funds to implement several key incentives programs to reduce diesel emissions in the Basin. Furthermore, the SCAQMD recently adopted fleet regulations requiring public and private fleets within the Basin to acquire alternatively fueled vehicles when making new purchases. Expected benefits of highlighting zero emission vehicle incentives could potentially expedite the acceptance and commercialization of advanced technologies by operators seeking to comply with the provisions of the recently adopted SCAQMD fleet rules. The resulting future emissions benefits will contribute to the goals of the AQMP. The school bus program and the Carl Moyer incentives program will also reduce large amounts of NOx and PM emissions in the basin in addition to reducing toxic air contaminants.

South Coast Air Quality Management District

Back to Agenda

ANNIVERSARY YEAR 1988 to 2018

November 2018

Clean Fuels Program

2019 Draft Plan Update

Technology Advancement Office

Leading the way to zero and near-zero emission technologies

Draft 2019 Plan Update Overview

- Identifies technical areas
- Describes projects in each plan area
- Proposes costs for these projects
- Input solicited through set mechanisms

Input Process

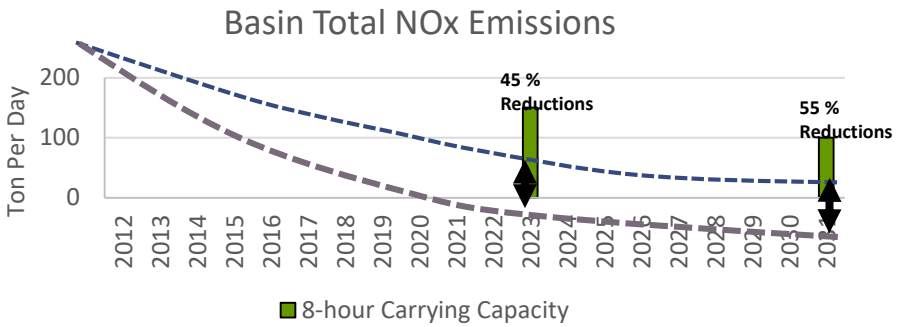
- Advisory group meetings
  - January and September 2018
  - Technology Advancement Advisory Group
  - Clean Fuels Advisory Group
  - Invited technical experts
- Conferences/Annual merit review meetings
- Individual meetings with agencies, industry groups technology providers and other stakeholders

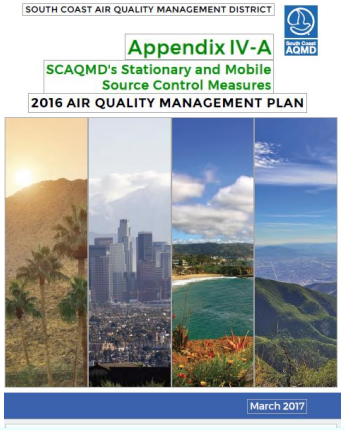
Federal/State Actions

- U.S. EPA – CNG Engine FOA
- CARB – Mobile Source Strategy
  - Innovative Clean Transit – Proposed
  - Zero and Near-Zero Freight Facilities
- LACI/Other Stakeholders – Zero Emissions 2028 RoadMap
- CPUC – IOU (SCE) MHD Infrastructure
- The 100 Percent Clean Energy Act of 2019
  - SB 100-California Renewables Portfolio Standard
  - Carbon Free by 2045

South Coast Plans & Policies

- 2016 AQMP – NAAQS
  - 2008 8-hr Ozone – 75 ppb





- Ports' Clean Air Action Plan

2019 Plan
Key Proposed Projects

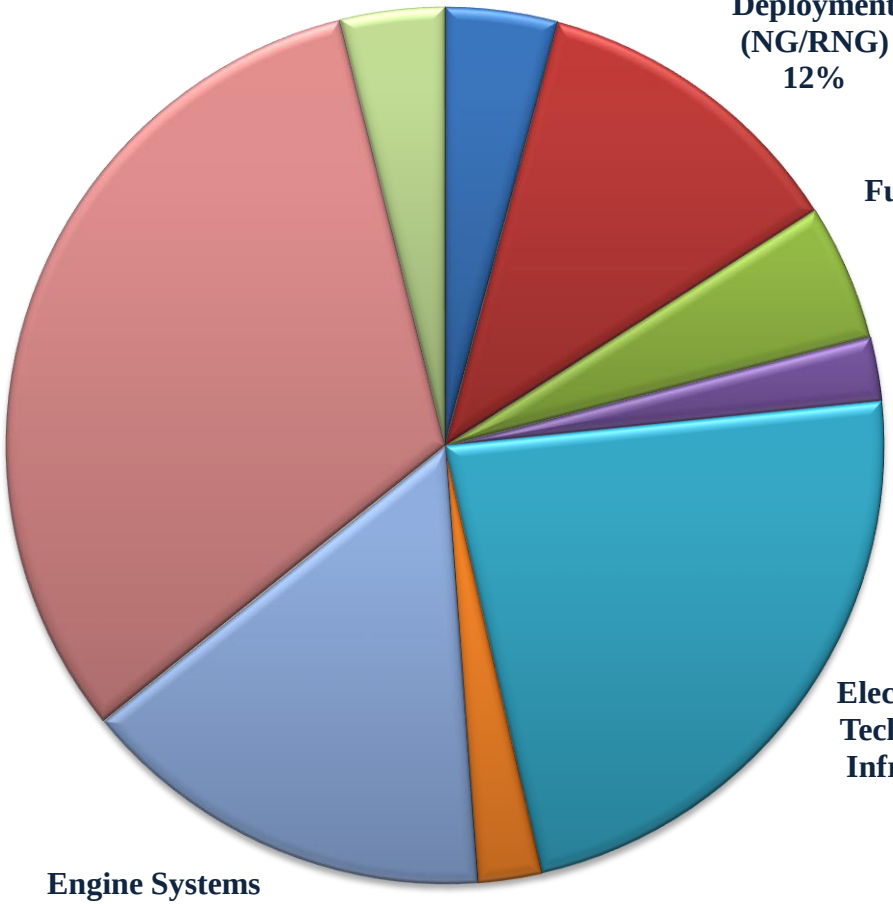
- Zero emission container truck development
- Medium- and heavy-duty fuel cell vehicles
- Infrastructure for medium- and heavy-duty vehicles
  - Hydrogen refueling stations
  - Electric vehicle charging infrastructure
- Development & demonstration of advanced engines
- Renewable fuels
- Freight efficiency studies

Projects not funded in 2019 may be considered for funding in future years

Draft 2019 Plan Update (Key Technical Areas)

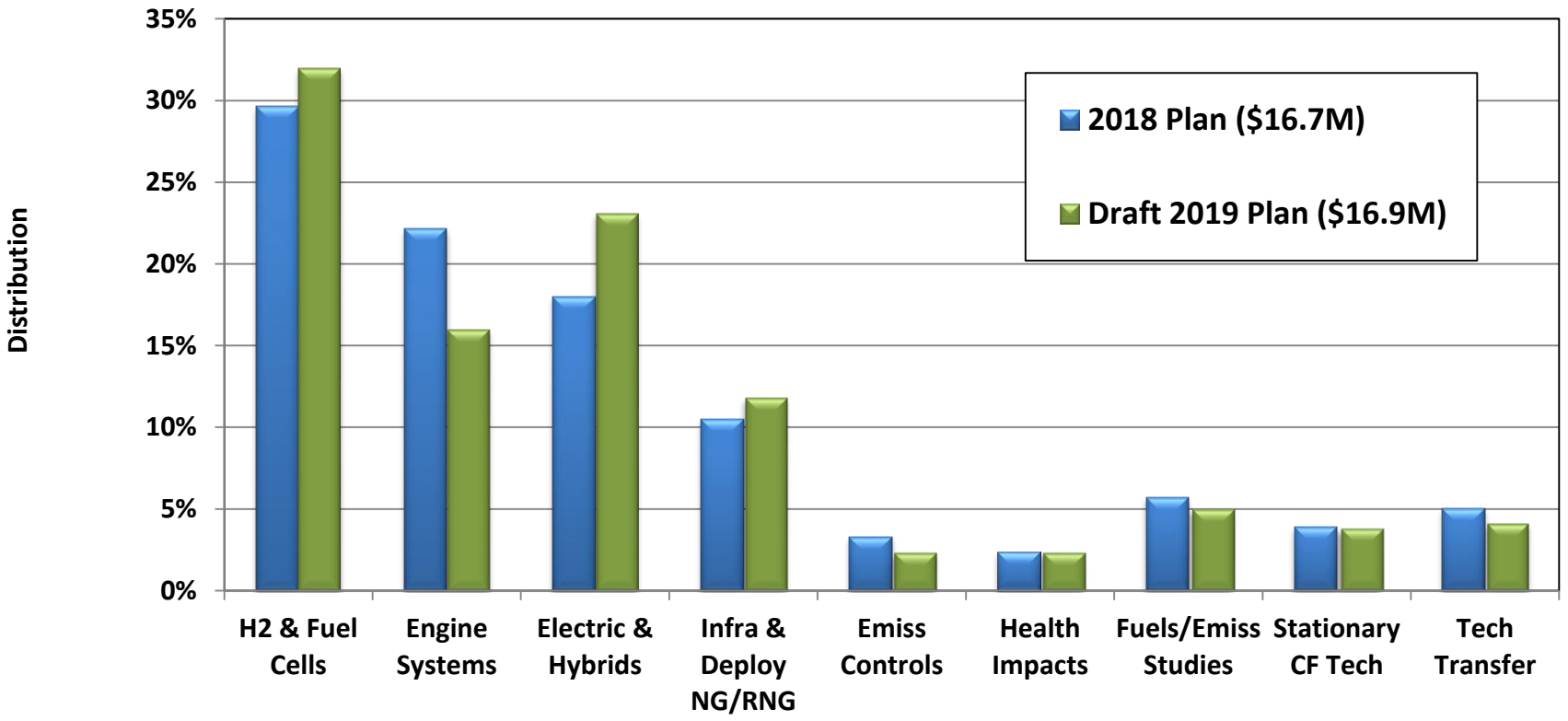
- Maintain focus priorities on zero and near-zero emissions goods movement technologies
- Near-zero emissions (gaseous and liquid fuel) engine systems, especially high HP uses
- Expand focus on local biogas production and use
- Maintain focus on hybrid, plug-in, electric-drive technologies and infrastructure
- Onsite hydrogen production and dispensing
- Maintain other areas of emphasis

Proposed 2019 Plan Distribution



$16,900,000

Plan Update Comparison



Proposed Distribution

	2018 Plan	Draft 2019 Plan
H2 & Fuel Cells & Infra	30%	32%
Electric & Hybrids & Infra	18%	23%
Engine Systems/Technologies	22%	16%
Infrastructure & Deployment (NG)	10%	12%
Fuel & Emissions Studies	6%	5%
Stationary CF Tech	4%	4%
Emissions Control Technologies	3%	2%
Health Impacts Studies	2%	2%
Tech Assessment/Transfer & Outreach	5%	4%
	100%	100%

Feedback Requested

Provide guidance on the following for incorporation into Final Plan Update for adoption with Annual Report (March 2019):

- Proposed distribution
- Other issues impacting 2019 Plan