SUBCHAPTER 4.2

ENERGY IMPACTS

4.2 ENERGY IMPACTS

4.2.1 INTRODUCTION

This subchapter examines impacts on the supply and demand of energy sources from proposed control measures in the 2007 AQMP. Additional information and supporting data for this analysis are contained in Appendix C; Supporting Documentation for Energy Impact Analysis.

All control measures in the 2007 AQMP were evaluated to determine whether or not they could generate direct or indirect energy impacts based on the anticipated methods of control. Some of the measures will require increased energy use, for example through increased pumping loads or more extensive exhaust filtering systems. Other measures will alter the form of energy used, for example switching from gasoline or diesel power to alternative fuels such as reformulated fuels, natural gas, and electricity.

4.2.2 2007 AQMP CONTROL MEASURES WITH POTENTIAL ENERGY IMPACTS

The energy impact analysis in this Program EIR identifies the net effect on energy resources from implementing the 2007 AQMP. All control measures were analyzed to identify both beneficial effects (energy conserving) and adverse impacts (energy consuming).

Implementing some of 2007 AQMP control measures could increase energy demand in the region from affected facilities. Specifically some types of control equipment will increase demand for electrical power to operate the equipment, natural gas for combustion devices, natural gas used as an alternative clean fuel for mobile sources, etc.

Evaluation of control measures was based on examination of the impact of the control measures and technologies in light of current energy trends. Evaluation of control methods for each control measure indicated that there are 34 control measures that could have potential energy consumption or conserving impacts. As shown in Table 4.2-1, 15 control measures to be implemented by the SCAQMD and 19 control measures under state and federal jurisdiction are expected to have energy impacts.

4.2.3 SIGNIFICANCE CRITERIA

Implementation of the 2007 AQMP will be considered to have significant adverse energy impacts if any of the following conditions occur:

- The project encourages activities which will result in the use of large amounts of fuel or energy resources.

- The project will result in the use of fuel or energy resources in a wasteful manner.

- The project will result in substantial depletion of existing energy resource supplies.

TABLE 4.2-1

Control Measures with Potential Energy Impacts

Control Measures	Control Measure Description (Pollutant)	Control Methodology	Energy Impact
MEASURES TO BE IMPLEMENTED BY THE SCAQMD			
FUG-04	Emission Reductions from Pipeline & Storage Tank Degassing	Enhanced control technology; increased control efficiency; establish concentration limits; expand source categories (smaller tank, etc.). Vapor space exhaust vented to air pollution control device.	Potential increase in electricity and natural gas demand associated with flares or afterburners.
CMB-01	NOx Reductions from Non-RECLAIM Ovens, Dryers & Furnaces	Use low-NOx burners through retrofit or replacement.	Potential increase in electricity and natural gas demand.
CMB-02	Further SOx Reductions of RECLAIM	Identifies control approaches for (BARCT) for reduction in SOx allocation. SOx reduction controls (i.e., sulfur recovery, etc).	Potential increase in electricity and natural gas demand.
CMB-03	Further NOx Reductions from Space Heaters	Establish more stringent emission limits for new space heaters through use of low-NOx burners and heat pumps.	Potential increase in electricity for fans and pumps and natural gas demand for low-NOx burners.
BCM-01	PM Control Devices (Baghouses, Wet Scrubbers, Electrostatic Precipitators, Other Devices)	Install continuous opacity monitor system or bag leak detection system for top process emitters. Baghouse filter; ventilation/hood systems.	Potential increase in electricity and natural gas demand for ventilation and hood systems.
BCM-02	PM Emission Hot Spots-Localized Control Program	Supplement the regional approach to address PM hot spots. Fencing; mowing; paving; soil stabilization; street sweeping; housekeeping.	Increased fuel use associated with operating equipment for maintenance activities.
BCM-03	Emission Reductions from Wood Burning Fireplaces & Woodstoves	Voluntary or mandatory wood burning curtailment during poor air quality. Prohibit burning of non-wood fuel (e.g., waste, garbage, etc.).	Potential increase in natural gas demand.
BCM-04	Additional PM Emission Reductions from Rule 444-Open Burning	Reduce PM emissions from open burning. Prohibit burns; alternatives to burn (chipping, grinding, composting, etc).	Increased fuel use to transport waste and chip, grind (run equipment).
BCM-05	Emission Reductions from Under-fired Charbroilers	Stimulate technology for PM emissions from under-fired charbroilers.	Electricity to operate equipment; afterburner combustion emissions.

TABLE 4.2-1 (cont.)

Control Measures	Control Measure Description (Pollutant)	Control Methodology	Energy Impact
MCS-01	Facility Modernization	Equipment retrofitted or replaced with BACT at the end of a pre-determined lifespan & use of super compliant materials/process change.	Potential increase in electricity and natural gas demand.
MCS-04	Emissions Reduction from Greenwaste Composting	Develop Best Management Practices for reducing PM10, VOC, & NH3.	Potential increase in electricity demand associated with biofilters, in-vessel treatment equipment.
MCS-05	Emission Reductions Livestock Waste	Air pollution control devices for larger facilities, reductions from smaller facilities. (use of belt/drying system); enclosures; VOC/odor control (i.e. afterburner).	Potential increase in electricity and natural gas demand.
EGM-01	Emission Reductions from New or Redevelopment Projects	Mitigate impacts new/redevelop projects. Dust control, alternative fuel; diesel PM filter; low-emitting engines; low VOC coatings; energy conservation; mitigation fee.	Potential increase/savings in petroleum fuel use. Potential increase in alternative fuel use.
MOB-02	Expanded Exchange Program	Expand lawn mower/leaf blower exchange programs. Low-emitting engines/electrical engines.	Potential increase in electricity demand.
MOB-03	Backstop Measure for Indirect Sources of Emissions from Ports & Port-Related Facilities	Address emissions stationary & mobile sources at ports & related facilities. PM filter/catalysts; use of non-diesel equipment (i.e., electrical, fuel cells, LNG, CNG, etc); alt diesel fuel (i.e. low sulfur, emulsified, etc); hoods, shoreside power (SCR); vessel speed reduction.	Potential increase in electricity and natural gas demand. Potential increase/savings in petroleum fuel use. Potential increase in alternative fuel use.
MEASURES FOR SOURCES UNDER STATE AND FEDERAL JURISDICTION			
ARB-ONRD-03 SCFUEL-01	CA Phase 3 Reformulation Gasoline Modifications	Offset impacts of ethanol in low level blended gasoline through gasoline reformulation; remove ethanol.	Potential increase in electricity and natural gas demand.
SCONRD-01	Accelerated Penetration of Partial Zero-Emission & Zero-Emission Vehicles	Focus on implementation of technologies capable of achieving partial zero-tailpipe emissions. Alternative fuels; advanced technology (partial zero emitting vehicles); old battery disposal.	Potential increase in electricity demand.

TABLE 4.2-1 (cont.)

Control Measures	Control Measure Description (Pollutant)	Control Methodology	Energy Impact
SCFUEL-02	Greater use of Diesel Fuel Alternatives and Diesel Fuel Reformulation	Two-phase approach to achieve additional emissions from diesel fuel engines. Fuel reformulation; diesel alternatives (Fischer-Tropsch, biodiesel, emulsified).	Potential increase in electricity and natural gas demand. Potential increase in alternative fuel use.
ARB-ONRD-04 SCONRD-03	Cleaner In Use Heavy Duty Vehicles	Accelerate retrofits for vehicles, fleet modernization and enhanced screening and repair, including out-of-state vehicles.	Potential decrease in engine efficiency could reduce fuel economy and increase emissions. Potential for passive filters to emit higher levels of NO_2. Potential increase in alternative fuels and natural gas.
ARB-ONRD-05 SCONRD-04	Further Emissions Reductions from Heavy-Duty Trucks Providing Freight Drayage Services	Retrofit or replace existing over-the-road trucks providing drayage serves at marine ports, intermodal facilities, or warehouses.	Potential increase/savings in petroleum fuel use. Potential increase in alternative fuel use.
ARB-OFFRD-04 SCOFFRD-01	Construction/Industrial Equipment Fleet Modernization	New off-road diesel engines meet more stringent emissions standards. Accelerated engine replacement/retrofit/repower; alt fuels.	Potential increase/savings in petroleum fuel use. Potential increase in alternative fuel use.
ARB-OFFRD-02 SCOFFRD-03	Further Emission Reductions from Locomotives	Operating in the Basin to meet Tier 3 equivalent emissions by 2014. Accelerated replacement; control tech (SCR, PM filters, hybrid battery engines).	Potential increase in electricity demand. Potential increase/savings in petroleum fuel use
ARB-OFFRD-01	Auxiliary Ship Engine Cold Ironing and Other Clean Technology. Cleaner Main Ship Engines and Fuel.	Reduce emissions from ships at berth cold ironing (electrical power) and other clean technologies. Further reduce emissions from main engines through added retrofits. Accelerate use of cleaner ships and rebuilt engines. Use low sulfur diesel fuel in main engines when operating within 24 nautical miles of shore.	Potential increase in electricity demand associated with cold ironing.
ARB-OFFRD-03	Clean Up Existing Commercial Harbor Craft	Require owners of existing commercial harbor craft to replace old engines with newer cleaner engines and/or add emission control technologies that clean up engine exhaust.	Electricity to operate control equipment. Construction emissions.

TABLE 4.2-1 (cont.)

Control Measures	Control Measure Description (Pollutant)	Control Methodology	Energy Impact
SCOFFRD-02	Further Emission Reductions from Cargo Handling Equipment	Additional emission reductions from cargo handling equipment beyond the state regulation. Accelerated retirement/retrofit (i.e., catalysts, PM traps, alt fuel-emulsified diesel)	Potential increase/savings in petroleum fuel use. Potential increase in electricity and natural gas demand. Potential increase in alternative fuel use.
SCOFFRD-04	Emission Reductions from Airport Ground Support Equipment	Reduce airport ground support equipment emissions primarily through electrification and emission standards.	Potential increase in electricity demand.
SCOFFRD-05	Emission Reductions from Truck Refrigeration Units	Provide electricity to eliminate use of diesel engines at truck stops.	Electricity generation to operate truck cooling refrigeration.
LONG TERM ("BLACK BOX") MEASURES			
SCLTM-01	Further Emission Reductions from On-Road Mobile Sources	Focus on implementation of technologies capable of achieving partial zero-tailpipe emissions. Alternative fuels; advanced technology (partial zero emitting vehicles); old battery disposal.	Potential increase in electricity demand.
SCLTM-02	Further Emission Reductions from Off-Road Mobile Sources	Further Reductions from Off-Road Mobile Sources through 1) accelerated turn-over of existing equipment and vehicles and replacement with new equipment meeting the new engine standards; 2) retrofit of existing vehicles and equipment with add-on controls such as SCR; and 3) develop new engine standards (e.g., aircraft, ships)	Potential increase in electricity demand.

4.2.4 POTENTIAL IMPACTS AND MITIGATION

4.2.4.1 Electricity

Potential electric energy impacts relative to the energy baseline are discussed below. The potential increase in electricity use due to implementation of the 2007 AQMP is partially associated with the potential installation of add-on control equipment. A number of control measures could result in the installation of add-on control equipment including FUG-04, CMB-01, CMB-02, CMB-03, BCM-01, BCM-05, MCS-01, MCS-05, MOB-02, MOB-03, MOB-04, ARB-ONRD-03/SCFUEL-01, SCONRD-01, SCFUEL-02, ARB-OFFRD-02/SCOFFRD-03, ARB-OFFRD-01, ARB-OFFRD-03, and SCOFFRD-02. There also is a potential increase in electricity use associated with the electrification of mobile sources, including MOB-01, MOB-

02, MOB-03, MOB-04, SCONRD-01, ARB-OFFRD-02/SCOFFRD-03, ARB-OFFRD-03, SCOFFRD-02, and SCOFFRD-04.

Stationary and Area Sources

For stationary sources, a slight increase in electricity demand is expected from the use of add-on air pollution controls associated with modifications and additional controls at refineries and other affected facilities, additional controls at RECLAIM facilities, fugitive VOC emissions reductions, add-on controls associated with control of emissions from livestock waste, and PM10 controls (e.g., baghouses). The amount of electricity to run these control devices is not known at this time because information regarding the number and size of the units is not known. This will be evaluated during development of the control measure, write a new or amended rule. Alternative processing equipment is expected to be the primary method of control for some of the control measures. For example, the primary method of control of VOC emissions from coatings and solvents is expected to be reformulation of coatings and solvents, and not add-on control equipment. Therefore, reformulating coatings is largely expected to be energy neutral.

Mobile Sources

Mobile source control measures are expected to increase the electricity demand in the district. A number of control measures would result in an increase in electricity demand associated with the electrification of mobile sources, including MOB-01, MOB-02, MOB-03, MOB-04, SCONRD-01, ARB-OFFRD-02/SCOFFRD-03, ARB-OFFRD-03, SCOFFRD-02, SCOFFRD-04, SCOFFRD-05, SCLTM-01, and SCLTM-02. This will shift some of the fuel source of cars, trucks, off-road vehicles and marine vessels to electricity as well as create an additional electrical load demand due to CNG recharging. The CEC currently estimates there were about 300,000 electric vehicles operating in California in 2003 with an estimated electricity consumption of 835 to 840 megawatt (MW) (assuming all equipment was charging at the same time). Assuming that an additional 2.5 million electric vehicles by 2020 are introduced into the district, an additional 6,600 MW would be required by 2020.

The estimated baseline electricity use in southern California was about 120,194 gigawatt-hours (gWh) in 2002. CEC estimates that an increase in electricity demand of 19 percent will occur between 2002 and 2016 (CEC 2005b) due to general population growth. Assuming a similar growth rate between 2016 and 2023, about 160,063 gWh will be required in 2023 (see Table 4.2-2).

TABLE 4.2-2
Electricity Impacts for Southern California (gigawatt-hours)[(1)]

	2002	**2016[2]**	**2023[(3)]**
Baseline	120,194	142,902	160,063
Impacts from 2007 AQMP:			
Mobile Source Measures	--	6.6	6.6
Percent of Baseline	--	0.005%	0.004%

(1) Source: CEC, 2005b
(2) Projection based on CEC, 2005b
(3) Calculations based on a growth rate estimates consistent with 2008 – 2016 projections.

Additional power plants will be required to supply the projected electricity, both in California and outside of California. Currently, there are a number of power plant projects planned in southern California to meet future needs. Relative to the projected future peak electricity demand, implementation of all the control measures is expected to result in an overall increase in 2016 and 2020 of less than one percent (see Table 4.2-2). Thus, the electric energy impacts from the implementation of the 2007 AQMP are expected to be less than significant.

The electric energy impacts in Table 4.2-2 represent a conservative estimate of electric energy demand and peak demand impacts. For example, substantial electric energy savings could occur with full implementation of programs association of control measure MCS-02. The SCAQMD has projected that the 709 GWh of electricity savings could occur from implementing the lighter roof portion of the control measure alone (SCAQMD, 2003). Additional energy savings would be expected from the tree planting portion of the control measure. However, since the control measure is currently a voluntary program, credit for their projected electricity savings is not taken by the AQMP.

Control Measure MOB-03 is a backstop measure that would allow the SCAQMD to control stationary and mobile sources at the port and port-related facilities, in the event that the Clean Air Action Plan developed by the ports is not implemented. One goal of the ports' Clean Air Action Plan and MOB-03 is to move all container berths, cruise ship operations, and other frequent visitors calling at the ports to shore-side power and to move other vessel types toward alternative hotelling emissions reduction technologies. With regard to shore-side power, the two ports are in different positions from an infrastructure standpoint. Generally, the Port of Los Angeles has the main electrical trunk lines in place from which to "step down" and condition power for ships. The Port of Long Beach, on the other hand needs to bring new electrical service lines from Interstate 405 into the Harbor District to supply the appropriate power, which will require significant infrastructure improvements (PLAX/PLB, 2006).

Over the next five years, the Port of Los Angeles proposes to conduct a massive infrastructure improvement program to make alternative marine power (or AMP) available at a number of berths at container, selected liquid bulk terminals, cruise terminals, and dredge plug-in locations. The Port of Los Angeles is expected to have alternative marine power available at 15 berths and needs to install 34.5 kV to 6.6 kV transformers at various terminals (PLAX/PLB, 2006).

Over the next five years, the Port of Long Beach plans to have crude oil Berth Y121 and nine container berths operational with shore-side power. In addition, the Port of Long Beach will need to construct an additional 6.6 kV sub-transmission line to serve the Harbor District and complete infrastructure improvements for the container terminals. The Port of Long Beach is currently limited by the lack of sufficient power infrastructure and expects to prepare a port-wide cold ironing infrastructure EIR covering electrical system enhancements required to upgrade electrical systems and install necessary infrastructure to provide power to cold ironing systems at all cargo terminal berths (PLAX/PLB, 2006).

Electricity impacts from constructing and using new electricity infrastructure at the ports is currently considered to be an impact for the Ports' Clean Air Action Plan. Should the Ports' fail

to implement the electricity components of the Clean Air Action Plan, impacts would then be attributed to implementing 2007 AQMP control measure MOB-03.

Conclusion - Electricity

The electric energy impacts presented above are expected to be conservative. The demands for electricity associated with increased electrification of mobile sources could be partially offset by charging equipment (e.g., electric vehicles) at night when the electricity demand is low, thus minimizing impacts on peak electricity demands. The 2007 AQMP includes strategies that promote energy conservation. These energy impacts, although unavoidable, are expected to be less than significant because current and future power generating utilities are expected to have the capacity to supply the estimated electrical increase. Further, increased electricity demand resulting from implementing AQMP control measures is expected to be less than one percent of projected future electricity demand.

PROJECT-SPECIFIC MITIGATION: No mitigation measures are currently required because no significant impacts on electricity demand were identified. As individual control measures are promulgated as new rules or rule amendment, mitigation measures will be identified as necessary to ensure that energy impacts remain less than significant.

4.2.4.2 Natural Gas

PROJECT-SPECIFIC IMPACTS: Control measures in the 2007 AQMP may result in an increase in demand for natural gas associated with stationary sources due to the need for additional emission controls, e.g., FUG-04, BCM-01, CMB-01, CMB-02, CMB-03, BCM-03, MCS-01 and MCS-05. Other control measures are expected to encourage the use of natural gas as a fuel to offset the use of petroleum fuels including MOB-03, ARB-ONRD-03/SCFUEL-01, SCONRD-01, SCFUEL-02, ARB-OFFRD-01, and SCOFFRD-02. In addition, increased demand for electricity will require additional natural gas, as most of the power plants in California are operated using natural gas.

Total natural gas (end use) consumption in California is approximately 787 billion cubic feet per year (see Table 4.2-3). About 57 percent of the natural gas consumed in the state is consumed in southern California. The residential, commercial, industrial, and electrical generation sectors account for approximately 10, 22, 26, and 42 percent, respectively, of total statewide natural gas (end use) consumption. The demand for natural gas in southern California is expected to increase by approximately 0.42 percent from 2004 to 2016 (CEC, 2005b). The projected per capita consumption is relatively lower than previously projected because of higher natural gas prices than previously anticipated (CEC, 2005b). California natural gas consumption for the categories other than vehicle fuel has remained relatively constant for the last eight years (CEC, 2005b). Natural gas for vehicle fuel use has steadily grown to where it totaled about 2.84 billion scf in 2004. Still this quantity was only about 0.17 percent of the total statewide natural gas use for the year.

TABLE 4.2-3

Natural Gas Impacts for the District
(Billion Cubic Feet/Year)

	2002	**2016[(1)]**	**2023[(2)]**
Baseline	787	754	792
Stationary Control Measures[(3)]	--	--	--
Mobile Source Control Measures	--	8.6	10.8
Total	**787**	**762.6**	**802.8**
Natural Gas Increase, Percent of Baseline	--	1.1	1.4

(1) Source: CEC, 2005b
(2) Calculations based on a growth rate estimates consistent with 2008 – 2016 growth projections.
(3) Natural gas increase in stationary sources is currently unknown.

Mobile Sources

According to the CEC, there are about 21,269 light-duty natural gas and 5,401 heavy-duty natural gas vehicles in California. The CEC expects an increase in natural gas consumption used as an alternative fuel (see Table 4.2-4). It is believed additional light-duty vehicles will penetrate the gasoline vehicle market once their more costly vehicle purchase prices are offset by fuel and other operational savings (CEC, 2005b).

TABLE 4.2-4

Projected Petroleum Fuel Displaced with Natural Gas in California[(1)]

	2012	2017	2022
Natural Gas Vehicle Fuel Consumption in California (billion cubic feet)	11	15	19
Estimate Natural Gas Vehicle Fuel Consumption in Southern California[(2)](billion cubic feet)	6.3	8.6	10.8
Petroleum Fuel Displaced in California (million gallons gasoline equivalents)	88	120	152
Petroleum Fuel Displaced in Southern California (million gallons gasoline equivalents)	50.3	68.4	86.6

(1) Source: CEC, 2005b.
(2) The district is estimated to consume about 57 percent of the diesel fuel consumed with the state.

Some of the control measures in the 2007 AQMP could result in an increase in the use of natural gas in medium- and heavy-duty on road vehicles. Expanded use of alternative fuels in medium-duty and heavy-duty trucks using more efficient, advanced natural gas engine technologies would be expected to reduce projected diesel-fuel use. Natural gas medium- and heavy-duty vehicles are an attractive environmental option to diesel fueled vehicles because they emit fewer criteria pollutants and toxic components. However, the limited availability of refueling facilities

and typically higher vehicle purchase prices have affected the sale of natural gas fuel vehicles (CEC 2005b).

Stationary Sources

For stationary sources, a slight increase in natural gas demand is expected from the use of add-on air pollution controls associated with add-on controls for fugitive emission reductions, add-on controls associated with livestock operations, add-on controls associated with VOC emission sources, and add-on controls associated with particulate matter control. The amount of natural gas to run these control devices is unknown. Alternative processing equipment is expected to be the primary method of control, e.g., the primarily method of control for CMB-01 and CMB-03 is expected to be new low NOx burners which are not expected to result in an increase in natural gas consumption, because this would require replacing one type of burner with a more efficient burner.

Approximately 40 percent of the natural gas consumed in California is used at power plants to generate electricity. Southern California Edison will need to add additional electricity generating capacity either in California or out of California to accommodate the increase in population growth. The increased electricity demand is expected to be generated by natural gas resulting in an increased demand for natural gas, the amount of which is currently unknown.

Because California is dependent on so few sources of LNG, with all sources being located outside of the state, and some quite distant, LNG supply disruptions have occurred which are a major inconvenience to LNG vehicle fleets. Most LNG comes from a liquefaction plant in Topock, Arizona. There are proposals for offshore LNG terminals, but final approval for such facilities has not occurred. There are also concerns that LNG supplies are not growing as fast as the demand, so, it is likely that additional natural gas infrastructure will be required to continue to supply natural gas to California (CEC, 2005b).

The natural gas impacts associated with the 2007 AQMP are summarized in Table 4.2-3. The natural gas impacts from the implementation of the 2007 AQMP are expected to be less than significant. The 2007 AQMP includes strategies that promote energy conservation. These energy impacts, although unavoidable, are expected to be less than significant because sufficient natural gas capacity and supplies are expected be available and the overall impact of the 2007 AQMP on natural gas is expected to be about one percent of the total natural gas use in southern California.

PROJECT-SPECIFIC MITIGATION: No mitigation measures are required because no significant impacts on natural gas resources. As individual control measures are promulgated as new rules or rule amendment, mitigation measures will be identified as necessary to ensure that energy impacts remain less than significant.

4.2.4.3 Petroleum Fuels

General growth in the district is expected to result in a substantial increase in the use of petroleum fuels between current conditions and 2030. Table 4.2-5 summarizes the expected

increases in fuel usage, as predicted by SCAG's transportation and air quality model, between 2000 and 2030 with the investments in the RTP and without the RTP.

TABLE 4.2-5

Projected Transportation Fuel Consumption in Southern California (thousand gallons per day)

Year	Gasoline	Percent Increase Over 2000	Diesel	Percent Increase Over 2000	Total	Percent Increase over 2000
2000	19,285.06	--	3,404.59	--	22,689.65	--
2030 (no RTP)	25,038.86	32%	6,397.25	92%	31,436.11	41%
2030 (with 2004 RTP)	23,354.77	23%	6,574.61	97%	29,929.38	24%

Source: SCAG, 2005

Implementation of the 2007 AQMP is expected to result in a decrease in the future increased demand for petroleum fuels[1] (i.e., diesel, distillate, residual oil, and gasoline) due to mobile source control measures (Tables 4.2-4 and 4.2-5), as well as a potential increase in engine efficiency associated with the retrofit of new engines. Control measures that are expected to result in a decrease in the demand for petroleum fuels include control measures that would result in the installation of new engines in mobile sources, which tend to be more fuel efficient, result in the use of alternative fuels, or result in an increase in electrification of sources, which would eliminate the use of petroleum fuels in the source. Control Measure SCONRD-01 is expected to encourage the introduction of about 2.5 million partial zero emitting vehicles which would be expected to result in a substantial decrease in petroleum fuel use. The estimated reduction in gasoline use is shown in Table 4.2-6. Control measure ARB-ONRD-04/SCONRD-03 is expected to replace about 12,000 heavy- and medium-duty diesel engines. ARB-ONRD-04/SCONRD-03 envisions that half of the truck replacements would be diesel-powered and the remaining half powered by natural gas. Control measure ARB-ONRD-04/SCONRD-03 would result in the reduction of about 122,790 gallons of diesel per year by 2020 (see Table 4.2-6). Further, new engines are generally more fuel efficient than older engines, thus, ARB-ONRD-04/SCONRD-03 would be expected to result in additional reductions in diesel fuel use. Other control measures that are expected to result in a decrease in petroleum fuel use include ARB-OFFRD-03 (use shore-side power or other alternative technology for marine vessels at berth), and SCOFFRD-04 (electrify airport ground support equipment). Specific reduction in fuel use from these three control measures, however, is not known at this time.

Several of the control measures for sources under state and federal jurisdiction are expected to result in the installation of retrofit equipment (catalysts, PM traps, etc.) on mobile sources including MOB-03, MOB-04, ARB-ONRD-04/SCONRD-03 (retrofit about 20,000 heavy-duty vehicles), and ARB-ONRD-05/SCONRD-04. An increase in the use of add-on control equipment associated with mobile sources could result in an increase in the use of petroleum fuels because add-on control devices, such as diesel particulate filters, SCRs, catalytic controls,

[1] Petroleum fuels include reformulated petroleum fuels (e.g., emulsified diesel fuels, reformulated gasoline, etc.) as they are predominately comprised of petroleum fuels.

etc., generally result in a decrease in engine efficiency. The amount of additional fuel that would be required would be dependent on the type of control equipment installed and the energy requirement to operate the equipment.

TABLE 4.2-6

Estimated Reduction in Petroleum Fuels Associated with 2007 AQMP Control Measures (gallons per year)(1)

Control Measure	2014	2020
SCONRD-01 – Accelerated Penetration of Partial Zero-Emission Vehicles (2.5 million vehicles)	4,102,150(2)	4,204,230(2)
ARB-ONRD-04/SCONRD-03 – Emission Reductions from Heavy Duty Vehicles (6,000 vehicles)	118,610(3)	122,790(3)

(1) Based on EMFAC2007 Model.
(2) Estimated reduction in gasoline use per year.
(3) Estimated reduction in diesel fuel use per year.

Some of the control measures for sources under state and federal jurisdiction are also expected to result in either the installation of retrofit equipment (catalysts, PM traps, etc.) or engine replacement including ARB-ONRD-05/SCONRD-04, ARB-OFFRD-04/SCOFFRD-01, ARB-OFFRD-02/SCOFFRD-03, and SCOFFRD-02. These control measures would be expected to result in both reductions as well as increases in petroleum fuel use. The portions of the fleet that would be retrofitted with control equipment could require additional petroleum fuels due to the potential decrease in engine efficiency. However, the portions of the fleet that would have new engines installed would be expected to result in an increase in engine efficiency and decrease in fuel use, the amount of which is currently unknown.

There is also the possibility that specifications for reformulated fuels, (e.g., CARB Phase 3 gasoline) could result in a slight decrease in the fuel efficiency for some vehicles and have an adverse impact on energy demand. The specifications for such fuels have not been developed so the magnitude of this impact is not currently known. Reformulation of fuels has lead to a general decrease in fuel efficiency of about two to three percent (Kortum, et al.).

Emissions from mobile sources are the largest contributors to emissions in the district. Overall, implementation of the 2007 AQMP is expected to result in a large reduction in emissions from mobile sources. Many of the emission reductions associated with the 2007 AQMP are expected to come from mobile sources. In order to achieve the necessary emission reductions, it is expected that a reduction in the use of petroleum fuels would be necessary. Therefore, overall the 2007 AQMP is expected to result in a reduction in the use of gasoline and diesel fuels, because of requirements resulting in higher energy efficiencies or displacement by alternative clean fuels. The largest reductions in use of petroleum-based fuels are expected from the on-road mobile source sector switching to electricity or alternative clean fuels. For on-road mobile sources, the combination of fleet standards for both light- and heavy-duty vehicles, as well as trip reduction measures, produce these large reductions in the use of petroleum-based fuels (see

Tables 4.2-4 and 4.2-6). Therefore, implementation of the 2007 AQMP is not expected to result in a significant increase on petroleum fuel use.

PROJECT SPECIFIC MITIGATION MEASURE: No significant impacts on petroleum fuels associated with the 2007 AQMP were identified because of anticipated reduction in future demand so that no mitigation measures are required.

4.2.4.4 Alternative Fuels

The 2007 AQMP continues to call for progressively lower vehicle emissions through the lowering of vehicle emission standards. These proposed control measures for on- and off-road mobile sources are expected to cause a shift from conventional petroleum fuels to alternative fuels such as CNG and hydrogen. (Please note that the impacts associated with reformulated petroleum fuels, e.g., emulsified diesel fuels and reformulated fuels, are included under the discussion of petroleum fuels as they are predominately comprised of petroleum-based fuels.) Control measures that are expected to increase the use of alternative fuels includes MOB-04, SCFUEL-02, ARB-ONRD-04/SCONRD-03, ARB-ONRD-04/SCONRD-03, ARB-OFFRD-04/SCOFFRD-01, SCOFFRD-02, and SCLTM-02.

The use of alternative fuels in California's transportation energy market continues at a gradual pace, but could be limited by a variety of market and regulatory uncertainties. Continuing progress in reducing new gasoline vehicle emissions is having an important effect on auto industry development and marketing of alternative fuel vehicles. The use of cleaner-burning alternative fuels such as CNG is not receiving as much emphasis in light-duty vehicle emission-reducing strategies as previously expected. The combination of gasoline reformulation and advances in automotive emission control technology appears to be making the exhaust emission levels required by California's low-emission vehicle standards achievable without relying on the use of alternative fuels. Therefore, the demand for alternative fuels would depend on their marketing strategies and the development of infrastructure to affect consumer choice.

There is growing interest and financial support for the use of hydrogen-powered fuel cells to power cars, trucks, homes and business. Hydrogen vehicles in California consist of demonstration fuel cell passenger cars, internal combustion engine passenger cars, fuel cell buses, and hybrid fuel cell buses. The California Fuel Cell Partnership, a public-private partnership between interested industry and state and local government agencies, has been leading the coordination of fuel cell vehicle demonstrations in California. To date, 134 light-duty fuel cell vehicles have been placed on California's roads in demonstration projects. Hydrogen fuel use in California is summarized in Table 4.2-7.

Hydrogen fuel cells are proven technology, but more work is needed to make them cost-effective for use in cars, trucks, homes or businesses. Hydrogen fuel cells create electricity to power cars with minimal pollution. California is developing the infrastructure of a hydrogen highway, a three-phase strategy with the first phase to be completed by 2010 and future phases as needs dictate. The first hydrogen station was opened on April 20, 2004. There are now 33 existing hydrogen fueling stations. By 2010, the plan is to have 170 fueling stations or a station every 20 miles along major federal and state highways across the state. While hydrogen fuel cell

technology is promising, its use in the future is dependent on many things (cost-effectiveness of the technology, availability of hydrogen, etc.), so that the extent to which it may be used in the future is currently unknown.

TABLE 4.2-7

Hydrogen Transportation Fuel Use in California

Number of hydrogen vehicles (2006)	160
Fraction of on-road population	0
Light duty vehicle models offered (2006)	1
Light duty vehicle engines certified (2006)	1
Hydrogen stations, total	33
Hydrogen stations with public access	5
Hydrogen dispensed, million kilograms	0.02
Petroleum fuel fraction	0.0001

Source: CEC, 2006r

One of the goals of the 2007 AQMP is to shift from conventional petroleum based fuels to less polluting alternative transportation fuels, including hydrogen. Although an increase in hydrogen as a transportation fuel is expected, this increase is not expected to be significant since hydrogen is available or the feedstock (natural gas) that produces the hydrogen is generally available. Future demand could be met through increased production. The energy impacts associated with the future use of hydrogen fuels are expected to be less than the current strategy that uses predominately petroleum-based fuels so that no significant impacts on alternative fuels are expected.

PROJECT-SPECIFIC MITIGATION: No significant impacts on alternative fuels are expected so that no mitigation measures are expected.

4.2.5 SUMMARY OF ENERGY IMPACTS

The following is the summary of the conclusions of the analysis of energy impacts associated with implementation of the 2007 AQMP.

- Electricity: The increase in electricity associated with the control measures and strategies in the 2007 AQMP is considered to be less than significant. While there may be an increase in electricity associated with the 2007 AQMP control measures, the overall increase in electricity is expected to be less than significant as compared to the overall electrical use in the district. No significant impacts are expected due to increased electricity demand.

- Natural Gas: The energy impacts associated with implementation of the control measures and strategies in the 2007 AQMP are expected to result in an increase in natural gas demand. The increased demand for natural gas is considered to be less than significant. In addition, sufficient natural gas resources are available so that no significant impacts associated with natural gas resources are expected.

- Petroleum Fuels: The energy impacts associated with implementation of the control measures and strategies in the 2007 AQMP are expected to result in a reduction in use (less demand) of petroleum fuels so that no significant impacts on petroleum fuels are expected.

- Alternative Fuels: Although an increase in demand for hydrogen as a transportation fuel is expected due to implementation of the control measures and strategies in the 2007 AQMP, this increase is not expected to be significant since hydrogen is available or the feedstock that produces it is generally available. Future demand is expected be met through increased production. The energy impacts associated with the future use of hydrogen is expected to be less than the current strategy that uses predominately petroleum based fuels so that no significant hydrogen demand impacts on are expected.