



Technology Advancement Office | *20 Years of Progress*

Clean Fuels Program
2007 Annual Report and
2008 Plan Update

March 2008



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Air Quality
Management
District

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EXECUTIVE SUMMARY

2007 Annual Report

The South Coast Air Quality Management District (SCAQMD) executed 67 new projects, studies or amended contracts with expenditures during Calendar Year (CY) 2007 to sponsor research, development, demonstration and deployment (RDD&D) of alternative fuel and clean fuel technologies in Southern California. Table 2 (page 17) and Table 6 (page 60) list projects which are further described in this report. The SCAQMD contributed nearly \$10 million towards such projects in partnership with other government organizations, private industry, academia and research institutes, and interested parties, with total project costs of nearly \$33 million. These projects addressed a wide range of issues and opportunities with a diverse mix of advanced technologies. The areas of technology advancement include the following:

- Infrastructure and Deployment
- Fuels and Emission Studies
- Emission Control Technologies
- Electric and Hybrid Vehicle Technologies
- Engine Technology (particularly in the heavy-duty vehicle sector)
- Mobile Fuel Cell Technologies
- Hydrogen Technology and Infrastructure
- Health Impacts Studies
- Stationary Clean Fuels Technology (including renewables)
- Outreach and Technology Transfer

During CY 2007, the SCAQMD supported a variety of projects and technologies, ranging from near-term to longer-term research, development, demonstration, and deployment activities. This “technology portfolio” strategy provides the SCAQMD the ability and flexibility to leverage state and federal funding while also addressing the specific needs of the South Coast Air Basin. Projects in CY 2007 included demonstration of emission control and retrofit technologies in off-road applications, further expansion of the natural gas alternative fueling infrastructure, development of heavy-duty natural gas engines, and additional conversions of plug-in hybrid electric vehicles. The SCAQMD also executed five health impacts studies to extend analyses of the connection between air pollution and health.

Eight research, development, demonstration and deployment projects or studies, 19 technology assessment or outreach projects, and 1 incentive project were completed in 2007, as listed in Table 5 (page 51). Summaries for the eight technical projects completed in 2007 are included in Appendix C. In accordance with California Health and Safety Code section 40448.5.1(d), this report must be submitted to the state legislature by March 31, 2008, after approval by the SCAQMD Governing Board.

2008 Plan Update

The Clean Fuels Program continually seeks to support the 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 co-funding opportunity. The SCAQMD program is significant, especially at a time when both public and private funding available for technology research and development are limited. However, since national and international activities affect the direction of technology trends, the real challenge for the SCAQMD is to identify project or technology opportunities in which its available funding can make a significant difference in deploying progressively cleaner technologies in the Basin.

The overall strategy is based in large part on technology needs identified in the Air Quality Management Plan (AQMP) and the Governing Board's directives to protect the health of residents in the South Coast Air Basin. The AQMP is the long-term "blueprint" that defines:

- the basin-wide emission reductions needed to achieve federal ambient air quality standards,
- the regulatory measures to achieve those reductions,
- the timeframes to implement these proposed measures, and
- the technologies required to meet these future proposed regulations.

The oxides of nitrogen (NO_x), volatile organic compounds (VOC), and particulate matter (PM) emission sources of greatest concern are heavy-duty on-road vehicles, light-duty on-road vehicles, and off-road equipment. The Plan Update includes projects to develop, demonstrate, and commercialize a variety of technologies, from near term to long term, that are intended to provide solutions to the emission control needs identified in the AQMP. Large NO_x and PM_{2.5} reductions will be necessary to meet the federal PM_{2.5} standards by 2015, and so near- and mid-term reductions are emphasized. Several of the technology areas of focus include:

- reducing emissions from port-related activities, such as cargo handling equipment and container movement technologies;
- mitigating criteria pollutant increases from renewable fuels, such as low-blend ethanol and high blend biodiesel; and
- increased activities in hybrid and plug-in hybrid technologies across light-, medium- and heavy-duty platforms.

CLEAN FUELS PROGRAM

Introduction

The Basin, which comprises the Los Angeles, Orange, San Bernardino, and Riverside counties, has the worst air quality in the nation due to a combination of factors, including high vehicle population, high vehicle miles traveled within the Basin, and geographic and atmospheric conditions favorable for photochemical oxidant (smog) formation. Due to these challenges, the state legislature enabled the SCAQMD to implement the Clean Fuels Program to accelerate the implementation and commercialization of clean fuels and advanced technologies in the Basin. In 1999, state legislation was passed which amended and extended the Clean Fuels Program. Specifically, as stated in the California Health and Safety Code (H&SC) section 40448.5.1(d), the SCAQMD must submit, on or before March 31 of each year to the Legislature, an annual report that includes:

- A description of the core technologies that the SCAQMD considers critical to ensure attainment and maintenance of ambient air quality standards and a description of the efforts made to overcome barriers to commercialization of those technologies;
- An analysis of the impact of the SCAQMD's Clean Fuels Program on the private sector and on research, development, and commercialization efforts by major automotive and energy firms, as determined by the SCAQMD;
- A description of projects funded by the SCAQMD, including a list of recipients, subcontractors, co-funding sources, matching state or federal funds, and expected and actual results of each project advancing and implementing clean fuels technology and improving public health;
- The title and purpose of all projects undertaken pursuant to the Clean Fuels Program, the names of the contractors and subcontractors involved in each project, and the amount of money expended for each project;
- A summary of the progress made toward the goals of the Clean Fuels Program; and
- Funding priorities identified for the next year and relevant audit information for previous, current, and future years covered by the report.

This report summarizes the progress of the SCAQMD Clean Fuels Program for CY 2007. This SCAQMD program cosponsors projects to develop, demonstrate, and expedite the implementation and deployment of low-emission clean fuels and advanced technologies in Southern California. These projects are conducted through public-private partnerships with industry, technology developers, academic and research institutes, and local, state and federal agencies.

During the period between January 1 and December 31, 2007, the SCAQMD executed 67 projects or studies and amended contracts that support clean fuels and advanced low-emission technologies. The SCAQMD contribution for these projects was nearly \$10 million, with total project costs of nearly \$33 million. These projects address a wide range of issues with a diverse technology mix. This report highlights achievements of the SCAQMD Clean Fuels Program in this period, summarizes project costs, and outlines future plans for the Program.

The Need for Advanced Technologies & Clean Fuels

Achieving federal and state clean air standards in Southern California will require emission reductions from both mobile and stationary sources beyond those expected using current technologies. The need for advanced technologies and clean fuels is best demonstrated by considering the emissions inventory for the Basin and the future emissions levels projected for the 2007 Air Quality Management Plan (AQMP). The baseline 2014 emissions inventory is shown in Figure 1. Based on the 2007 AQMP, significant reductions are necessary to demonstrate attainment with the federal standards.

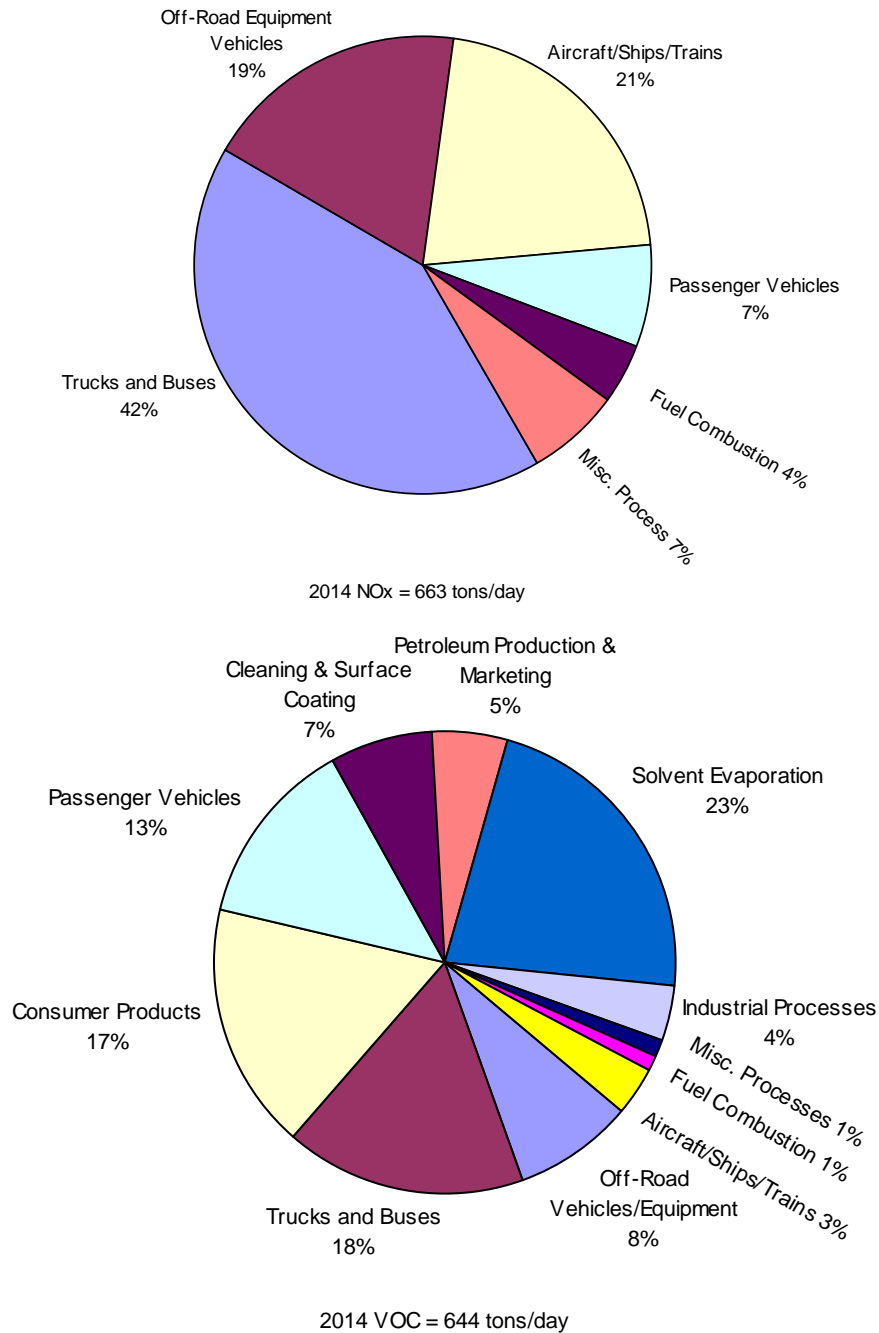


Figure 1: Major Source Contributions (2014)

To fulfill long-term emission reduction measures, the 2007 AQMP relies on advanced technologies that are not yet fully developed for commercial use. Significant reductions are anticipated from implementation of advanced control technologies for both on-road and non-road mobile sources.

In addition, the new air quality standards for ozone (0.08 ppm, 8-hour average) and fine particulate matter, promulgated by the U.S. Environmental Protection Agency (U.S. EPA) in 1997, are projected to require additional long-term controls for both NO_x and VOC.

Recent health studies also indicate a greater need to reduce NO_x emissions and toxic air contaminant emissions. More importantly, the California Air Resources Board (CARB) listed diesel exhaust emissions as a toxic air contaminant in 1998. Subsequently, in 1999, the SCAQMD completed the Multiple Air Toxics Exposure Study (MATES-II) and found that diesel combustion sources (primarily from heavy-duty vehicles) contribute approximately 70 percent to the estimated potential cancer risk from air toxics in the Basin. A follow-on study, MATES-III, which was initiated in Spring 2004 and ended in 2007, was undertaken to evaluate air toxic exposure trends, expand the list of known air toxics, and assess local impacts from industrial, commercial and mobile sources. Initial results have shown a decrease in stationary emitted air toxics, but continued high levels of emissions from mobile, specifically diesel sources. The MATES III draft report was issued in January 2008 and the final is anticipated to be approved in April 2008. The results will be used to determine appropriate control strategies for reducing public exposures to these toxics.

In addition, there are increasing concerns over greenhouse gas emissions and petroleum dependence arising from the heavy use of conventional technologies. In recognition of these concerns, the federal government has several programs (the Hydrogen, Fuel Cells, and Infrastructure Technologies Program, and the FreedomCAR and Vehicle Technologies Program) to investigate and develop increased efficiency and alternative fuel (namely hydrogen) technologies. Similarly, the state has adopted goals to reduce long-term dependence on petroleum-based fuels (AB 2076) and transition to alternative fuels based on life-cycle analyses (AB 1007).

California's Governor took this concern one step further when in January 2007 he established a Low-Carbon Fuel Standard (LCFS) by Executive Order. This GHG standard for transportation fuels will necessitate increased research into alternatives to oil and traditional fuels. The LCFS came out of AB 32, the "Global Warming Solutions Act," which was signed by the Governor in fall 2006 and requires California's greenhouse gas emissions to be capped at 1990 levels by 2020.

It is clear that clean, advanced, energy efficient and renewable technologies are needed not only for attainment, but also to protect the health of those who reside within the SCAQMD's jurisdiction; reduce long-term dependence on petroleum-based fuels; and support a more sustainable energy future. To help meet this need for advanced, clean technologies, the SCAQMD Governing Board continues to promote the Clean Fuels Program through the Technology Advancement Office. This program is intended to assist in the rapid development and deployment of progressively lower-emitting technologies and fuels through innovative public-private partnership. Since its inception, the SCAQMD Technology Advancement Office has co-funded projects in cooperative partnership with private industry, technology developers, academic and research institutes, and local, state, and federal agencies. Funding for the program and the public-private partnerships are described in the next section.

Program Funding

The Clean Fuels Program, under California Health and Safety Code (H&SC) Sections 40448.5 and 40512 and Vehicle Code Section 9250.11, establishes mechanisms to collect revenues from mobile and stationary sources to support the program's objectives and identifies the constraints on the use of

the funds. In 2003 these funding mechanisms, described below, were reauthorized through January 1, 2010, under SB 288 (Sher). The objective of the Program is to support and promote projects to increase the utilization of clean-burning alternative fuels and related technologies, such as hydrogen, fuel cells, liquid petroleum gas, natural gas, combination fuels, synthetic fuels, electricity including electric and hybrid vehicles, as well as unique applications of conventional fuels and other clean alternatives yet to be developed.

The Program is funded through a \$1 fee on motor vehicles registered in the SCAQMD. Revenues collected from these motor vehicles must be used to support mobile source projects. Stationary source projects are funded by an emission fee surcharge on stationary sources emitting more than 250 tons of pollutants per year within the SCAQMD. For CY 2007 the funds available through each of these mechanisms were as follows:

- Mobile sources (DMV revenues) \$ 12,289,209
- Stationary sources (emission fee surcharge) \$ 377,483

The SCAQMD Clean Fuels Program also receives grants and cost-sharing revenue contracts from various agencies, on a project-specific basis, that supplement the SCAQMD program. Historically, such cooperative project funding revenues have been received from CARB, the California Energy Commission (CEC), the U.S. EPA, the U.S. Department of Energy (DOE), and the U.S. Department of Transportation (DOT). These supplemental revenues depend in large part on the originating agency, its budgetary and planning cycle, and the specific project or intended use of the revenues.

Table 3 lists the supplemental grants and revenues recognized in 2007.

The final and perhaps most significant funding source can best be described as an indirect source, i.e., funding not directly received by the SCAQMD. This indirect source is the cost-sharing provided by private industry and other public and private organizations. Historically, the Technology Advancement Office has been successful in leveraging its available public funds with more than \$3 of outside funding for each \$1 of SCAQMD funding. Through this public-private partnership, the SCAQMD has shared the investment risk of developing new technologies along with the benefits of expedited development and commercial availability, increased end-user acceptance, reduced emissions from the demonstration projects, and ultimately increased use of clean technologies in the Basin. The SCAQMD's Clean Fuels Program has also avoided duplicative efforts by coordinating and jointly funding projects with major funding agencies and organizations.

Program Review

In 1990, the SCAQMD initiated an annual review of its technology advancement program by an external panel of experts. That external review process has evolved, in response to SCAQMD policies and legislative mandates, into two external advisory groups. The Technology Advancement Advisory Group (one of six standing Advisory Groups that make up the SCAQMD Advisory Council) is made up of stakeholders representing industry, academia, regulatory agencies, the scientific community, and environmental interests. The Technology Advancement Advisory Group, whose members are listed in Appendix A, serves:

- to coordinate the SCAQMD program with related local, state, and national activities;
- to review and assess the overall direction of the program; and
- to identify new project areas and cost-sharing opportunities.

The second advisory group was formed as required by SB 98 (Alarcon). Under H&SC Section 40448.5.1(c), this advisory group must comprise 13 members with expertise in clean fuels technology and policy or public health, appointed from the scientific, academic, entrepreneurial, environmental,

and public health communities. This legislation further specified conflict-of-interest guidelines prohibiting members from advocating expenditures towards projects in which they have professional or economic interests. The objectives of the SB 98 Clean Fuels Advisory Group are to make recommendations regarding projects, plans, and reports, including approval of the required annual report prior to submittal to the SCAQMD Governing Board. The members of the SB 98 Clean Fuels Advisory Group are also listed in Appendix A.

The review process of the Clean Fuels Program now includes several meetings of the two Advisory Groups, review by the Technology Committee of the SCAQMD Board, public hearing of the Annual Report and Plan Update before the full SCAQMD Governing Board, and submittal of the Annual Report to the Legislature.

Core Technologies

The broad technology areas of focus for the Clean Fuels Program are listed below:

- Infrastructure and Deployment
- Emission Control Technologies
- Electric and Hybrid Vehicle Technologies
- Engine Technologies
- Mobile Fuel Cell and Hydrogen Technologies
- Stationary Clean Fuels Technologies

The SCAQMD continually seeks to support the deployment of lower emitting technologies. The Clean Fuels Program is shaped by two basic factors:

- 1) Low- and zero-emission technologies needed to achieve clean air standards in the Basin; and
- 2) Available funding to support technology development within the constraints imposed by that funding.

The SCAQMD strives to maintain a flexible program to address dynamically evolving technologies and the latest progress in the state-of-the-technology. Although the SCAQMD program is significant, especially at a time when both public and private funding available for technology research and development are limited, national and international activities affect the direction of technology trends. As a result, the SCAQMD program must be flexible in order to leverage and accommodate these changes in state, national, and international priorities. The ultimate challenge for the SCAQMD is to identify project or technology opportunities in which its available funding can make a difference in achieving progressively cleaner air in the Basin.

Given the diversity of sources that contribute to the air quality problems in the Basin, there is no single technology that can solve all of the problems. Thus, the core technologies represent a variety of applications with full emissions benefit “payoffs,” i.e., perceived time to full commercialization and mass deployment, occurring at different times. Historically, mobile source projects have targeted low-emission developments in automobiles, transit buses, medium- and heavy-duty trucks, and non-road applications. These vehicle-related efforts have focused on advancements in engine design, electric power-trains, and energy storage/conversion devices (e.g., fuel cells and batteries); and implementation of clean fuels (e.g., natural gas, propane, and hydrogen) including their infrastructure development. Stationary source projects have included a wide array of advanced low NO_x technologies and clean energy alternatives such as fuel cells, solar power, and other renewable energy systems.

Specific projects are selected for co-funding from competitive solicitations, cooperative agency agreements, and unsolicited proposals. Criteria considered in project selection include emissions

reduction potential, technological innovation, potential to reduce costs and improve cost effectiveness, contractor experience and capabilities, overall environmental impact or benefit, commercialization and business development potential, cost sharing, and consistency with program goals and funding constraints. The core technologies for the SCAQMD programs that meet both the funding constraints as well as AQMP needs for achieving clean air are briefly described below.

Infrastructure and Deployment

A key element for the widespread acceptance and resulting increased use of alternative fueled vehicles is the availability of the supporting refueling infrastructure. The refueling infrastructure for gasoline and diesel fuel is well established and accepted by the driving public. Alternative, clean fuels such as natural gas, alcohol-based fuels, propane, hydrogen, hydrogen-natural gas mixtures, and even electricity are much less available or accessible. To realize the emissions reduction benefits, the alternative fuel infrastructure must be developed in tandem with the growth in alternative fueled vehicles. The objectives of the SCAQMD are to expand the infrastructure to support zero and near-zero emission vehicles through the development, demonstration and installation of alternative fuel vehicle refueling technologies.

Emission Control Technologies

This broad category refers to technologies that could be deployed on existing mobile sources, aircraft, locomotives, marine vessels, farm and construction equipment, cargo handling equipment, industrial equipment, and utility and lawn-and-garden equipment. The in-use fleet comprises the majority of emissions, especially the older vehicles and non-road sources, which are typically uncontrolled and unregulated, or controlled to a much lesser extent than on-road vehicles. The authority to develop and implement regulations for retrofit on-road and non-road mobile sources lies primarily with the U.S. EPA and CARB and to a lesser extent with the SCAQMD.

Low-emission and clean-fuel technologies that appear promising for on-road mobile sources should be effective at reducing emissions from a number of non-road sources. For example, immediate benefits are possible from particulate traps, selective catalytic reduction (SCR), and emulsified fuels that have been developed for diesel applications. Clean fuels such as natural gas, propane, hydrogen, and hydrogen-natural gas mixtures may also provide an effective option to reduce emissions from some non-road applications. Reformulated gasoline, ethanol and alternative diesel fuels, such as biodiesel and gas-to-liquid (GTL), also show promise when used in conjunction with advanced emissions controls and new engine technologies. The CARB, U.S. EPA, and the SCAQMD have also promulgated regulations that lower the sulfur content of diesel fuels.

Electric and Hybrid Vehicle Technologies

There has been an increased level of activity and attention on hybrid vehicles due to a confluence of factors, including the highly successful commercial introductions of hybrid passenger vehicles by Toyota, Honda, and Ford, increases in and variability of oil prices, and increased public attention on global warming. A Technology Review of the California Zero Emission Vehicle (ZEV) regulation conducted by CARB in the fall of 2007 suggests several changes to the regulation. In concept, while the volume of fuel cell vehicles expected from the major automakers by 2008 (250) and by 2011 (2,500) is still expected, the proposal offers an alternative strategy utilizing additional plug-in hybrid electric vehicles (PHEVs) or “silver plus” vehicles, such as PHEVs and hydrogen-fueled internal combustion engine (ICE) vehicles.

Due to these factors, there is a window of opportunity to leverage state and federal activities to accelerate the development and deployment of such advanced hybrid technologies, including PHEV

deployment, medium- and heavy-duty hybrid vehicles, energy storage technologies, hybrid emission certification cycle development, battery durability testing, and driver use-patterns. Such technology developments, if successful, are considered *enabling* because they can be applied to a variety of fuels (e.g., gasoline, natural gas, ethanol, and hydrogen) and propulsion systems (e.g., ICEs and fuel cells).

Engine Technologies

Medium- and heavy-duty on-road vehicles contributed approximately 30% of the Basin's NO_x in 2005. More importantly, on-road heavy-duty diesel engines contributed almost 50% of the on-road mobile source PM_{2.5}, which has known toxic effects. These figures notably do not include the significant contribution from off-road mobile sources. In fact, CARB's off-road 2006 emission model estimates that diesel-powered off-road construction equipment alone emits 120 tons per day of NO_x and 7.5 tons per day of PM emissions in the Basin. Clearly, significant emission reductions will be required from mobile sources, especially from the heavy-duty sector, to attain the federal clean air standards.

The use of alternative fuels in heavy-duty vehicles can provide significant reductions in NO_x and particulate emissions. The current NO_x emissions standard for heavy-duty engines is 1.2 g/bhp-hr (combined NO_x and VOC emissions), and there is currently only one heavy-duty natural gas engine with demonstrated NO_x emissions levels at 0.2 g/bhp-hr (Cummins 8.9L). The SCAQMD, along with various local, state and federal agencies, continues to support the development and demonstration of alternative fueled heavy-duty engine technologies, using compressed natural gas (CNG) and liquefied natural gas (LNG) for applications in transit buses, school buses, and refuse collection and delivery vehicles to meet future federal emissions standards.

Mobile Fuel Cell and Hydrogen Technologies

Most of the automobile manufacturers have conceded that mass commercial introduction of fuel cell vehicles (FCVs) are likely to be delayed due to the cost, durability, and infrastructure issues associated with hydrogen and fuel cells. The SCAQMD continues to support the infrastructure required to refuel these demonstration fuel cell vehicles but is also actively engaged in finding alternatives to the costly and potentially longer term fuel cell power plant. As mentioned previously, plug-in hybrid technology could help enable fuel cells by reducing the size and complexity of the vehicle. Further bridging technologies being investigated are hybrid or plug-in hybrid hydrogen ICE vehicles and hydrogen-CNG blended ICE vehicles.

Stationary Clean Fuel Technologies

Given the limited funding available to support low-emission stationary source technology development, this area has historically been limited in scope. To gain the maximum air quality benefits in this category, higher polluting fossil fuel-fired electric power generation needs to be replaced with clean renewable energy resources or other advanced near zero-emission technologies, such as solar, wind, geo-thermal energy, and bio-mass conversion. Although combustion sources are lumped together as stationary, the design and operating principles vary significantly. Included in the stationary category are boilers, heaters, gas turbines, and reciprocating engines. Boilers and heaters vary in size, heat input, process conditions, and operating ranges. Gas turbines vary greatly in size and application and are typically natural gas-fired with add-on controls to clean up the flue gas. Stationary ICEs can be either rich-burn or lean-burn. The core technologies for this category focus on using advanced combustion processes, development of catalytic add-on controls, and alternative fuels and technologies.

PROGRAM IMPACT

Expected Benefits of the Clean Fuels Program

To reap the maximum emissions benefits from any technology, widespread deployment and thus end-user acceptance must occur. The product manufacturers must overcome technical and market barriers to ensure a competitive and sustainable business. Unfortunately, the time can be long and the costs high to address these technical and market barriers, discouraging both manufacturers and end-users from considering advanced technologies. A combination of real-world demonstrations, education, outreach, and regulatory impetus and incentives is necessary to catalyze new, clean technologies. The Clean Fuels Program addresses several of these aspects by co-funding research, development, demonstration, and deployment projects to share the risk of emerging technologies.

Figure 2 provides a conceptual diagram of the wide scope of the Clean Fuels Program. As mentioned in the Core Technologies section, various “stages” of technology projects are funded not only to provide a variety of emissions benefit payback timing, but also to proliferate technology choices.

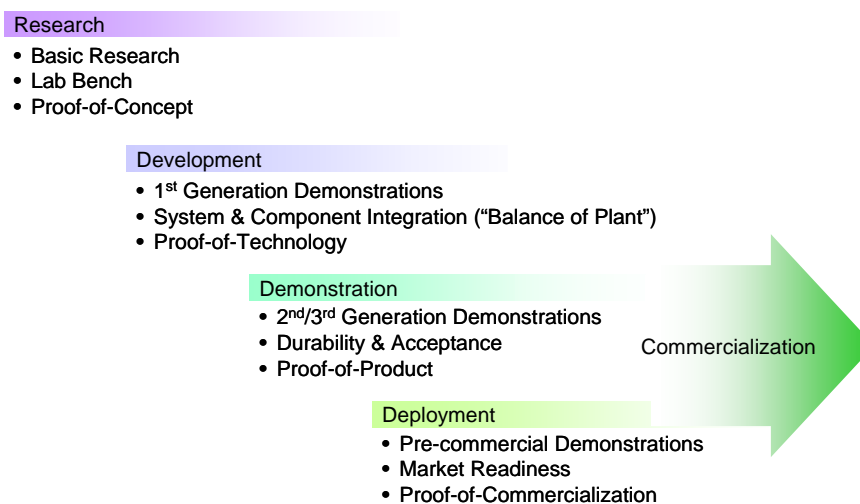


Figure 2: Clean Fuels Program Project Types

Due to the nature of these advanced technology research, development, demonstration, and deployment projects, the benefits are difficult to quantify since their full emission reduction potential may not be realized until sometime in the future, or perhaps not at all. However, a good indication of the impact and benefits of the Clean Fuels Program overall is provided by a brief list of sponsored projects which have resulted in commercialized products or helped to advance the state-of-the-technology.

- CNG Engine Development for Heavy-Duty Vehicles
 - Westport Innovations: ISX 15L (LNG)
 - Cummins Westport: C8.3L (CNG, LNG), B5.9L (CNG) L10 (CNG), ISL 8.9L (CNG, LNG)
 - Detroit Diesel: Series 60G (CNG/LNG), Series 50G (CNG/LNG);
 - John Deere: 6068 (CNG), 6081 (CNG);

- Mack: E7-400G (LNG); and
- Clean Air Partners/Power Systems (Caterpillar): 3126B (Dual Fuel), C-10 (Dual Fuel), C-12 (Dual Fuel).
- Fuel Cell Development and Demonstrations
 - Ballard Fuel Cell Bus (first of its kind);
 - ISE/ThunderPower Fuel Cell Bus; and
 - Commercial Stationary Fuel Cell Demonstration with UTC and SoCalGas (first of its kind).
- Electric and Hybrid Electric Vehicle Development and Demonstrations
 - EPRI hybrid vehicle evaluation study
 - Hybrid electric vehicle demonstrations with SCE, UC Davis, and AC Propulsion;
 - Electric vehicle demonstrations with Santa Barbara Bus Works, Toyota, and GM; and
 - Plug-in Hybrid Electric Van with EPRI, DaimlerChrysler, and SCE.
- Aftertreatment Technologies for Heavy-Duty Vehicles
 - Johnson Matthey and Engelhard trap demonstrations on buses and construction equipment; and
 - Lubrizol optimization and demonstration of oxidation catalysts on CNG, heavy-duty vehicles.

The benefits of these technologies, however, could not have been achieved unless all stakeholders (i.e., manufacturer, end-users, and government) collectively worked to overcome the technology, market, and project-specific barriers encountered at every stage of the research, development, demonstration, and deployment process.

Overcoming Barriers

Commercialization and implementation of advanced technologies come with a variety of real-world challenges and barriers. These include project-specific issues as well as general technology concerns.

Project-Specific Issues

- Identifying a committed demonstration site
- Overall project cost and cost-share using public monies
- Securing the fuel
- Identifying and resolving real & perceived safety issues
- Quantifying the actual emissions benefits
- Viability of the technology provider

Technology Implementation Issues

- Viable commercialization path
- Technology price/performance parity with conventional technology
- Consumer acceptance
- Fuel availability/convenience issues
- Certification, safety, and regulatory barriers
- Quantifying emissions benefits
- Sustainability of market and technology

Other barriers include reduced research budgets, infrastructure and energy uncertainties, sensitivity to multi-media environmental impacts, and the need to find balance between environmental and

economic needs. In order to address these barriers, the SCAQMD seeks to establish relationships with the stakeholders through unique public-private partnerships involving industry, end-users, and other government agencies. Partnerships that involve all the key stakeholders have become essential to address these challenges in bringing advanced technologies from development to commercialization.

Each of these stakeholders and partners contributes more than just funding. Industry, for example, can contribute technology production expertise as well as the experience required for compatibility with process operations. Academic and research institutions bring state-of-the-technology knowledge and testing proficiency. Governmental and regulatory agencies can provide guidance in identifying sources with the greatest potential for emissions reduction, assistance in permitting and compliance issues, coordination of infrastructure needs, and facilitation of standards setting and educational outreach. There is also synergy in developing technologies that address multiple goals of public and private bodies regarding the environment, energy, and transportation.

The SCAQMD actively seeks additional partners for the program through participation in various working groups, committees, and task forces. This participation has resulted in coordinating the SCAQMD program with a number of state and federal government organizations, including CARB, CEC, U.S. EPA, and U.S. DOE and several of its national laboratories. Additionally, this list includes the AB 2766 Discretionary Fund Program administered by the Mobile Source Air Pollution Reduction Review Committee (MSRC), various local air districts, National Association of Fleet Administrators (NAFA), major local transit districts, and local gas and electric utilities. The list of organizations with which the SCAQMD coordinates research and development activities also includes the organizations specified in H&SC Section 40448.5.1(a)(2).

In addition, the SCAQMD holds periodic meetings with several organizations specifically to review and coordinate program and project plans. For example, the SCAQMD staff meets with CARB staff to review research and development plans, discuss project areas of mutual interest, avoid duplicative efforts, and identify potential opportunities for cost sharing. Periodic meetings are also held with industry-oriented research and development organizations, such as the Manufacturers of Emission Controls Association (MECA), the California Fuel Cell Partnership, the California Stationary Fuel Cell Collaborative, and the California Natural Gas Vehicle Partnership.

The coordination efforts with these various stakeholders have resulted in a number of cosponsored projects. The descriptions of the contracts executed in CY 2007 are provided in the next section of this report. It is noteworthy that most of the projects are cosponsored by various funding organizations and include the active involvement of manufacturers. Such partnerships are essential to address commercialization barriers and help expedite the implementation of advanced low-emission technologies. Listed in Table 1 are the funding agency partners and major manufacturers actively involved in SCAQMD projects for this reporting period. It is important to note that, although not listed, there are many other technology developers, smaller manufacturers, and project participants who make important contributions critical to the success of the SCAQMD program. These partners are identified in the more detailed Project Summaries section.

Table 1: SCAQMD Funding Partners in CY 2007

Research Funding Organizations	Major Manufacturers/Providers
California Air Resources Board National Inst. of Environmental Health Services National Renewable Energy Laboratory Southern California Gas Company U.S. Department of Energy	Clean Energy Fuels Corporation City of Los Angeles Emissions Solutions, Inc. Johnson Matthey Inc. Orange County Transportation Authority Port of Los Angeles Port of Long Beach Quantum Fuel Systems Technologies

The following two subsections broadly address the SCAQMD’s impact and benefits by describing specific examples of accomplishments and commercial—or near-commercial—products supported by the Clean Fuels Program in CY 2007. Such examples are provided in the following sections on Technology Advancement’s Research, Development, and Demonstration projects and Technology Deployment and Commercialization efforts.

Research, Development and Demonstration

Important examples of the impact of SCAQMD research and development coordination efforts are: (a) the development and demonstration of heavy-duty engines; and (b) the further development of plug-in hybrid and electric vehicle technologies.

Heavy-Duty Engines

Heavy-duty vehicles contribute the majority of NO_x and particulate emissions in the South Coast Air Basin. The SCAQMD has a long history of supporting clean conventional and alternative fuel strategies for this sector of the mobile inventory. One project contracted during CY 2007 is to develop natural gas engines capable of meeting the stringent 2010 federal emissions standards. Emissions Solutions Inc. proposes to develop, demonstrate and certify a 7.6L heavy-duty natural gas engine that could be used in both the repower of existing diesel engines as well as in new vehicles that meet the 2010 heavy-duty engine NO_x standard.

Plug-in Hybrid and Electric Vehicles

The SCAQMD has actively sponsored the development of PHEVs for light-duty and medium-duty platforms. For the light-duty application, the SCAQMD has funded a \$2 million project with



Figure 3: Electric Tow Tractor

Quantum Fuel Systems Technologies to convert 20 new Ford Escape Hybrid vehicles to plug-in hybrid electric vehicles using advanced lithium-ion battery systems and controls.

The SCAQMD has also partnered with the Port of Los Angeles to develop and demonstrate an electric tow tractor for transporting containers from shipping terminals to nearby warehouses. The air pollutant

contribution caused by goods movement is becomingly increasingly evident and needs to be addressed through the development of new and improved technologies. This project awarded to Balqon Corporation is to develop a tractor that will provide sufficient torque and power to tow a 60,000-pound container. The tractor will include a fast-charging battery with a 40-mile per charge range and zero emissions.

Technology Deployment and Commercialization

One function of the Clean Fuels Program is to help expedite the deployment and commercialization of low- and zero-emission technologies and fuels needed to meet the requirements of the AQMP control measures. This is accomplished through a unique public-private partnership where the risks and costs of developing and demonstrating promising technologies and clean-burning fuels are shared with industry. In many cases, new technologies, although considered “commercially available,” require assistance to fully demonstrate the technical viability to end-users and decision-makers.

The following projects contracted during the CY 2007 reporting period illustrate the impact of SCAQMD technology deployment and commercialization efforts.

Demonstrate Emission Controls on Off-Road Diesel Construction Equipment

There are nearly 70,000 pieces of diesel-powered off-road construction equipment operating in the Basin. As mentioned earlier, CARB’s off-road 2006 emission model estimates that 120 tons per day of NO_x and 7.5 tons per day of PM emissions are produced by this equipment. In 2007, the SCAQMD cosponsored the demonstration of SCR technology for NO_x and PM emissions control on heavy-duty diesel construction equipment. Engine, Fuel, and Emissions Engineering, Inc. (EFEE) will design, install, and demonstrate SCR technology on heavy-duty diesel construction equipment at the Los Angeles County Sanitation District Puente Hills landfill. The project could potentially reduce NO_x emissions by 80% and PM emissions by 30% in these types of equipment.



Figure 4: Equipment without Aftertreatment



Figure 5: Equipment with Aftertreatment

In July 2007, CARB approved its “In-Use Off-Road Diesel Vehicles” regulation to address diesel vehicles, including off-road construction vehicles. CARB estimates that the regulation will prevent 4,000 premature deaths and at its peak retrofit up to 100,000 vehicles. However, the regulation is only enforceable if verified devices are available on the market. The MSRC, working closely in conjunction with CARB, developed a broad-based “Showcase” program to demonstrate and ultimately verify diesel emission control retrofit systems on heavy-duty off-road diesel construction equipment. The MSRC and CARB worked closely together to match compatible diesel emissions control devices with appropriate off-road construction equipment and ranked devices and equipment to achieve the broadest demonstration across vehicle classes. The MSRC’s “Showcase” Program

ultimately provided more than \$3.6 million in funding for 16 manufacturers producing 30 devices and 18 equipment owners with 230 off-road vehicles. The MSRC's Program, however, focused solely on devices that reduced PM emissions. To address the NO_x component, the SCAQMD is providing funding to demonstrate devices that reduce both PM and NO_x emissions, which typically have a higher cost. In late 2007, the SCAQMD Board approved 11 projects totaling more than \$1.2 million for 11 fleets and 32 pieces of equipment. The emissions reductions achieved from these projects and the MSRC's "Showcase" will be considerable, but most importantly they will result in the commercialization of verified retrofit equipment for off-road construction equipment and allow CARB to implement its In-Use Off-Road Diesel Vehicle regulation.

Natural Gas Infrastructure and Deployment

In 2007, the SCAQMD continued to aggressively add and upgrade natural gas refueling facilities to support the need for CNG and LNG fuel by fleet operators subject to clean fuel fleet requirements. In fact, contracts were executed in 2007 for natural gas infrastructure and deployment exceeding \$1.5 million or 15% of the funds executed for this reporting period. The map below shows the distribution of natural gas infrastructure throughout the South Coast Air Basin (SCAB). Currently, there are 100 CNG refueling stations and 18 LNG refueling stations. Of the 18 LNG refueling stations, half of them are L/CNG, which means they can refuel either liquid or compressed NG.

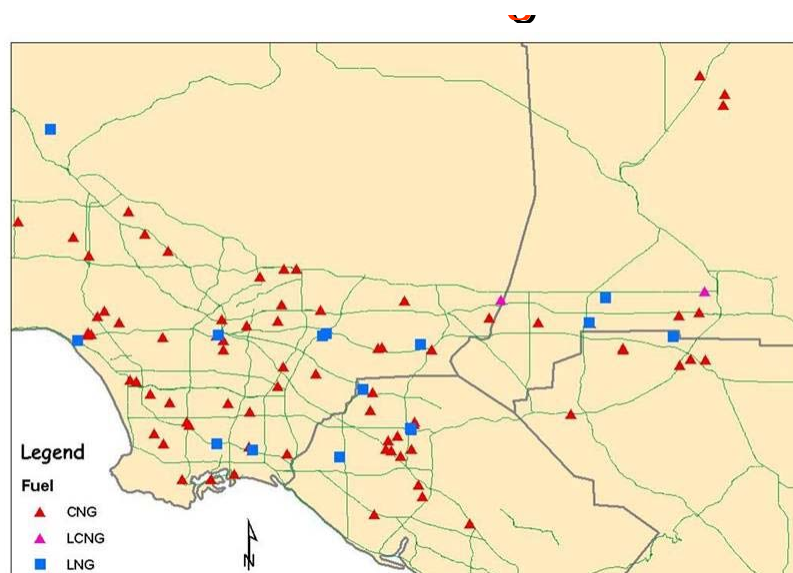


Figure 6: Natural Gas Refueling Facilities within the SCAB

Health Impacts Studies

The SCAQMD also executed five projects totaling more than \$1.4 million to participate in several broad health impacts studies including evaluating particulate matter toxicity, understanding actual exposure levels in communities with multiple air pollution sources, and measuring the effects of goods movement on port community children. The findings can be used to more accurately determine the health benefits of using alternative and advanced technologies to reduce diesel emissions.

2007 PROJECT EXPENDITURES

The SCAQMD Clean Fuels Program follows a “technology-driven” approach, supporting clean fuels and technologies that appear to offer the most promise in reducing emissions, promoting energy diversity, and in the long term, providing cost-effective alternatives to current technologies. In order to address the wide variety of pollution sources in the Basin and the need for reductions now and in the future, the SCAQMD seeks to fund a wide variety of projects to establish a diversified technology portfolio to proliferate choices with the potential for different commercial maturity timing. Given the evolving nature of technology and changing market conditions, such a representation is only a “snapshot-in-time,” as reflected by the projects approved by the Governing Board.

As projects are approved by the Governing Board and executed into contracts every month, the finances necessarily change to reflect these projects. As such, the following represents the status of the Clean Fuels Fund as of December 31, 2007.

Financial Summary

The SCAQMD continued its successful leveraging of public funds with outside investment to support the development of advanced clean air technologies. During the period January 1 through December 31, 2007, a total of 67 contracts, projects or studies that support clean fuels were executed or amended, as shown in Table 2. The major technology areas summarized are: infrastructure and fuel production, fuels/emission studies, emission control technology, electric and hybrid technologies, engine technology, hydrogen technology and infrastructure, fuel cell technology, health impacts studies, stationary clean fuel technology, and outreach and technology transfer. The distribution of funds based on technology area is shown graphically in Figure 7. This wide array of technology support represents the SCAQMD’s commitment to researching, developing, demonstrating, and deploying potential near-term and longer-term technology solutions.

The project expenditures that were contracted or amended for the 2007 reporting period are shown below with the total project costs:

- | | |
|--|---------------|
| • SCAQMD Clean Fuels Fund Contribution | \$ 9,893,039 |
| • Total Cost of Clean Fuels Projects | \$ 32,931,303 |

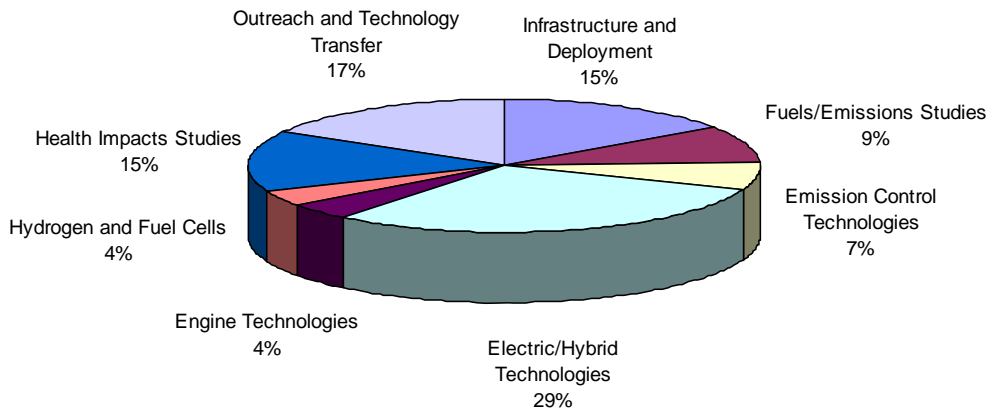
Each year, the Governing Board approves funds to be transferred to the General Fund Budget for Clean Fuels administration. For 2007, the Board transferred \$600,000 for workshops, conferences, co-sponsorships and outreach activities as well as postage, supplies, and costs for special conferences. Only the funds committed by December 31, 2007, are included within this report. Any portion of the Clean Fuels Funds not spent by the end of Fiscal Year 2007-08 ending June 30, 2008, will be returned to the Clean Fuels Fund.

Partially included with the SCAQMD contribution are supplemental sponsorship revenues from various organizations that supported these technology advancement projects. This supplemental revenue is listed in

Table 3. Appendix B lists all Clean Fuels Fund contracts that were open and active as of January 1, 2008.

For Clean Fuels executed or amended contracts in 2007, the average SCAQMD contribution is approximately 30 percent of the total cost of the projects, identifying that each dollar from the SCAQMD was leveraged with nearly three dollars of outside investment.

During 2007, the SCAQMD executed contracts, projects, studies or contract amendments with expenditures of nearly \$10 million for Clean Fuels projects. The distribution of funds for executed contracts is shown in Figure 7 below.



**Figure 7: Distribution of Funds for Executed Clean Fuels Projects
CY 2007 (\$9.9 million)**

Review of Audit Findings

State law requires the SCAQMD undergo a standard, annual financial audit after the closing of each fiscal year. The financial audit is conducted by an independent accounting firm selected through a competitive bid process. For the fiscal year ended June 30, 2007, the firm of Thompson, Cobb, Bazilio & Associates, P.C. conducted the financial audit. As a result of this financial audit, a Comprehensive Annual Financial Report (CAFR) was issued. The CAFR noted there were no adverse internal control weaknesses with regard to SCAQMD financial statements, which include the Clean Fuels Program revenue and expenditures. Thompson, Cobb, Bazilio & Associates, P.C. gave the SCAQMD an “unqualified opinion,” which is the highest possible financial rating. Notably, the SCAQMD has achieved this rating on all prior annual financial audits.

Table 2: Contracts Initiated or Amended between January 1 and December 31, 2007

Contract	Contractor	Project Title	Start Term	End Term	AQMD \$	Project Total \$
Infrastructure and Deployment						
06017	Fuelmaker Corporation	Incentive Buydown Program for CNG Home Refueling Appliance	09/26/05	03/31/08	250,000	250,000
06018	American Honda Motor Co., Inc.	Incentive Buydown Program for CNG Home Refueling Appliance	11/02/05	03/31/08	(250,000)	(250,000)
07149	City of San Bernardino	Purchase & Install New Public Access LNG-L/CNG Refueling Station at City of San Bernardino Municipal Service Yard	06/25/07	12/31/12	164,861	1,399,110
07151	Menifee Unified School District	Purchase & Install New Public Access CNG Refueling Station	01/25/07	12/31/12	75,000	414,500
07152	Newport-Mesa Unified School District	Purchase & Install New Limited Public Access CNG Refueling Station	05/16/07	12/31/12	150,000	375,000
07243	City of Commerce	Purchase & Install New Public Access L/CNG Refueling Station	05/16/07	12/31/12	250,000	1,300,000
07244	SunLine Transit Agency	Upgrade Existing Public Access CNG Refueling Stations in Thousand Palms & Indio	04/04/07	12/31/12	90,000	180,000
07253	Colton Joint Unified School District	Local Match to Purchase & Install CNG Refueling Station	03/19/07	05/15/08	170,000	1,348,408
07320	Orange County Transportation Authority	Install New CNG Refueling Station in the City of Santa Ana	12/21/07	12/31/12	350,000	5,841,729
08033-1	California Air Resources Board	Demonstrate LPG Stop-Fill Unit	06/25/07	06/24/10	75,000	498,900
08101	Pupil Transportation Cooperative	Upgrade Existing Public Access CNG Refueling Station	12/31/07	12/31/13	187,154	300,000
Fuels/Emission Studies						
06086	West Virginia University	Perform Emissions Testing of up to Four Cleaire Longview Systems on Waste Collection Vehicles	01/17/07	04/30/09	180,000	180,000
07054	West Virginia University	Conduct In-Use Emissions Testing of Refuse Trucks	12/31/06	05/31/08	500,000	500,000
07341	Southwest Research Institute	Remote Sensing of Heavy-Duty Engines including Locomotives	06/29/07	12/31/07	70,000	140,000
08033-2	California Air Resources Board	Test Particulate Measurement Device for In-Use Vehicles	06/25/07	06/24/10	125,000	504,514
Emission Control Technologies						
07236	National Renewable Energy Laboratory	Investigate the Role of Lubricating Oil on Particulate Matter Emissions from Vehicles	03/23/07	08/31/08	200,000	446,887
08033-3	California Air Resources Board	Demonstrate Retrofit SCR System for NOx Emission Reduction Using Crystalline Matrix Storage for Ammonia	06/25/07	06/24/10	78,500	338,268
08068	Johnson Matthey Inc.	Develop & Demonstrate SCR Technology for NOx and PM Emissions	12/14/07	01/31/09	254,000	655,500

Table 2: Contracts Initiated or Amended between January 1 and December 31, 2007 (cont'd)

Contract	Contractor	Project Title	Start Term	End Term	AQMD \$	Project Total \$
Emission Control Technologies (cont'd)						
08161	Engine, Fuel & Emissions Engineering, Inc.	Demonstrate NOx & PM Emissions Control on Construction Equipment	12/31/07	02/28/09	135,830	330,850
Electric/Hybrid Technologies						
99109	Toyota Motor Credit Corporation	Three-Year Lease of One RAV4 Electric Vehicle	04/04/99	01/01/08	7,794	7,794
07265	Descanso Gardens	Demonstrate Electric Tram	04/20/07	07/19/08	96,000	121,000
07293	Balqon Corporation	Develop & Demonstrate Electric Tow Tractor for Transportation Containers from Shipping Terminals	04/27/07	05/31/08	527,000	527,000
08063	Quantum Fuel Systems Technologies Worldwide, Inc.	Develop & Demonstrate 20 Plug-In Hybrid Electric Vehicles	12/31/07	12/15/14	2,095,613	2,815,266
08067	Calstart	Demonstrate Hydraulic-Hybrid Shuttle Bus	10/30/07	03/31/10	250,000	1,210,000
Engine Technologies						
07306	Emission Solutions, Inc.	Develop, Demonstrate & Certify Heavy-Duty Natural Gas Engine Meeting 2010 Emission Standards	06/28/07	07/31/08	400,000	1,200,000
Mobile Fuel Cell Technologies						
04126	American Honda Motor Co., Inc.	Lease of One Additional Honda Fuel Cell Electric Vehicle	06/22/04	05/23/08	10,825	10,825
07356	ISE Research Corporation	Upgrade & Demonstrate Fuel Cell Bus	11/02/07	08/31/09	325,000	1,285,000
Hydrogen Technology and Infrastructure						
Purchase Order	Hydrogenics Corporation	Refurbish Hydrogen Refueling Station at SCAQMD Headquarters in Diamond Bar	06/12/07	07/31/07	43,000	43,000
Health Impacts Studies						
07181	California Air Resources Board	Physical, Chemical & Toxicological Assessment of the Semi-Volatile & Non-Volatile Fraction of PM	01/17/07	04/01/10	338,975	667,950
07196	California Air Resources Board	Environmental Justice Saturation Monitoring of Selected Pollutants in Wilmington, CA	01/17/07	12/31/08	100,000	400,000
07359	University of Southern California	Study on Combustion Exhaust and Respiratory Health of Port Community Children	12/14/07	08/31/08	489,300	2,989,300
08033-4	California Air Resources Board	Spatiotemporal Analysis of Air Pollution and Mortality in California Based on the American Cancer Society Cohort	06/25/07	06/24/10	374,988	749,976

Table 2: Contracts Initiated or Amended between January 1 and December 31, 2007 (cont'd)

Contract	Contractor	Project Title	Start Term	End Term	AQMD \$	Project Total \$
Health Impacts Studies (cont'd)						
08033-5	California Air Resources Board	Extended Analyses of Air Pollution & Cardiopulmonary Disease in the California Teachers Study Cohort	06/25/07	06/24/10	142,326	284,652
Outreach and Technology Transfer						
97113	JME Inc.	Review & Assessment of Technical Proposals Regarding ATTB Ultracapacitor System	05/08/97	03/31/09	15,000	15,000
05008	Bevilacqua-Knight Inc.	Participate in California Fuel Cell Partnership for FY 2007 & Provide Support for Regional Coordinator	07/07/04	07/06/08	133,800	2,293,274
05127	Protium Energy Technologies	Technical Assistance for Development, Outreach & Commercialization of Hydrogen & Fuel Cell Applications	03/14/05	03/31/08	20,000	20,000
06061	Saint Malo Solutions	Consulting Services in Preparation of Mobile Source Emissions Element of 2007 AQMP	05/17/06	03/31/08	40,000	40,000
07059	Dowling Associates, Inc.	Technical Assistance Related to Air Quality Impacts of Regional Goods	12/19/06	11/30/08	10,000	10,000
07130	Burnett & Burnette	Technical Assistance with CNG Technology	01/17/07	12/31/08	40,000	40,000
07185	Joseph C. Calhoun, P.E., Inc.	Technical Assistance for Development, Outreach & Commercialization of Advanced Low-Emission Vehicle Technologies	01/29/07	01/31/08	20,000	20,000
07241	Charles Wyman, Ph.D.	Technical Assistance for Cellulosic Ethanol Forum & Roundtable	02/24/07	07/31/07	7,300	7,300
07247	TIAX LLC	Technical Assistance with Low-Emission and Alternative Fuels Technologies	03/19/07	12/31/08	50,000	50,000
07257	Michael Studer, Ph.D.	Technical Assistance for Forum & Roundtable on Cellulosic Ethanol	04/11/07	07/31/07	1,000	1,000
07262	Judith Lamare	Technical Assistance for Smog Check Technology Forum & Roundtable	03/16/07	07/31/07	12,000	12,000
07314	Engine, Fuel & Emissions Engineering, Inc.	Technical Assistance with Advanced Heavy-Duty and Off-Road Technologies	06/25/07	12/31/09	60,000	60,000
07342	Douglas R. Lawson	Technical Assistance for Mobile Source Technologies	06/21/07	08/31/08	15,000	15,000
Direct	Payment from Clean Fuels	Co-Host CAPCOA's The Future is Green Conference & Expo in September 2008	09/18/07	09/18/08	50,000	500,000
Transfer	Transfer from Clean Fuels	Participate in California Natural Gas Vehicle Partnership	02/02/07	02/02/08	25,000	250,000

Table 2: Contracts Initiated or Amended between January 1 and December 31, 2007 (cont'd)

Contract	Contractor	Project Title	Start Term	End Term	AQMD \$	Project Total \$
Outreach and Technology Transfer (cont'd)						
Transfer	Transfer from Clean Fuels	Return Funds Received from LADWP Settlement Fund in CY 2003 to Re-allocate to City of Los Angeles Million Trees Initiative	09/07/07	09/07/07	933,050	933,050
Varies	Various Contractors	Co-Sponsorships of 18 Conferences, Workshops and Events, plus 3 Memberships	Varies	Varies	204,723	1,599,250

Table 3: Supplemental Grants/Revenue Received between January 1 and December 31, 2007

Revenue Agreement	Revenue Source	Project Title	Contractor	SCAQMD Project	Total
Contract #07255	CARB	Investigate the Role of Engine Lubrication on PM Emissions from Mobile Sources	National Renewable Energy Lab	Contract #07236	\$100,000
Contract #07270	City of Los Angeles, Dept. of Public Works, Bureau of Sanitation/Solid Resources	In-Use Emissions Testing of Refuse Trucks	West Virginia University Research Corporation	Contract #07054	\$500,000
Contract #07300	City of Angeles, Port of Los Angeles	Develop & Demonstrate Electric Tractor Tow for Transporting Containers from Shipping Terminals	Balqon Corporation	Contract #07293	\$263,500
Direct Deposit	Mack Trucks Inc.	Develop, Demonstrate & Certify Heavy-Duty Natural Gas Engine Meeting 2010 Emission Standards	Emissions Solutions, Inc.	Contract #07306	\$50,000

SunLine's two CNG stations are among the highest volume stations in the Southern California area. Over the last four years, SunLine has had complaints with 3,600 psig vehicle customers because the CNG public refueling stations cannot full fuel these vehicles to about 4,200 psig temperature compensated during the summer months. SunLine recently evaluated the existing stations and determined that it was necessary to upgrade the public and private CNG stations to increase the pressure of the fuel system from 3,000 psig to 3,600 psig. Currently, all new CNG vehicles are designed with the 3,600 psig option and 100% of all CNG vehicles in the Coachella Valley are designed with 3,600 psig. SunLine proposed to upgrade and retrofit the refueling systems at both their Thousand Palms and Indio stations. The upgrades will enable the public stations to accommodate vehicles with the 3,600 psig, as well as enable SunLine to retrofit the transit only refueling stations to accommodate new buses purchased in 2006. The projects included adding a third dispenser to meet 3,600 psig at the internal transit bus refueling island, connecting the new dispenser to an existing card reader, removing one of the six CNG 4,000 psig storage vessels (10,000 scf each) and replace a 4,000 psig bottle with one each 5,500 and 12,000 scf psig bottle for full filling temperature compensated to 3,600 psig.

07253: Local Match to Purchase & Install CNG Refueling Station

Contractor: Colton Joint Unified School District
SCAQMD Cost-share: \$ 170,000

Cosponsor:
Carl Moyer Program AB 923 Fund 1,178,408

Term: 03/19/07 – 12/31/12
Total Cost: \$ 1,348,408

SCAQMD awarded Colton Joint Unified School District eight new CNG school buses, while in turn Colton Joint would deliver eight of its newer diesel buses to three other schools willing to crush six older pre-1987 diesel buses and two pre-1977 buses. These schools are Fontana and Coachella Valley Unified School Districts and Sherman American-Indian High School. Colton Joint USD must provide a local match of \$25,000 per bus for the replacement of the pre-1987 buses and \$10,000 per bus for the replacement of the pre-1977 buses. However, due to the school's budget constraints, the SCAQMD approved an additional award of \$170,000 from the Clean Fuels Fund to cover the school's local match.

07320: Install New CNG Refueling Station in the City of Santa Ana

Contractor: Orange County Transportation Authority
SCAQMD Cost-share: \$ 350,000

Cosponsors:
1309.1 Priority Reserve Fund 180,000
AES Settlement Fund 470,000
MSRC/AB 2766 Discretionary Fund 200,000
Orange County Transportation Authority 4,641,729

Term: 12/21/07 – 12/31/12
Total Cost: \$ 5,841,729

In May 2006, the Orange County Transportation Authority (OCTA) Board of Directors approved the accelerated procurement and delivery of 249 CNG buses. The CNG refueling station at the Santa Ana Base required significant facility modifications to accommodate the maintenance of CNG vehicles as

