3.4 Energy, Greenhouse Gases, and Climate Change

Environmental Setting

PHYSICAL SETTING

Energy

In the United States, California is the second largest consumer of energy, second only to Texas. However, California's per capita energy consumption is relatively low, in part due to mild weather that reduces energy demand for heating and cooling, and in part due to the state government's energy efficiency programs and standards. Petroleum and natural gas currently supply the majority of the energy consumed in California.

The concept of energy security is based on sensitivity to limited supplies, uneven distribution, and rising costs of fossil fuels such as petroleum and gas. Energy insecurity is most frequently described in terms of U.S. vulnerability to the political or social upheaval in energy-producing countries, as well as U.S. vulnerability to attacks on energy distribution infrastructure, accidents, and natural disasters. Increasing energy security can be achieved through efforts to decrease demand for energy overall, decrease demand for energy that is supplied by less politically stable nations, increase the resiliency of our national infrastructure, and increase supply of more sustainable and stable energy sources.

The concept of sustainable energy generally refers to renewable energy sources, such as solar power, wind power, wave power, geothermal power, tidal power and biomass, as well as technologies that improve energy efficiency. Energy conservation refers to efforts made to reduce energy consumption in order to preserve future resource capacities and reduce pollutants. Energy conservation can be achieved through increased energy efficiency, decreased energy consumption, and/or reduced consumption from conventional, nonrenewable energy sources.

State Energy Conditions

Electricity

In 2010, California used over 272,300 gigawatt-hours of electricity[1]. Electricity use in California for differing land uses varies substantially by the type of uses in a building, type of construction materials used in a building, and the efficiency of all electricity-consuming devices within a building.

Because of the state's energy efficiency standards and efficiency and conservation programs, California's per capita electricity use has remained stable for more than 30 years while the national average has steadily increased. The California Energy Commission's (CEC's) 2011 Integrated Energy Policy Report estimates that electricity consumption will grow by up to 1.67 percent per year between 2010 and 2020, with peak demand growing an average of 1.76 percent annually over the same period.[2]

Of California's electricity generation, the majority is from natural gas (50 percent), hydroelectric power production (20 percent), and nuclear power plants (17 percent). Other sources include coal-fired power plants and other renewable energy sources, such as solar panels. California also imports electricity from out of state.[3]

Natural Gas

In 2010, California used approximately 2.3 trillion cubic feet of natural gas[4]. California is the second largest natural gas consumer in the United States, representing more than 10 percent of national natural gas consumption. In 2010, residential and commercial uses accounted for 33 percent of the state's natural gas demand. Large consumers such as electricity generators and the industrial sector accounted for about 63 percent of demand. Vehicle fuel amounted to 1 percent of natural gas usage in the state. California remains heavily dependent on natural gas to generate electricity, which accounted for more than 30 percent of natural gas demand in 2010.[5]

The CEC's 2011 Integrated Energy Policy Report forecasts that natural gas consumption by end users (excluding electricity generation) is expected to grow by up to .89 percent annually through 2020.[6]

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[1] CEC (California Energy Commission). 2011. *2011 Integrated Energy Policy Report.* Publication No. CEC-100-2011-001-CMF. http://www.energy.ca.gov/2011publications/CEC-100-2011-001/CEC-100-2011-001-CMF.pdf

[2] *Ibid.*

[3] U.S. Department of Energy. 2012. "U.S. States – California." U.S. Energy Information Administration, Independent Statistics & Analysis. Accessed October 31, 2012. http://www.eia.gov/beta/state/data.cfm?sid=CA.

[4] *Ibid.*

[5] *Ibid.*

[6] CEC (California Energy Commission). 2011. *2011 Integrated Energy Policy Report.* Publication No. CEC-100-2011-001-CMF. http://www.energy.ca.gov/2011publications/CEC-100-2011-001/CEC-100-2011-001-CMF.pdf

Petroleum

In 2010, California used approximately 653.3 million barrels of petroleum[7]. Petroleum use in California includes petroleum products such as motor gasoline, distillate fuel, liquefied petroleum gases, and jet fuel.[8]

According to the CEC's 2012 Integrated Energy Policy Report, due to the prevalence of petroleum products use in the transportation sector, the rise in costs of these fuels, the federal Renewable Fuel Standard (RFS), and the California Low Carbon Fuel Standard (LCFS), California is diversifying its transportation fuel sources, increasing fuel efficiency, and changing land use and urban design to reduce the needs for transportation.[9]

Regional and Local Energy Conditions

The San Diego Association of Governments' (SANDAG's) 2009 Regional Energy Strategy (RES) identified the existing energy conditions and future projects of the region, outlining energy goals for the region with specific early implementation actions:

1. Pursue a comprehensive building retrofit program to improve efficiency and install renewable energy systems;

2. Create financing programs to pay for projects and improvements that save energy;

3. Utilize the SANDAG–SDG&E (San Diego Gas & Electric) Local Government Partnership to implement the RES at the local level. SANDAG will work with local governments to identify opportunities and implement energy savings at government facilities and throughout their communities;

4. Support land use and transportation planning strategies that reduce energy use and greenhouse gas (GHG) emissions;

5. Support planning of electric charging and alternative fueling infrastructure throughout the region; and

6. Support use of existing unused reclaimed water to decrease the amount of energy needed to meet the water needs of the San Diego region.

The goals and recommended actions of the RES will help the San Diego region meet its energy needs while making substantial progress on a path to a low carbon energy future. The RES identifies actions that can improve air quality, reduce traffic congestion, save money, create jobs,

[7] U.S. Department of Energy. 2012. "U.S. States – California." U.S. Energy Information Administration, Independent Statistics & Analysis. Accessed October 31, 2012. http://www.eia.gov/beta/state/data.cfm?sid=CA.

[8] *Ibid.*

[9] CEC. 2012. 2012 Integrated Energy Policy Report Update. Publication No. CEC-100-2011-001-CMF. http://www.energy.ca.gov/2012publications/CEC-100-2012-001/CEC-100-2012-001-CMF.pdf.

increase the use of alternative fuels, expand transportation alternatives, ensure an adequate energy supply to meet growth projections, and improve the region's quality of life.[10]

The Carlsbad Community Vision targets a few specific sustainable energy approaches of particular interest to the city: renewable resources, energy efficiency, conservation, and technological and business partnerships that would contribute to greater energy self-sufficiency in the region. The city's current energy security efforts include:

- **Pre-plumb for Solar Water Heating.** The City of Carlsbad requires all new residential units to include plumbing specifically designed to allow the later installation of a system that utilizes solar energy as the primary means of heating domestic potable water. (City of Carlsbad Building Code 18.30.020)
- **Efficient Street Lights.** In 2010 and 2011, the city replaced the high-pressure sodium street lights with energy-saving, high efficiency induction lamps. The new lamps use 60 percent less energy and save city taxpayers as estimated $300,000 a year in energy and maintenance costs.
- **Hydroelectric Power.** The city is preparing to install a hydroelectric power-generating facility at Maerkle Reservoir that will generate about two-million kilowatt hours of electricity per year—or 125 percent of the Carlsbad Municipal Water District's annual consumption of electricity.
- **Solar Power.** The city has installed solar heating for the Alga Norte Community Park aquatics center, and is also investigating the use of photovoltaic panels and electric vehicle charging stations at the new park.
- **Hybrid Vehicles.** Hybrid vehicles are used for 15 percent of the city's fleet. In recent years, the city has procured several hybrid vehicles as new or replacement units for the fleet. The current fleet includes Toyota Prius, Honda Civic, and Ford Escape hybrid vehicles. Procurement of hybrid vehicles is recommended in those cases where it makes economic and operational sense for the city.
- **Favorable Financing for Energy Improvements.** Property owners within Carlsbad are eligible to participate in Property Assessed Clean Energy (PACE) programs. PACE programs allow the financing of renewable energy, energy efficiency or water conservation projects through a voluntary assessment on their tax bill. The CaliforniaFIRST program is available for commercial/industrial property owners and the California HERO and Figtree PACE programs are available for both residential and commercial/industrial property owners.

[10] SANDAG (San Diego Association of Governments). 2009. Regional Energy Strategy for the San Diego Region. December 2009. http://www.sandag.org/uploads/publicationid/publicationid_1476_10631.pdf

- **Construction of Energy-Efficient Civic Facilities.** Carlsbad City Council Policy 71 declares that the city's goal is that, "whenever practicable, and within a reasonable cost/benefit ratio, new facilities will be designed to be at least 25 percent more energy efficient than required by the State of California, Title 24 Energy Regulations." The policy calls for new city facilities to strive for Leadership in Energy and Environmental Design (LEED) "Silver" certification or its equivalent and to generate a minimum of 10 percent of its energy demand on site, whenever practicable and within a reasonable cost/benefit ratio.
- **Energy Management.** The city is participating in the Sustainable Region Program with SANDAG, the California Center for Sustainable Energy (CCSE), and SDG&E to develop energy management plans and implement cost-saving energy measures for municipal facilities.

Greenhouse Gas Emissions

The Greenhouse Effect and Greenhouse Gases

Climate change refers to any significant change in measures of climate, such as temperature, precipitation, or wind, lasting for an extended period (decades or longer).

Gases that trap heat in the atmosphere are often called "greenhouse gases" (GHGs). The greenhouse effect traps heat in the troposphere through a threefold process as follows: Short-wave radiation emitted by the Sun is absorbed by the Earth; the Earth emits a portion of this energy in the form of long-wave radiation; and GHGs in the upper atmosphere absorb this long-wave radiation and emit it into space and toward the Earth. This "trapping" of the long-wave (thermal) radiation emitted back toward the Earth is the underlying process of the greenhouse effect. Principal GHGs include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), ozone (O_3), and water vapor (H_2O). Some GHGs, such as CO_2, CH_4, and N_2O, occur naturally and are emitted to the atmosphere through natural processes and human activities. Of these gases, CO_2 and CH_4 are emitted in the greatest quantities from human activities. Emissions of CO_2 are largely by-products of fossil fuel combustion, whereas CH_4 results mostly from off-gassing associated with agricultural practices and landfills. Man-made GHGs, which have a much greater heat-absorption potential than CO_2, include fluorinated gases, such as hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF_6), and nitrogen trifluoride (NF_3), which are associated with certain industrial products and processes.[11]

The greenhouse effect is a natural process that contributes to regulating the Earth's temperature. Without it, the temperature of the Earth would be about 0° Fahrenheit (F) (−18° Celsius (C))

[11] CAT (Climate Action Team). 2006. *Climate Action Team Report to Governor Schwarzenegger and the Legislature.* California Environmental Protection Agency, California Climate Action Team. March 2006. http://www.climatechange.ca.gov/climate_action_team/reports/2006report/2006-04-03_FINAL_CAT_REPORT.PDF

instead of its present 57°F (14°C). Global climate change concerns are focused on whether human activities are leading to an enhancement of the greenhouse effect.[12]

The effect each GHG has on climate change is measured as a combination of the mass of its emissions and the potential of a gas or aerosol to trap heat in the atmosphere, known as its "global warming potential" (GWP). GWP varies between GHGs; for example, the GWP of CH_4 is 21, and the GWP of N_2O is 310. Total GHG emissions are expressed as a function of how much warming would be caused by the same mass of CO_2. GHG gas emissions are typically measured in terms of pounds or tons of "CO_2 equivalent" (CO_2e).[13]

Contributions to Greenhouse Gas Emissions

In 2010, the United States produced 6,822 million metric tons of CO_2e ($MMTCO_2e$).[14] The primary GHG emitted by human activities in the United States was CO_2, representing approximately 84 percent of total GHG emissions. The largest source of CO_2, and of overall GHG emissions, was fossil-fuel combustion, which accounted for approximately 94 percent of the CO_2 emissions and 78 percent of overall GHG emissions.

According to the 2009 GHG inventory data compiled by the California Air Resources Board (CARB) for the California Greenhouse Gas Inventory for 2000–2009, California emitted 457 $MMTCO_2e$ of GHGs, including emissions resulting from out-of-state electrical generation.[15] The primary contributors to GHG emissions in California are transportation, electric power production from both in-state and out-of-state sources, industry, agriculture and forestry, and other sources, which include commercial and residential activities. These primary contributors to California's GHG emissions and their relative contributions in 2009 are presented in Table 3.4-1, GHG Sources in California.

[12] NCDC (National Climatic Data Center). 2009. "Global Warming Frequently Asked Questions." http://lwf.ncdc.noaa.gov/oa/climate/globalwarming.html.

[13] The CO_2 equivalent for a gas is derived by multiplying the mass of the gas by the associated GWP, such that $MTCO_2e$ = (metric tons of a GHG) x (GWP of the GHG). For example, the GWP for CH_4 is 21. This means that emissions of 1 metric ton of methane are equivalent to emissions of 21 metric tons of CO_2.

[14] EPA. 2012. *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2010*. EPA 430-R-12-001. Washington, D.C.: EPA. April 15, 2012. http://www.epa.gov/climatechange/emissions/usinventoryreport.html.

[15] CARB. 2011. "California Greenhouse Gas Inventory for 2000–2008 – by Category as Defined in the Scoping Plan." October 26, 2011. Accessed September 2012. http://www.arb.ca.gov/cc/inventory/data/tables/ghg_inventory_scopingplan_00-09_2011-10-26.pdf.

Table 3.4-1: GHG Sources in California

Source Category	*Annual GHG Emissions ($MMTCO_2e$)*	*Percent of Total*
Agriculture	32.13	7.03 percent
Commercial and residential	42.95	9.40 percent
Electricity generation	103.58[a]	22.68 percent
Forestry (excluding sinks)	0.19	0.04 percent
Industrial uses	81.36	17.81 percent
Recycling and waste	7.32	1.60 percent
Transportation	172.92	37.86 percent
High-GWP substances	16.32	3.57 percent
Totals	**456.77**	**100.00 percent**

Note: Includes emissions associated with imported electricity, which account for 48.05 MMT CO_2e annually.

Source: CARB 2011.

City of Carlsbad GHG Emissions

The City of Carlsbad conducted a Greenhouse Gas Emissions Inventory of community emissions for 2011 in its 2013 Draft Climate Action Plan. The Carlsbad community emitted approximately 705,744 metric tons CO_2e ($MTCO_2e$) in 2011. As shown in Table 3.4-2 below, the transportation sector was the largest source of emissions, generating approximately 273,745 $MTCO_2e$, or 39 percent of total 2011 emissions. Transportation sector emissions are the result of diesel and gasoline combustion in vehicles traveling on both local roads and state highways that pass through the jurisdictional boundaries of Carlsbad. Electricity and natural gas consumption within the commercial and industrial sector, the second greatest source of 2011 emissions, generated 224,960 $MTCO_2e$, or 32 percent of the total. Similarly, electricity and natural gas use in Carlsbad's residential sector produced 176,405 $MTCO_2e$, or 25 percent of total community emissions. The remaining 4 percent (30,634 $MTCO_2e$) are estimated emissions from the solid waste and wastewater sectors.

Table 3.4-2: 2011 Community GHG Emissions Summary by Sector

Sector	*Greenhouse Gas Emissions ($MTCO_2e$)*
Transportation	273,745
Commercial	178,712
Residential	176,405
Industrial	46,248
Solid Waste	24,317
Wastewater	6,317
Total	**705,744**

Source: Draft Carlsbad Climate Action Plan, 2014.

Climate Change

Climate change refers to a change in the average global climate that may be measured by wind patterns, storms, precipitation, and temperature. The term climate change is often used interchangeably with the term global warming. Global warming refers to an average increase in the temperature of the atmosphere near the Earth's surface, which can contribute to changes in global climate patterns. However, rising temperatures are just one aspect of climate change.[16]

The U.S. Environmental Protection Agency's (EPA's) indicators of climate change include:

- ***Greenhouse Gases:*** the amount of GHGs emitted into the atmosphere through human activities, the concentrations of these gases in the atmosphere, and how emissions and concentrations have changed over time.
- ***Weather and Climate:*** frequency of heat waves, increased drought conditions, increased average precipitation and shifting weather patterns, and the intensity of tropical storms.
- ***Oceans:*** increased ocean heat affecting water temperature, sea level, and currents; changes in sea level; increased ocean acidity affecting marine organisms.
- ***Snow and Ice:*** reduced Arctic sea ice, diminished glaciers, decreased time that lakes stay frozen, decreased snow cover and snowpack.
- ***Society and Ecosystems:*** heat-related illnesses, increased length of growing season reflecting earlier spring warming and later fall/winter frosts, shifts in plant hardiness zones reflecting higher winter temperatures, changes in bird migration patterns as a result of temperature variability.

Potential Effects of Human Activity on Climate Change

Among scientists, global climate change is now a widely accepted phenomenon. National and international science academies and scientific societies have assessed the available evidence and largely followed or endorsed the Intergovernmental Panel on Climate Change (IPCC) position of January 2001 which states: "An increasing body of observations gives a collective picture of a warming world and other changes in the climate system . . . There is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities." To date, no scientific body of national or international standing has maintained a dissenting opinion; the last was the American Association of Petroleum Geologists, which in 2007 updated its 1999 statement rejecting the likelihood of human influence on recent climate with its current noncommittal position.

[16] EPA (U.S. Environmental Protection Agency). 2010. *EPA and NHTSA Finalize Historic National Program to Reduce Greenhouse Gases and Improve Fuel Economy for Cars and Trucks*. Regulatory Announcement. Office of Transportation and Air Quality. EPA-420-F-10-014. April. http://www.epa.gov/oms/climate/regulations/420f10014.pdf.

According to CARB, some of the potential impacts in California of global warming may include loss in snow pack, sea level rise, more extreme heat days per year, more high O_3 days, more large forest fires, and more drought years.[17] Several recent studies have attempted to explore the possible negative consequences that climate change, left unchecked, could have in California. These reports acknowledge that climate scientists' understanding of the complex global climate system, and the interplay of the various internal and external factors that affect climate change, remains too limited to yield scientifically valid conclusions on such a localized scale. Substantial work has been done at the international and national level to evaluate climatic impacts, but far less information is available on regional and local impacts.

The primary effect of global climate change has been a rise in average global tropospheric temperature of 0.2°C per decade, determined from meteorological measurements worldwide between 1990 and 2005. Climate change modeling using 2000 emission rates shows that further warming would occur, which would induce further changes in the global climate system during the current century. Changes to the global climate system and ecosystems and to California would include, but would not be limited to:

- The loss of sea ice and mountain snowpack resulting in higher sea levels and higher sea surface evaporation rates with a corresponding increase in tropospheric water vapor due to the atmosphere's ability to hold more water vapor at higher temperatures.[18]
- A rise in global average sea level primarily due to thermal expansion and melting of glaciers and ice caps and the Greenland and Antarctic ice sheets.[19]
- Changes in weather that includes widespread changes in precipitation, ocean salinity, and wind patterns, and more energetic aspects of extreme weather including droughts, heavy precipitation, heat waves, extreme cold, and the intensity of tropical cyclones.[20]
- A decline of Sierra mountain range snowpack, which accounts for approximately half of the surface water storage in California, by 70 percent to as much as 90 percent over the next 100 years.[21]

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[17] CARB (California Air Resources Board). 2006. Public Workshop to Discuss Establishing the 1990 Emissions Level and the California 2020 Limit and Developing Regulations to Require Reporting of Greenhouse Gas Emissions. Sacramento, California. December 1, 2006. http://www.arb.ca.gov/cc/inventory/meet/2006_12_01_presentation_intro.pdf.

[18] IPCC (Intergovernmental Panel on Climate Change). 2007. "Summary for Policy Makers." In *Climate Change 2007: The Physical Science Basis*, eds. S. Solomon, D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller, 1–18. A report of Working Group I of the Intergovernmental Panel on Climate Change. New York, New York: Cambridge University Press. Accessed April 2011. http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-spm.pdf.

[19] *Ibid.*

[20] *Ibid.*

[21] CAT (Climate Action Team). 2006. Climate Action Team Report to Governor Schwarzenegger and the Legislature. California Environmental Protection Agency, California Climate Action Team. March 2006.

- An increase in the number of days conducive to O_3 formation by 25 percent to 85 percent (depending on the future temperature scenario) in high O_3 areas of Los Angeles and the San Joaquin Valley by the end of the 21st century.[22]
- High potential for erosion of California's coastlines and seawater intrusion into the Delta and levee systems due to the rise in sea level.[23]

REGULATORY SETTING

Federal Regulations

Federal Energy Policy and Conservation Act

In 1975, Congress enacted the Federal Energy Policy and Conservation Act, which established the first fuel economy standards for on-road motor vehicles in the United States. Pursuant to the act, the National Highway Traffic Safety Administration (NHTSA) is responsible for establishing additional vehicle standards. In 2012, new fuel economy standards were approved for model year 2017 passenger cars and light-duty trucks at 54.5 miles per gallon (mpg).[24] Fuel economy is determined based on each manufacturer's average fuel economy for the fleet of vehicles available for sale in the United States.

Corporate Average Fuel Economy Standards

Corporate Average Fuel Economy (CAFE) Standards were first enacted by U.S. Congress in 1975 with the purpose of reducing energy consumption by increasing the fuel economy of cars and light-duty trucks. In August 2012, the standard was raised to increase fuel economy to the equivalent of 54.5 mpg for cars and light-duty trucks by model year 2025, which was previously set at 35.5 mpg by 2016.[25]

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http://www.climatechange.ca.gov/climate_action_team/reports/2006report/2006-04-03_FINAL_CAT_REPORT.PDF

[22] *Ibid.*

[23] *Ibid.*

[24] EPA and NHTSA. 2012. *2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards*. EPA–HQ–OAR–2010–0799, NHTSA-2010-0131. http://www.gpo.gov/fdsys/pkg/FR-2012-10-15/pdf/2012-21972.pdf

[25] NHTSA (National Highway Traffic Safety Administration). 2012. "Obama Administration Finalizes Historic 54.5 mpg Fuel Efficiency Standards. August 28, 2012. http://www.nhtsa.gov/About+NHTSA/Press+Releases/2012/Obama+Administration+Finalizes+Historic+54.5+mpg+Fuel+Efficiency+Standards.

Energy Improvement and Extension Act of 2008

Formerly known as the Renewable Energy and Job Creation Act of 2008, passed under the Bush Administration, the Energy Improvement and Extension Act of 2008 amends the Internal Revenue Code to extend and modify expiring provisions related to energy production and conservation and to provide revenue enhancements.

Energy Star Program

Energy Star is a joint program of the U.S. EPA and the DOE. The program establishes criteria for energy efficiency for household products and labels energy efficient products with the Energy Star seal. Homes can be qualified as "Energy Star Homes" if they meet efficiency standards. In California, Energy Star Homes must use at least 15 percent less energy than standards set by Title 24 (whose standards are now more stringent than ever, see below), pass the California Energy Star Homes Quality Insulation Installation and Thermal Bypass Checklist Procedures, have Energy Star windows, and have minimal duct leakage.

Massachusetts vs. EPA

On April 2, 2007, in Massachusetts v. EPA, the U.S. Supreme Court directed the U.S.EPA Administrator to determine whether GHG emissions from new motor vehicles cause or contribute to air pollution that may reasonably be anticipated to endanger public health or welfare, or whether the science is too uncertain to make a reasoned decision. In making these decisions, the U.S. EPA Administrator is required to follow the language of Section 202(a) of the Clean Air Act (CAA). On December 7, 2009, the Administrator signed a final rule with two distinct findings regarding GHGs under Section 202(a) of the CAA:

- The Administrator found that elevated concentrations of GHGs—CO_2, CH_4, N_2O, HFCs, PFCs, and SF_6—in the atmosphere threaten the public health and welfare of current and future generations. This is referred to as the "endangerment finding."
- The Administrator further found the combined emissions of GHGs—CO_2, CH_4, N_2O, and HFCs—from new motor vehicles and new motor vehicle engines contribute to the GHG air pollution that endangers public health and welfare. This is referred to as the "cause or contribute finding."

These two findings were necessary to establish the foundation for regulation of GHGs from new motor vehicles as air pollutants under the CAA.

Energy Independence and Security Act

On December 19, 2007, the Energy Independence and Security Act of 2007 (EISA) was signed into law. In addition to setting increased CAFE standards for motor vehicles, the EISA includes other provisions related to energy efficiency:

- Renewable Fuel Standard (RFS) (EISA Section 202)
- Appliance and Lighting Efficiency Standards (EISA Sections 301–325)

- Building Energy Efficiency (EISA Sections 411–441).

This federal legislation requires ever-increasing levels of renewable fuels—the RFS—to replace petroleum. The U.S. EPA is responsible for developing and implementing regulations to ensure that transportation fuel sold in the United States contains a minimum volume of renewable fuel. The RFS program regulations were developed in collaboration with refiners, renewable fuel producers, and many other stakeholders.

The RFS program was created under the Energy Policy Act of 2005 and established the first renewable fuel volume mandate in the United States. As required under the act, the original RFS program (RFS1) required 7.5 billion gallons of renewable fuel to be blended into gasoline by 2012. Under the EISA, the RFS program was expanded in several key ways that lay the foundation for achieving significant reductions of GHG emissions from the use of renewable fuels, for reducing imported petroleum, and encouraging the development and expansion of our nation's renewable fuels sector. The updated program is referred to as RFS2 and includes the following:

- EISA expanded the RFS program to include diesel, in addition to gasoline.
- EISA increased the volume of renewable fuel required to be blended into transportation fuel from 9 billion gallons in 2008 to 36 billion gallons by 2022.
- EISA established new categories of renewable fuel and set separate volume requirements for each one.
- EISA required the U.S. EPA to apply lifecycle GHG performance threshold standards to ensure that each category of renewable fuel emits fewer GHGs than the petroleum fuel it replaces.

Additional provisions of the EISA address energy savings in government and public institutions, promoting research for alternative energy, additional research in carbon capture, international energy programs, and the creation of "green jobs."

U.S. EPA and NHTSA Joint Final Rules for Vehicle Standards

On April 1, 2010, the U.S. EPA and NHTSA announced a joint final rule to establish a national program consisting of new standards for light-duty vehicles model years 2012 through 2016. The joint rule is intended to reduce GHG emissions and improve fuel economy. The U.S. EPA finalized the first-ever national GHG emissions standards under the CAA, and NHTSA is finalizing CAFE standards under the Energy Policy and Conservation Act.[26] This final rule follows the U.S. EPA and U.S. Department of Transportation's joint proposal on September 15, 2009, and

[26] EPA (U.S. Environmental Protection Agency). 2010. *EPA and NHTSA Finalize Historic National Program to Reduce Greenhouse Gases and Improve Fuel Economy for Cars and Trucks*. Regulatory Announcement. Office of Transportation and Air Quality. EPA-420-F-10-014. April. http://www.epa.gov/oms/climate/regulations/420f10014.pdf.

is the result of President Obama's May 2009 announcement of a national program to reduce GHGs and improve fuel economy.[27] The final rule became effective on July 6, 2010.[28]

The U.S. EPA GHG standards require new passenger cars, light-duty trucks, and medium-duty passenger vehicles to meet an estimated combined average emissions level of 250 grams of CO_2 per mile in model year 2016, equivalent to 35.5 mpg if the automotive industry were to meet this CO_2 level through fuel economy improvements alone. The CAFE standards for passenger cars and light-duty trucks will be phased in between 2012 and 2016, with the final standards equivalent to 37.8 mpg for passenger cars and 28.8 mpg for light-duty trucks, resulting in an estimated combined average of 34.1 mpg. Together, these standards will cut GHG emissions by an estimated 960 million metric tons and 1.8 billion barrels of oil over the lifetime of the vehicles sold under the program. The rules will simultaneously reduce GHG emissions, improve energy security, increase fuel savings, and provide clarity and predictability for manufacturers (U.S. EPA 2011).

In August 2012, the U.S. EPA and NHTSA approved a second round of GHG and CAFE standards for model years 2017 and beyond (U.S. EPA and NHTSA 2012). These standards will reduce motor vehicle GHG emissions to 163 grams of CO_2 per mile, which is equivalent to 54.5 mpg if this level were achieved solely through improvements in fuel efficiency, for cars and light-duty trucks by model year 2025. A portion of these improvements, however, will likely be made through improvements in air conditioning leakage and through use of alternative refrigerants, which would not contribute to fuel economy. The first phase of the CAFE standards, for model year 2017 to 2021, are projected to require, on an average industry fleet-wide basis, a range from 40.3 to 41.0 mpg in model year 2021. The second phase of the CAFE program, for model years 2022 to 2025, are projected to require, on an average industry fleet-wide basis, a range from 48.7 to 49.7 mpg in model year 2025. The second phase of standards have not been finalized due to the statutory requirement that NHTSA set average fuel economy standards not more than five model years at a time. The regulations also include targeted incentives to encourage early adoption and introduction into the marketplace of advanced technologies to dramatically improve vehicle performance, including:

- Incentives for electric vehicles, plug-in hybrid electric vehicles, and fuel cell vehicles.
- Incentives for hybrid technologies for large pickups and for other technologies that achieve high fuel economy levels on large pickups.
- Incentives for natural gas vehicles.

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[27] EPA. 2011. *Final Rulemaking: Light-Duty Vehicle Greenhouse Gas Emissions Standards and Corporate Average Fuel Economy Standard*s. Regulations and Standards–Vehicles and Engines. Last updated February 2011. http://www.epa.gov/otaq/climate/regulations.htm.

[28] EPA and NHTSA (U.S. Environmental Protection Agency and National Highway Traffic Safety Administration). 2010. *Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards; Final Rule*. EPA–HQ–OAR–2009–0472. NHTSA-2009-0059. Accessed at: http://www.epa.gov/oms/climate/regulations/ldv-ghg-final-rule.pdf

- Credits for technologies with potential to achieve real-world GHG reductions and fuel economy improvements that are not captured by the standards test procedures.

State Regulations

State of California Building Energy Efficiency Standards (Title 24, Part 6)

California's Energy Efficiency Standards for Residential and Nonresidential Buildings (24 California Code of Regulations (CCR) Part 6) were first established in 1978 in response to a legislative mandate to reduce California's energy consumption. The standards are updated periodically to allow consideration and possible incorporation of new energy efficiency technologies and methods. The premise for the standards is that energy efficient buildings require less electricity, natural gas, and other fuels. Electricity production from fossil fuels and on-site fuel combustion (typically for space and water heating) results in GHG emissions.

The CEC adopted new 2008 Building Energy Efficiency Standards effective January 1, 2010. The standards were updated for a number of reasons, including:

- To respond to Assembly Bill 32, the Global Warming Solutions Act of 2006;
- To pursue California energy policy that will establish energy efficiency as the resource of first choice for meeting California's energy needs;
- To act on the findings of California's Integrated Energy Policy Report that indicates standards in general (as opposed to incentives or other mechanisms) are the most cost-effective means to achieve energy efficiency;
- To meet California's commitment to include aggressive energy efficiency measures in updates of state building codes; and
- To meet California's commitment to improve the energy efficiency of nonresidential buildings through aggressive standards.

California Green Building Code

In 2007, Governor Schwarzenegger directed the California Building Standards Commission (CBSC) to work with state agencies on the adoption of green building standards for residential, commercial, and public building construction for the 2010 code adoption process. A voluntary version of the California Green Building Standards Code, referred to as CalGreen, was added to Title 24 as Part 11 in 2009. The 2010 version of CalGreen took effect January 1, 2011, and instituted mandatory minimum environmental performance standards for all ground-up new construction of commercial and low-rise residential buildings, state-owned buildings, schools, and hospitals. It also included voluntary tiers (I and II) with stricter environmental performance standards for these same categories of residential and nonresidential buildings. Local jurisdictions must enforce the minimum mandatory requirements and may also adopt the Green Building Standards with amendments for stricter requirements.

The mandatory standards require:

- 20 percent mandatory reduction in indoor water use relative to specified baseline levels;
- 50 percent construction/demolition waste diverted from landfills;
- Mandatory inspections of energy systems to ensure optimal working efficiency; and
- Requirements for low-pollutant emitting exterior and interior finish materials such as paints, carpets, vinyl flooring, and particleboards.

The voluntary standards include:

- Tier I – 15 percent improvement in energy requirements, stricter water conservation requirements for specific fixtures, 65 percent reduction in construction waste, 10 percent recycled content, 20 percent permeable paving, 20 percent cement reduction, cool/solar reflective roof.
- Tier II – 30 percent improvement in energy requirements, stricter water conservation requirements for specific fixtures, 75 percent reduction in construction waste, 15 percent recycled content, 30 percent permeable paving, 30 percent cement reduction, cool/solar reflective roof.

Similar to the compliance reporting procedure described above for demonstrating energy code compliance in new buildings and major renovations, compliance with the CalGreen water reduction requirements must be demonstrated through completion of water use reporting forms for new low-rise residential and nonresidential buildings. The water use compliance form must demonstrate a 20 percent reduction in indoor water use by either showing a 20 percent reduction in the overall baseline water use as identified in CalGreen or a reduced per-plumbing-fixture water use rate.

The CBSC published an updated 2013 version of CalGreen which was anticipated to come into effect on January 1, 2014. However, on December 18, 2013, the CBSC extended the effective date for only the energy provisions of CalGreen to July 1, 2014, citing delays in development of the 2013 Public Domain Residential and Nonresidential California Building Energy Code Compliance software. All other non-energy related provisions of CalGreen came into effect on January 1, 2014.

A summary of changes to the mandatory standards include:

- Clarifications regarding the mandatory application of CalGreen standards to additions or alterations;
- A new section for water reduction measures, prescriptive reduced flow rates for fixtures, and references to the California Plumbing Code;
- Added requirements for waste reduction and recycling for demolition;

- Added CA Collaborative for High Performance Schools (CA-CHPS) criteria as an approved method of compliance for pollutant control measures regarding resilient flooring;
- Clarifications with respect to Volatile Organic Compound (VOC) emissions limits and testing; and
- Non-residential specific:
- Added CA-CHPS criteria as an approved method of compliance for carpet systems;
- Added new sections for outdoor air quality measures for refrigerants including leakage reduction, meeting the standards of the California Mechanical Code, and use of corrosion-resistant materials.
- Residential specific:
- Expands CalGreen to encompass all low-rise, high-rise, and hotel/motel buildings designated as Group R occupancy; and
- Clarifications of the definition of residential building to include both low- and high-rise buildings.

The above list provides a summary of the changes to the mandatory measures through the adoption of the 2013 CalGreen standards. The full 2013 California Building Standards Code is available through the CBSC.

Assembly Bill 1493

In a response to the transportation sector accounting for more than half of California's CO_2 emissions, Assembly Bill (AB) 1493 was enacted on July 22, 2002. AB 1493 required CARB to set GHG emission standards for passenger vehicles, light-duty trucks, and other vehicles determined by the state board to be vehicles whose primary use is noncommercial personal transportation in the state. The bill required that CARB set GHG emission standards for motor vehicles manufactured in 2009 and all subsequent model years. CARB adopted the standards in September 2004. When fully phased in, the near-term (2009–2012) standards will result in a reduction of about 22 percent in GHG emissions compared to the emissions from the 2002 fleet, while the mid-term (2013–2016) standards will result in a reduction of about 30 percent.

Before these regulations could go into effect, the U.S. EPA had to grant California a waiver under the federal CAA, which ordinarily preempts state regulation of motor vehicle emission standards. The U.S. EPA Administrator granted the waiver on June 30, 2009. On March 29, 2010, the CARB Executive Officer approved revisions to the motor vehicle GHG standards to harmonize the state program with the national program for 2012–2016 model years (see "EPA and NHTSA Joint Final Rule for Vehicle Standards" above). The revised regulations became effective on April 1, 2010.

Executive Order S-3-05

In June 2005, Governor Schwarzenegger established California's GHG emissions reduction targets in Executive Order S-3-05, which are: GHG emissions should be reduced to 2000 levels by

2010; GHG emissions should be reduced to 1990 levels by 2020; and GHG emissions should be reduced to 80 percent below 1990 levels by 2050. The California Environmental Protection Agency (CalEPA) Secretary is required to coordinate efforts of various agencies to collectively and efficiently reduce GHGs. The California Climate Action Team (CAT) is responsible for implementing global warming emissions reduction programs. Representatives from several state agencies comprise the CAT. The CAT fulfilled its report requirements through the March 2006 Climate Action Team Report to the governor and the legislature (CAT 2006). A second biennial report, released in April 2010[29] expands on the policy oriented in the 2006 assessment. The report provides new information and scientific findings regarding the development of new climate and sea-level projections using new information and tools that have recently become available and evaluates climate change within the context of broader social changes, such as land use changes and demographics. The 2009 report also identifies the need for additional research in several different aspects that affect climate change in order to support effective climate change strategies. The aspects of climate change determined to require future research include vehicle and fuel technologies, land use and smart growth, electricity and natural gas, energy efficiency, renewable energy and reduced carbon energy sources, low GHG technologies for other sectors, carbon sequestration, terrestrial sequestration, geologic sequestration, economic impacts and considerations, social science, and environmental justice.

Subsequently, the 2010 *Climate Action Team Report to Governor Schwarzenegger and the California Legislature* (CAT 2010b) reviews past Climate Action Milestones, including voluntary reporting programs, GHG standards for passenger vehicles, the Low Carbon Fuel Standard (LCFS), a statewide renewable energy standard, and the cap-and-trade program. Additionally, the 2010 report includes a cataloguing of recent research and ongoing projects; mitigation and adaptation strategies identified by sector (e.g., agriculture, biodiversity, electricity and natural gas); actions that can be taken at the regional, national, and international levels to mitigate the adverse effects of climate change; and today's outlook on future conditions. The 2010 report also focuses on case studies involving collaborative efforts among multiple agencies on research projects related to climate change and policy development.

AB 32

In furtherance of the goals established in Executive Order S-3-05, the legislature enacted AB 32 (Núñez and Pavley), the California Global Warming Solutions Act of 2006, which Governor Schwarzenegger signed on September 27, 2006. The GHG emissions limit is equivalent to the 1990 levels, which are to be achieved by 2020.

CARB has been assigned to carry out and develop the programs and requirements necessary to achieve the goals of AB 32. Under AB 32, CARB must adopt regulations requiring the reporting

[29] CAT. 2010. *Climate Action Team Biennial Report.* California Environmental Protection Agency, California Climate Action Team. April 2010. http://www.energy.ca.gov/2010publications/CAT-1000-2010-005/CAT-1000-2010-005.PDF

and verification of statewide GHG emissions. This program will be used to monitor and enforce compliance with the established standards. CARB is also required to adopt rules and regulations to achieve the maximum technologically feasible and cost-effective GHG emission reductions. AB 32 allows CARB to adopt market-based compliance mechanisms to meet the specified requirements. Finally, CARB is ultimately responsible for monitoring compliance and enforcing any rule, regulation, order, emission limitation, emission reduction measure, or market-based compliance mechanism adopted.

The first action under AB 32 resulted in the adoption of a report (June 21, 2007) listing early action GHG emission reduction measures. The early actions include three specific GHG control rules that meet the narrow legal definition of "discrete early action GHG reduction measures":

- A low-carbon fuel standard to reduce the "carbon intensity" of California fuels
- Reduction of refrigerant losses from motor vehicle air conditioning system maintenance to restrict the sale of "do-it-yourself" automotive refrigerants
- Increased methane capture from landfills to require broader use of state-of-the-art methane capture technologies.

On October 25, 2007, CARB approved an additional six early action GHG reduction measures under AB 32, which were also considered "discrete early action GHG reduction measures":

- Reduction of aerodynamic drag, and thereby fuel consumption, from existing trucks and trailers through retrofit technology
- Reduction of auxiliary engine emissions of docked ships by requiring port electrification
- Reduction of PFCs from the semiconductor industry
- Reduction of propellants in consumer products (e.g., aerosols, tire inflators, and dust removal products)
- Requirements that all tune-up, smog check, and oil change mechanics ensure proper tire inflation as part of overall service in order to maintain fuel efficiency
- Restriction on the use of SF_6 from non-electricity sectors if viable alternatives are available.

As required under AB 32, on December 6, 2007, CARB approved the 1990 GHG emissions inventory, thereby establishing the emissions limit for 2020. The 2020 emissions limit was set at 427 $MMTCO_2e$. In addition to the 1990 emissions inventory, CARB also adopted regulations requiring mandatory reporting of GHGs for large facilities that account for 94 percent of GHG emissions from industrial and commercial stationary sources in California. About 800 separate sources fall under the new reporting rules and include electricity generating facilities, electricity retail providers and power marketers, oil refineries, hydrogen plants, cement plants, cogeneration facilities, and other industrial sources that emit CO_2 in excess of specified thresholds.

On December 11, 2008, CARB approved the *Climate Change Proposed Scoping Plan: A Framework for Change*[30] to achieve the goals of AB 32. The scoping plan establishes an overall framework for the measures that will be adopted to reduce California's GHG emissions. The scoping plan evaluates opportunities for sector-specific reductions, integrates all CARB and CAT early actions and additional GHG reduction measures by both entities, identifies additional measures to be pursued as regulations, and outlines the role of a cap-and-trade program.

The key elements of the scoping plan include:

- Expanding and strengthening existing energy efficiency programs as well as building and appliance standards
- Achieving a statewide renewables energy mix of 33 percent
- Developing a California cap-and-trade program that links with other Western Climate Initiative partner programs to create a regional market system and caps sources contributing 85 percent of California's GHG emissions
- Establishing targets for transportation-related GHG emissions for regions throughout California, and pursuing policies and incentives to achieve those targets
- Adopting and implementing measures pursuant to existing state laws and policies, including California's clean car standards, goods movement measures, and the LCFS
- Creating targeted fees, including a public goods charge on water use, fees on high GWP gases, and a fee to fund the administrative costs of California's long-term commitment to AB 32 implementation.

Senate Bill 1368

In September 2006, Governor Schwarzenegger signed Senate Bill (SB) 1368, which requires the CEC to develop and adopt regulations for GHG emissions performance standards for the long-term procurement of electricity by local publicly owned utilities. These standards must be consistent with the standards adopted by the California Public Utilities Commission (CPUC). This effort will help protect energy customers from financial risks associated with investments in carbon-intensive generation by allowing new capital investments in power plants whose GHG emissions are as low or lower than new combined-cycle natural gas plants, by requiring imported electricity to meet GHG performance standards in California, and by requiring that the standards be developed and adopted in a public process.

Executive Order S-1-07

Issued on January 18, 2007, Executive Order S 1-07 sets a declining LCFS for GHG emissions measured in CO_2e gram per unit of fuel energy sold in California. The target of the LCFS is to

[30] CARB. 2008. *Climate Change Proposed Scoping Plan: A Framework for Change.* December 2008. Accessed December 9, 2009. http://www.arb.ca.gov/cc/scopingplan/document/adopted_scoping_plan.pdf

reduce the carbon intensity of California passenger vehicle fuels by at least 10 percent by 2020. The carbon intensity measures the amount of GHG emissions in the lifecycle of a fuel, including extraction/feedstock production, processing, transportation, and final consumption, per unit of energy delivered. CARB adopted the implementing regulation in April 2009. The regulation is expected to increase the production of biofuels, including those from alternative sources such as algae, wood, and agricultural waste. In addition, the LCFS would drive the availability of plug-in hybrid, battery electric, and fuel-cell power motor vehicles. The LCFS is anticipated to lead to the replacement of 20 percent of the fuel used in motor vehicles with alternative fuels by 2020.

SB 97

In August 2007, the legislature enacted SB 97 (Dutton), which directs the Governor's Office of Planning and Research (OPR) to develop guidelines under the California Environmental Quality Act (CEQA) for the mitigation of GHG emissions. OPR was to develop proposed guidelines by July 1, 2009, and the Natural Resources Agency was directed to adopt the guidelines by January 1, 2010. On April 13, 2009, OPR submitted to the Secretary for Natural Resources its proposed amendments to the CEQA Guidelines.

On June 19, 2008, OPR issued a technical advisory as interim guidance regarding the analysis of GHG emissions in CEQA documents.[31] The advisory indicated that a project's GHG emissions, including those associated with vehicular traffic, energy consumption, water usage, and construction activities, should be identified and estimated. The advisory further recommended that the lead agency determine significance of the impacts and impose all mitigation measures that are necessary to reduce GHG emissions to a level that is less than significant.

The Natural Resources Agency adopted the CEQA Guidelines amendments on December 30, 2009, and transmitted them to the Office of Administrative Law on December 31, 2009. On February 16, 2010, the Office of Administrative Law completed its review and filed the amendments with the secretary of state. The amendments became effective on March 18, 2010. The amended guidelines establish several new CEQA requirements concerning the analysis of GHGs, including the following:

- Requiring a lead agency to "make a good faith effort, based to the extent possible on scientific and factual data, to describe, calculate or estimate the amount of GHG emissions resulting from a project" (CEQA Section 15064.4(a))
- Providing a lead agency with the discretion to determine whether to use quantitative or qualitative analysis or performance standards to determine the GHG emissions resulting from a particular project (CEQA Section 15064.4(a))

[31] OPR (Governor's Office of Planning and Research). 2008. *CEQA and Climate Change: Addressing Climate Change through California Environmental Quality Act (CEQA) Review*. Technical Advisory. Sacramento, California: OPR. June 19, 2008. Accessed February 3, 2009. http://opr.ca.gov/download.php?dl=ceqa/pdfs/june08-ceqa.pdf.

- Requiring a lead agency to consider the following factors when assessing the significance of impacts from GHG emissions on the environment (CEQA Section 15064.4(b)):
- The extent to which the project may increase or reduce GHG emissions as compared to the existing environmental setting.
- Whether the project emissions exceed a threshold of significance that the lead agency determines applies to the project.
- The extent to which the project complies with regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction or mitigation of GHG emissions.
- Allowing lead agencies to consider feasible means of mitigating the significant effects of GHG emissions, including, among others (CEQA Section 15126.4(c)):
- Measures in an existing plan or program for reduction of emissions that are required as part of the lead agency's decision.
- Reductions in emissions through the implementation of project features or off-site measures, including offsets that are not otherwise required.
- In the case of the adoption of a general plan, mitigation may include the identification of specific measures that may be implemented on a project-by-project basis. Mitigation may also include the incorporation of specific measures or policies found in an adopted ordinance or regulation that reduces the cumulative effect of emissions.

The amended CEQA guidelines also establish two new guidance questions in the Environmental Checklist regarding GHG emissions (CEQA Guidelines Appendix G):

- Would the project generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?
- Would the project conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases?

The adopted amendments do not establish a GHG emission threshold, and instead allow a lead agency to develop, adopt, and apply its own thresholds of significance or those developed by other agencies or experts.[32] The Natural Resources Agency also acknowledges that a lead agency may

[32] "The CEQA Guidelines do not establish thresholds of significance for other potential environmental impacts, and SB 97 did not authorize the development of a statement threshold as part of this CEQA Guidelines update. Rather, the proposed amendments recognize a lead agency's existing authority to develop, adopt and apply their own thresholds of significance or those developed by other agencies or experts" (California Natural Resources Agency 2009, p. 84).

consider compliance with regulations or requirements implementing AB 32 in determining the significance of a project's GHG emissions.[33]

SB 375

In August 2008, the legislature passed and on September 30, 2008, Governor Schwarzenegger signed, SB 375, which addresses GHG emissions associated with the transportation sector through regional transportation and sustainability plans. Regional GHG reduction targets for the automobile and light-duty truck sector for 2020 and 2035, as determined by CARB, are required to consider the emission reductions associated with vehicle emission standards (see SB 1493), the composition of fuels (see Executive Order S-1-07), and other CARB-approved measures to reduce GHG emissions. Regional metropolitan planning organizations (MPOs) will be responsible for preparing a sustainable communities strategy (SCS) within their regional transportation plan (RTP).

The goal of the SCS is to establish a development plan for the region, which, after considering transportation measures and policies, will achieve, if feasible, the GHG reduction targets. If a SCS is unable to achieve the GHG reduction target, an MPO must prepare an alternative planning strategy demonstrating how the GHG reduction target would be achieved through alternative development patterns, infrastructure, or additional transportation measures or policies. SB 375 provides incentives for streamlining CEQA requirements by substantially reducing the requirements for "transit priority projects," as specified in SB 375, and eliminating the analysis of the impacts of certain residential projects on global warming and the growth-inducing impacts of those projects when the projects are consistent with the SCS or alternative planning strategy. On September 23, 2010, CARB adopted the SB 375 targets for the regional MPOs. The targets for SANDAG are a 7 percent reduction in emissions per capita by 2020 and a 13 percent reduction by 2035. Achieving these goals through adoption of a SCS will be the responsibility of the MPOs.

Executive Order S-13-08

Governor Schwarzenegger issued Executive Order S-13-08 on November 14, 2008. The Executive Order is intended to hasten California's response to the impacts of global climate change, particularly sea level rise. It directs state agencies to take specified actions to assess and plan for such impacts. It directs that the California Natural Resources Agency, in cooperation with the California Department of Water Resources, CEC, California's coastal management agencies, and the California Ocean Protection Council, request the National Academy of Sciences to prepare a sea level rise assessment report by December 1, 2010. The California Ocean Protection Council, California Department of Water Resources, and CEC, in cooperation with other state agencies are required to conduct a public workshop to gather information relevant to the sea level rise assessment report. The Business, Transportation, and Housing Agency was ordered to assess,

[33] "A project's compliance with regulations or requirements implementing AB 32 or other laws and policies is not irrelevant. Section 15064.4(b)(3) would allow a lead agency to consider compliance with requirements and regulations in the determination of significance of a project's greenhouse gas emissions" (California Natural Resources Agency 2009, p. 100).

within 90 days of the order, the vulnerability of the state's transportation systems to sea level rise. OPR and the California Natural Resources Agency are required to provide land use planning guidance related to sea level rise and other climate change impacts. The order also requires the other state agencies to develop adaptation strategies by June 9, 2009, to respond to the impacts of global climate change that are predicted to occur over the next 50 to 100 years. A discussion draft adaptation strategies report was released in August 2009, and the final adaption strategies report was issued in December 2009. To assess the state's vulnerability, the report summarizes key climate change impacts to the state for the following areas: public health, ocean and coastal resources, water supply and flood protection, agriculture, forestry, biodiversity and habitat, and transportation and energy infrastructure. The report then recommends strategies and specific responsibilities related to water supply, planning and land use, public health, fire protection, and energy conservation.

Executive Order S-14-08

On November 17, 2008, Governor Schwarzenegger issued Executive Order S-14-08. This Executive Order focuses on the contribution of renewable energy sources to meet the electrical needs of California while reducing the GHG emissions from the electrical sector. The governor's order requires that all retail suppliers of electricity in California serve 33 percent of their load with renewable energy by 2020. Furthermore, the order directs state agencies to take appropriate actions to facilitate reaching this target. The California Natural Resources Agency, through collaboration with the CEC and California Department of Fish and Wildlife (CDFW), is directed to lead this effort. Pursuant to a Memorandum of Understanding between the CEC and the CDFW creating the Renewable Energy Action Team, these agencies will create a "one-stop" process for permitting renewable energy power plants.

Executive Order S-21-09

On September 15, 2009, Governor Schwarzenegger issued Executive Order S-21-09. This Executive Order directed CARB to adopt a regulation consistent with the goal of Executive Order S-14-08 by July 31, 2010. CARB is further directed to work with the CPUC and CEC to ensure that the regulation builds upon the Renewable Portfolio Standard (RPS) program and is applicable to investor-owned utilities, publicly owned utilities, direct access providers, and community choice providers. Under this order, CARB is to give the highest priority to those renewable resources that provide the greatest environmental benefits with the least environmental costs and impacts on public health and can be developed the most quickly in support of reliable, efficient, cost-effective electricity system operations. On September 23, 2010, CARB adopted regulations to implement a "Renewable Electricity Standard," which would achieve the goal of the executive order (contribution of renewable energy to meet the state's electrical needs) with the following intermediate and final goals: 20 percent for 2012–2014, 24 percent for 2015–2017, 28 percent for 2018–2019, and 33 percent for 2020 and beyond. Under the regulation, wind; solar; geothermal; small hydroelectric; biomass; ocean wave, thermal, and tidal; landfill and digester gas; and biodiesel would be considered sources of renewable energy. The regulation would apply to investor-owned utilities and public (municipal) utilities.

SB X1 2

On April 12, 2011, Governor Jerry Brown signed SB X1 2 in the first extraordinary session, which would expand the RPS by establishing a goal that renewable energy shall comprise 20 percent of the total electricity sold to retail customers in California per year, by December 31, 2013, and 33 percent by December 31, 2020, and in subsequent years. Under the bill, a renewable electrical generation facility is one that uses biomass, solar thermal, photovoltaic, wind, geothermal, fuel cells using renewable fuels, small hydroelectric generation of 30 megawatts or less, digester gas, municipal solid waste conversion, landfill gas, ocean wave, ocean thermal, or tidal current and that meets other specified requirements with respect to its location. In addition to the retail sellers covered by SB 107, SB X1 2 adds local publicly owned electric utilities to the RPS. By January 1, 2012, the CPUC is required to establish the quantity of electricity products from eligible renewable energy resources to be procured by retail sellers in order to achieve targets of 20 percent by December 31, 2013; 25 percent by December 31, 2016; and 33 percent by December 31, 2020. The statute also requires that the governing boards for local publicly owned electric utilities establish the same targets, and the governing boards would be responsible for ensuring compliance with these targets. The CPUC will be responsible for enforcement of the RPS for retail sellers, while the CEC and CARB will enforce the requirements for local publicly owned electric utilities.

California Air Pollution Control Officers Association

The California Air Pollution Control Officers Association (CAPCOA) is the association of air pollution control officers representing all 35 air quality agencies throughout California. CAPCOA is not a regulatory body, but has been an active organization in providing guidance in addressing the CEQA significance of GHG emissions and climate change as well as other air quality issues.

Local Regulations

SANDAG: Climate Action Strategy

The SANDAG Climate Action Strategy serves as a guide to help policymakers address climate change as they make decisions to meet the needs of our growing population, maintain and enhance our quality of life, and promote economic stability. The policy measures contained in this document are intended to be a list of potential options for consideration as SANDAG updates its RTP and Regional Comprehensive Plan, and as local governments update their general plans and other community plans. The policy measures are not requirements under SANDAG, local governments, or any other entity. Moreover, it is the discretion of each agency to decide whether and how to best implement the various policy measures listed in this plan.

SANDAG 2009 San Diego Regional Energy Strategy

The RES is an important and integral part of the larger San Diego Regional Comprehensive Plan, intended to contain an integrated set of public policies, strategies and action plans to promote a smarter, more sustainable growth for the San Diego region. The following goals set forth by the RES are relevant to the proposed General Plan:

- Renewable Energy: Support the development of renewable energy resources to meet or exceed a 33 percent RPS by 2020 and a 45 percent RPS by 2030.
- Distributed Generation: Increase the total amount of clean distributed generation (renewable and nonrenewable) to reduce peak demand and diversify electricity resources in the San Diego region.
- Energy and Water: Reduce water-related energy use.
- Peak Demand: Implement cost-effective steps and incentives to utilize demand response and energy efficiency measures to reduce peak demand.
- Transportation Fuels: Substantially increase the deployment of alternative transportation fuels and vehicles.

Sustainable Energy Master Plan

In December of 2008, the City of Carlsbad released their Sustainable Energy Master Plan, a report on potential renewable energy sources and measures to reduce power consumption. This report evaluated a variety of energy efficiency and reduction measures including automated meter readings to monitor water meters and reduce operating costs, off-peak water pumping to lower power costs, and variable speed motors to increase efficiency of heating, ventilation, and air conditioning (HVAC) systems and water pumps. The report also evaluated green roofs which reduce indoor building temperatures and reduce GHGs, as well as solar water heating systems and tankless water heating systems to reduce energy consumption. The master plan also addressed hybrid and electric vehicles, energy efficient chillers, LEED green building standards, LED traffic signals and interconnection, induction and LED streetlights, and energy management systems.

Carlsbad Building Code 18.18 Solar Energy Code

The City of Carlsbad has adopted the Uniform Solar Energy Code, 2009 Edition, as a baseline solar energy code for the city. The 2009 Uniform Solar Energy Code provides provisions for a safe and functional solar energy system with minimum regulations. It applies to the erection, installation, alteration, repair, replacement, addition to, use, or maintenance of solar energy systems.

Carlsbad Building Code 18.30 Energy Conservation Regulations

The City of Carlsbad has adopted the California Energy Code, 2010 Edition, as a baseline energy code for the city. Specifically Carlsbad Building Code Section 18.30.040 requires all new residential units to include plumbing specifically designed to allow the later installation of a system which utilizes solar energy as the primary means of heating domestic potable water.

City of Carlsbad Climate Change Initiatives

The City of Carlsbad recognizes that government operations and community activities contribute to GHG emissions, which may adversely affect city businesses and residents. The city also understands that local government plays a key role in both reducing GHG emissions, as well as

adapting to the potential effects of climate change. The city has taken a proactive approach to creating a sustainable and healthy quality of life in Carlsbad by balancing social, economic, and environmental needs of the community. The city's efforts toward environmental sustainability include, but are not limited to, the efficient use of non-renewable resources, stewardship of natural and constructed open spaces, development of drought-resistant water supplies, reduction in the city's waste stream, and measures to promote clean air and water. Specific examples of the city's efforts are as follows:

- **Vehicle Fleet Operations.** Hybrid vehicle purchases.
- **Renewable Energy.** The hydroelectric power project at Maerkle Reservoir.
- **Water Conservation.** Conservation programs to reduce water demand and dependency on imported water supplies and adoption of a drought response plan and water conservation program through Carlsbad Municipal Water District Ordinance No. 44 on January 6, 2009.
- **High Efficiency Streetlights.** Replacement of more than 7,000 high-pressure sodium street-lights throughout Carlsbad with high-efficiency induction lights that use 60% less electricity than the old lights.
- **Energy Management.** Participation in the Sustainable Region Program with SANDAG, CCSE, and SDG&E to develop energy management plans and implement cost-saving energy measures for municipal facilities. The city was the initial agency collaborating with SANDAG, CCSE, and SDG&E when the Sustainable Region Program Pilot launched in 2005. Today, the city is one of five member agencies involved in the program to identify energy management roadmaps and implement cost- saving energy measures for their particular agencies. Since the pilot program, the city has saved 489,571 kilowatt-hour (kWh) in energy consumption through local energy efficiency programs like the CCSE Tax Exempt Customer program.[34] City Council Policy 71 became effective July 1, 2006, to implement the city's Energy Conservation and Management Program.
- **Waste Reduction and Recycling.** Development of a green purchasing policy.
- **Energy Partnerships.** At the state level, working with the Attorney General's office to effect legislation that would advance the California Solar Initiative and other solar financing options. At the local level, partnering with SDG&E to assist residents in energy audits and participating in demand response programs that commit the city to reducing its electric use during periods of peak demand such as hot summer days.
- **Climate Action Planning.** Conducted a 2005 GHG emissions baseline inventory for municipal operations (of which the city has direct control) and community activities (excluding the airport and power plant). The city utilized this baseline to identify GHG

[34] SANDAG (San Diego Association of Governments). 2009. *Regional Energy Strategy for the San Diego Region.* December 2009. http://www.sandag.org/uploads/publicationid/publicationid_1476_10631.pdf

emission sources and opportunities to improve operations not only to reduce GHG emissions, but also to invest in more energy efficiency programs and partnerships.

  - Examples of the city's actions to reduce energy consumption include installing complete HVAC systems in all city-owned buildings (occupied by at least 15 people) in order to establish automatic and manual climate controls and rezone the control center and measuring energy consumption by use in order to monitor energy spikes at city facilities and adjust energy load settings.

- **Climate Adaptation Planning.** The city identified three primary effects of a changing climate that are particular threats to Carlsbad: drought, fire, and rising sea level. Some of the city's current efforts to adapt to these effects of climate change include, but are not limited to, actively pursuing desalination opportunities, investing in a recycled water system that provides 20 percent of the city's water supply, requiring Class I fire-resistant roofs, enforcing a strict fire code and fuel-modification zones around development, restricting development within the 100-year floodplain, and identifying areas of the city that could be threatened by sea level rise.

Impact Analysis

SIGNIFICANCE CRITERIA

Energy

The CEQA Guidelines Appendix G does not contain specific thresholds to identify when a significant energy-use impact would occur. CEQA Guidelines Appendix F, Energy Conservation, provides direction as to the type of information, analysis, and mitigation that should be considered in evaluating a proposed project, but does not provide specific energy conservation thresholds.

Other guidance on the content and standards for environmental impact report (EIR) energy evaluations has come from recent case law. On August 27, 2009, the California Court of Appeal, Third Appellate District, issued the first ever CEQA decision on the requirements of an energy conservation impacts analysis in the case of Tracy First v. City of Tracy 177 Cal.App. 4th 912 (2009). The court ruled it was appropriate for the EIR to rely upon the California Building Code (CBC) Energy Efficiency Standards, which are part of the state's Title 24 Building Code, to determine that the project's energy impacts would be less than significant. The court also held that CEQA does not require that an EIR discuss "every possible energy impact or conservation measure" listed in Appendix F of the CEQA Guidelines.

In accordance with Appendix F of the CEQA Guidelines and recent case law, and for the purposes of this Program EIR, the proposed General Plan would result in a significant impact to energy conservation if it would:

- Cause wasteful, inefficient, and unnecessary consumption of energy during project construction, operation, and/or maintenance; or

- Conflict with the CBC Energy Efficiency Standards, the 2009 San Diego RES renewable energy goals, the CARB passenger vehicle GHG emission reduction targets for 2020 and 2035, or any other applicable energy conservation regulations.

Greenhouse Gas Emissions and Climate Change

The California Natural Resources Agency, through its December 2009 amendments to the CEQA Guidelines provides a framework for the evaluation of the GHG emissions associated with the proposed General Plan.

The State of California has developed guidelines to address the significance of climate change impacts based on Appendix G of the CEQA Guidelines, which provides guidance that a project would have a significant environmental impact if it would:

- Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment; or
- Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases.

The City of Carlsbad has not established official thresholds of significance for GHG emissions. In the absence of a city-adopted threshold, this assessment follows an approach used by the County of San Diego. The County of San Diego relies on a screening threshold of 2,500 $MTCO_2e$ per year[35] as a "bright line" threshold, based on the County of San Diego's 2013 Guidelines for Determining Significance for Climate Change. The City of Carlsbad 2014 Draft Climate Action Plan (CAP), which has been prepared concurrently with the city's General Plan, lists project review thresholds for a range of project types and sizes to identify the "bright line" threshold. Projects equal to or exceeding these thresholds would be subject to CAP GHG reduction measures.

METHODOLOGY AND ASSUMPTIONS

Information and analysis regarding the proposed General Plan GHG emissions have been compiled based on an understanding of the existing local and regional greenhouse gas sources and review of existing technical data, aerial maps, and applicable laws, regulations, and guidelines. Analysis of GHG emissions and reductions was also derived from the CAP.

SUMMARY OF IMPACTS

Future development under the proposed General Plan would result in an increase in energy consumption and generation of GHG emissions from mobile, stationary, and area sources.

[35] The City of San Diego's 2013 Draft Significance Thresholds for Greenhouse Gas Emissions contain the same bright line threshold of 2,500 MTCO2e. The methodology used to develop the threshold is referred to as the "gap-based approach," and is described in detail in both the City's draft and County's adopted significance thresholds.

Federal, state, and local regulations, as well as policies in the proposed General Plan and associated reduction measures in the CAP would make the impacts of the proposed General Plan less than significant. Despite the overall increase in future energy use, the state's current and future energy code and the proposed General Plan policies would ensure energy efficient designs in new development and encourage energy efficiency upgrades in existing development, both of which would minimize wasteful, inefficient energy consumption. Additionally, the proposed General Plan and associated reduction measures in the CAP would meet all GHG emissions targets through 2035. Moreover, the proposed General Plan would not conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of GHGs.

IMPACTS

Impact 3.4-1 Development under the proposed General Plan would not cause wasteful, inefficient, and unnecessary consumption of energy during project construction, operation, and/or maintenance. (*Less than Significant*)

Development under the proposed General Plan would increase future energy consumption within the plan area, resulting in additional demand for electricity and natural gas supply and services. Future development projects and land uses proposed under the proposed General Plan would increase the population and employment in the city, and associated energy demand above existing conditions. However, despite the overall increase in future energy use, the state's current and future energy code and the proposed General Plan policies would ensure energy efficient designs in new development and encourage energy efficiency upgrades in existing development, both of which would minimize wasteful, inefficient energy consumption.

Future development would be required to comply with Title 24 energy performance standards and the proposed General Plan energy conservation policies and actions. Policy 9-P.2 promotes energy conservation throughout all municipal operations and the use of alternative transportation to reduce energy consumption. Policy 9-P.8 promotes energy efficiency through green building construction and building retrofits. Policy 9-P.10 promotes energy conservation through reductions in artificial cooling, heating and lighting energy use. Policy 9-P.12 directs the city to explore renewable energy resources and infrastructure. Policy 9-P.13 establishes the city's CAP as the platform for delineating and implementing energy conservation measures for future development.

With implementation of the proposed General Plan, impacts would be less than significant.

Proposed General Plan Policies that Reduce the Impact

Sustainability Element Policies

9-G.3 Promote energy efficiency and conservation in the community.

9-P.2 Continue efforts to decrease use of energy and fossil fuel consumption in municipal operations, including transportation, waste reduction and recycling, and efficient building design and use.

9-P.8 Promote energy conservation and retrofitting of existing buildings. Measures the city should consider for improving energy performance of existing buildings include, but are not limited to:

- Developing and implementing point-of-sale residential energy and water efficiency audits or upgrade requirements and/or incentives if necessary;
- Providing financial incentives and low-cost financing products and programs that encourage investment in energy efficiency and renewable energy within existing residential buildings; and
- Educating residents about the availability of free home energy audit programs and encourage implementation of audit findings.

9-P.10 Decrease the need for artificial cooling, heating and lighting, and promote outdoor lifestyles in Carlsbad's sunny and moderate climate by:

- Ensuring that the Zoning Ordinance provides for adequate private and common open spaces as part of multifamily developments.
- Encouraging residential and office buildings to have windows that open to the outside in all habitable rooms, and maximize the use of daylight.

9-P.12 Continue pursuit of sustainable energy sources—such as hydroelectricity, geothermal, solar, and wind power—to meet the community's needs.

9-P.13 Use the city's Climate Action Plan as the platform for delineating and implementing measures to improve energy conservation, and increase renewable energy use (such as solar) in existing and new development.

Mitigation Measures

None required.

Impact 3.4-2 The proposed General Plan would not conflict with the CBC Energy Efficiency Standards, the 2009 San Diego Regional Energy Strategy renewable energy goals, the CARB passenger vehicle GHG emission reduction targets for 2020 and 2035, or any other applicable energy conservation regulations. *(Less than Significant)*

All future development under the proposed General Plan would be required to comply with the latest CBC requirements, including CBC Energy Efficiency Standards, as well as all federal, state, and local rules and regulations pertaining to energy consumption and conservation. The proposed General Plan includes Goal 9-G.3 and policies 9-P.2, 9-P.8, 9-P.10, 9-P.12, and 9-P.13 as described in Impact 3.4-1, which emphasize energy reduction strategies currently being pursued

by the city. Additionally, the draft CAP is designed to reduce the city's GHG emissions and streamline environmental review of future development projects in accordance with CEQA. The CAP has been prepared concurrently with the city's proposed General Plan and includes actions to carry out the General Plan's goals and policies including those described in Impact 3.4-1 regarding energy efficiency and conservation. The CAP includes goals, policies, and actions for the city to reduce GHG emissions, as well as an inventory of citywide and local government GHG emissions; forecasts of future citywide and local government GHG emissions; a comprehensive, citywide strategy and actions to manage and reduce GHG emissions, with emission targets through 2035; and actions that demonstrate the city's commitment to achieve state GHG reduction targets through enforceable measures, and monitoring and reporting processes to ensure targets are met. The CAP is written for intended implementation through the year 2035.

Through implementation of city policies as delineated in the proposed General Plan, and concurrent implementation of the CAP, the proposed General Plan would support the 2009 San Diego RES renewable energy goals and the CARB passenger vehicle GHG emissions reduction targets through measures that would reduce vehicle miles traveled (VMT) throughout the city. Additionally, CARB's LCFS, which aims to reduce the carbon intensity of the life-cycle of gasoline and diesel fuels by 10 percent by 2020, would further assist in meeting energy reduction goals and GHG emission reduction targets. Therefore, impacts would be considered less than significant.

Proposed General Plan Policies that Reduce the Impact

See **Goal 9-G3** and **Policies 9-P.2, 9-P.8, 9-P.10**, **9-P.12** and **9-P.13** from the proposed General Plan Sustainability Element as described in Impact 3.4-1.

Mobility Element Policies

3-P.6 Utilize transportation demand management strategies, non-automotive enhancements (bicycle, pedestrian, transit, train, trails, and connectivity), and traffic signal management techniques as long-term transportation solutions and traffic mitigation measures to carry out the Carlsbad Community Vision.

3-P.30 Actively pursue grant programs such as SANDAG's Active Transportation Grant Program and Smart Growth Incentive Program to improve non-automotive connectivity throughout the city. The emphasis of grant-funded projects shall be on implementation, which includes planning documents that guide and prioritize implementation, programs that encourage the use of active transportation modes, education for the use of active transportation modes, or physical improvements themselves.

3-P.31 Partner with other agencies and/or developers to improve transit connectivity within Carlsbad. As part of a comprehensive transportation demand management (TDM) strategy and/or with transit oriented development (TOD), a shuttle system could be established that connects destinations and employment centers like LEGOLAND, hotels, the Village, McClellan-Palomar Airport, business parks, the COASTER and Breeze transit stations, and key destinations

along the coast. The system could incorporate shuttle service in adjacent cities to maximize connectivity.

3-P.32 Encourage NCTD, SANDAG and other transit providers to provide accessibility for all modes of travel to the McClellan-Palomar Airport area.

3-P.33 Coordinate with NCTD to improve the quality of bus stop facilities in the city.

Mitigation Measures

None required.

Impact 3.4-3 Development under the proposed General Plan would generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment. (*Less than Significant*)

The following analysis and emissions estimates were derived from the City of Carlsbad draft CAP.

Total Carlsbad GHG emissions from the 2005 inventory were 630,310 $MTCO_2e$ per year. Therefore, the 2020 target under state guidance as outlined in CARB's Scoping Plan (2008) is a 15 percent reduction from 2005 emissions, which corresponds to a target of 535,763 $MTCO_2e$.

The horizon for the CAP is 2035, corresponding with the proposed General Plan horizon. The CAP follows a linear trajectory in emissions reductions between 2020 and 2050 (which is 80 percent below the 2020 target) to determine the 2035 target. Table 3.4-3 summarizes these emissions targets and the percentage reduction from 2005 emissions.

Table 3.4-3: 2005 Emissions and Emissions Targets

Year	*GHG Emissions and Targets*	*Reduction from 2005 Baseline*
2005	630,310 $MTCO_2e$	N/A
2020	535,763 $MTCO_2e$	15 percent
2035	321,458 $MTCO_2e$	49 percent

Source: Draft Carlsbad Climate Action Plan, 2014.

Business As Usual Forecast

The BAU forecast estimates emissions through the year 2035, based on the growth in emissions from the 2005 to 2011 citywide inventory. The increase in community emissions from 2005 to 2011 was linearly projected outward to the year 2035. The BAU forecast simply assumes that emissions will increase in the future at the same growth rate that occurred between the 2005 and 2011 citywide inventories. According to the city's draft CAP, emissions are forecast to reach 1,007,473 MT CO_2e in the year 2035.

Community Forecast with General Plan Land Use and Circulation System

The Statewide Energy Efficiency Collaborative (SEEC) model was used to predict community GHG emissions across all sectors to 2035 in the CAP. This tool is based on the International Council for Local Environmental Initiatives' (ICLEI's) Clean Air and Climate Protection (CACP) model used to estimate the 2005 and 2011 emissions inventories. The primary reason for using SEEC rather than CACP is that SEEC includes the effects of the RPS and Pavley I Fuel Economy Standards, whereas CACP requires manual adjustment to account for the state-mandated electrical production and fuel efficiency improvements.

The SEEC community forecast predicts all direct GHG emissions[36] from sources within the boundaries of Carlsbad, including fuel combusted in the community[37] and direct emissions from landfills within the community. Indirect emissions associated with the consumption of energy that is generated outside the borders of the city are also included. Other indirect or embodied emissions are not covered by the forecast, in accordance with ICLEI standards. The SEEC community forecast tallies emissions from seven sectors:

1. Residential
2. Commercial
3. Industrial
4. Transportation[38]
5. Waste
6. Landfills[39]
7. Wastewater

The emissions projected in the SEEC community forecast use the activity data (or usage) from the 2005 community inventory as an initial value, and the 2011 inventory to provide an intermediate value to adjust the model. The predicted growth in each sector is then added into the model to project future emission. Refer to the CAP for additional details regarding model inputs.

Table 3.4-4 shows the emissions from the SEEC community forecast for each sector—residential, commercial, industrial, transportation, waste, landfill, and wastewater—and the sum total community emissions. The forecast includes the effect of the General Plan land use and circulation system on transportation emissions (compact, infill, mixed-use, and transit-oriented

[36] GHGs considered in the CAP are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and hydrofluorcarbons. The emissions have been converted to carbon dioxide equivalents (CO_2e), which converts the three other GHGs into the equivalent volume of carbon dioxide.

[37] This does not include the Encina Power Station, for reasons described in the CAP.

[38] For transportation trips that originate or end in Carlsbad, emissions for the half of the entire trip are included, and not just for the miles traveled within Carlsbad; however, trips that just pass through Carlsbad are excluded, as their emissions would be reflected at their trip ends.

[39] The 2011 inventory considered landfill emissions as part of waste. The SEEC model separates out landfills from waste as an emission source, so the separation has been preserved in this analysis and in the CAP.

development; open space protection; new traffic signals and roadway extensions), as well as the effects of the RPS and Pavley I Fuel Economy Standards.

The greatest projected emissions continue to be from the transportation sector, which accounts for 41 percent of emissions in 2020 and 36 percent of emissions in 2035. Residential emissions are the next largest sector, with 26 percent of emissions in 2020 and 28 percent of the total in 2035. Commercial, industrial, and waste, wastewater, and landfill emissions are the next largest sectors in order of total emissions.

Table 3.4-4: Community Forecast Emissions by Sector, 2011 to 2035 ($MTCO_2e$)

Year	*Residential*	*Commercial*	*Industrial*	*Transportation*	*Waste*	*Landfill*	*Wastewater*	*Total*
2011	176,405	178,712	46,248	273,745	21,719	2,598	6,317	**705,744**
2020	145,419	126,431	31,278	234,113	23,073	1,204	4,355	**565,873**
2035	163,881	148,978	35,249	210,568	26,002	558	4,601	**589,837**

Source: Draft Carlsbad Climate Action Plan, 2014.

Total emissions are projected to decrease from 705,744 $MTCO_2e$ in 2011 to 565,873 $MTCO_2e$ in 2020 (a decrease of 20 percent), then increase from 2020 values to 589,837 $MTCO_2e$ in 2035 (an increase of 4 percent). In 2020, the total emissions of 565,873 are about 30,000 $MTCO_2e$ above the AB 32 target emissions.

Government Operations Forecast

The SEEC government operations forecast, which is a subset of the community forecast, covers direct emissions from the sources the City of Carlsbad owns and/or controls. The emissions from government operations are included in the totals shown in Table 3.4-4 above. The government operations forecast includes mobile combustion of fuel for city vehicles and the use of natural gas to heat city buildings. Indirect emissions associated with the consumption of electricity, steam, heating, or cooling for city operations that are purchased from an outside utility are also forecast. All other indirect emissions sources, including employee commute and the decomposition of government-generated solid waste, are not included as part of the local government forecast, but rather are counted in the community forecast. The government operations inventory covers emissions from the following sectors:

- Buildings and Facilities
- Vehicle Fleet
- Public Lighting
- Water Delivery Facilities
- Wastewater Transport

The government operations forecast uses the 2005 inventory to represent baseline emissions, and the 2011 inventory to provide an intermediate value to adjust the model. Within each sector,

certain types of emissions are assumed to scale with population growth, projected to grow at 0.9 percent in 2020 and one percent in 2035, while other types of emissions are expected to remain constant or decrease with efficiency improvements. Refer to the CAP for additional details regarding underlying assumptions for growth rates applied for each government operations sector.

The city operations forecast from 2011, 2020 and 2035 is shown by sector in Table 3.4-5. Government operations emissions are projected to decrease from the 2011 inventory total of 8,205 $MTCO_2e$ to 5,185 $MTCO_2e$ in 2020. The decrease in emissions is primarily due to the implementation of the RPS and the fuel efficiency gains from Pavley I standards. Emissions are forecast to then increase at a low rate through the year 2035 to 5,922 $MTCO_2e$, due to projected increases in city staff in select departments to accommodate an increased need for city services.

The relative contribution of each sector to the total city operations emissions is generally constant over time. The two largest emissions sectors are buildings and facilities, comprising about 40 percent of total emissions, and fleet emissions, which are approximately 33 percent of the total emissions. Streetlights are about 15 percent of total emissions, followed by wastewater facilities at 8 percent, and water delivery facilities at 1 percent. Overall, government operations emissions are forecast to remain a small portion of community emissions, about 0.9 percent in 2020 and 1 percent in 2035.

Table 3.4-5: Government Operations Emissions Forecast ($MTCO_2e$)

Sector	*2011*	*2020*	*2035*
Building and Facilities	3,410	2,192	2,409
Streetlights	1,747	902	902
Water Delivery Facilities	79	71	76
Wastewater Facilities	716	470	506
Fleet	2,253	2,092	2,029
Total	**8,205**	**5,185**	**5,922**

Source: Draft Carlsbad Climate Action Plan, 2014

GHG Reductions to Community Forecast from State and Federal Actions

GHG reductions from state and federal actions and other trends to the community forecast are quantified and include the following:

1. Renewable Portfolio Standard
2. Pavley I fuel economy standards
3. Low Carbon Fuel Standard

4. Title 24 building efficiency improvements
5. Reductions in VMT from rising gasoline prices.[40]

The GHG reductions from these policies were quantified in the CAP using the Energy Policy Initiatives Center (EPIC) mitigation calculator. The EPIC at the University of San Diego developed this model to develop BAU projections, set targets, and levels of mitigation measures for all local jurisdictions in the San Diego region. As the EPIC model was developed specifically for cities within San Diego County and the mitigation calculator calculates the effect of the federal and statewide reductions, it was selected to quantify these policies and actions.

Renewable Portfolio Standard

The RPS requires that investor-owned utilities like SDG&E supply 33 percent of their electricity from renewable resources by 2020. While a RPS past 2020 has not been established, the assumption used in the EPIC mitigation calculator was that the 33 percent renewable standard would be extended through the year 2035—a conservative assumption, given that this is targeted to already be attained by 2020. Emissions reductions from the RPS are provided in Table 3.4-6.

Pavley I Fuel Economy Standards

In 2009, CARB adopted amendments to the Pavley regulations to reduce GHG emissions in new passenger vehicles from 2009 to 2016. The standards became the model for the updated CAFE standards established by the U.S. EPA. The emissions reductions from the improved fuel efficiency standards were calculated using the EPIC mitigation calculator, and were phased in following the 2011 inventory. Emissions reductions from Pavley I Fuel Economy Standards are provided in Table 3.4-6.

Low Carbon Fuel Standard

The LCFS, adopted by CARB, is performance-based and is designed to reduce the GHG intensity of transportation fuels by 10 percent by 2020. The regulation established annual performance standards that fuel producers and importers must meet beginning in 2011. The LCFS applies to all fuels used for transportation in California, including gasoline, diesel fuel, E85, compressed or liquefied natural gas, biogas, and electricity. The LCFS is also "lifecycle" based, meaning the entire extraction, recovery, production, and transportation of the fuel is taken into account. The default assumption of 10 percent reduction in GHG intensity was assumed to continue through 2035 for the EPIC mitigation calculator. Emissions reductions from the LCFS are provided in Table 3.4-6.

Title 24 Building Efficiency Improvements

Title 24 is California's Building Energy Code, which is updated every 3 years. In 2010, Title 24 was updated to include the California Green Building Standards Code, referred to as CALGreen. CALGreen requires that new buildings reduce water consumption, increase system efficiencies, divert construction waste from landfills, and install low pollutant-emitting finish materials.

[40] The rise in gasoline prices are not a result of any state or federal policy or action, but are included in the CAP as part of a larger systematic trend forecast to occur regardless of other emission reduction measures.

CALGreen has mandatory measures that apply to nonresidential and residential construction. The most recent CALGreen code was adopted in 2013 and became effective in 2014. Emissions reductions from Title 24 are provided in Table 3.4-6.

Reduction in VMT from Rising Gasoline Prices

The U.S. Energy Information Administration (EIA) collects, analyzes and disseminates independent and impartial energy information, including projections of future gasoline prices. The 2013 EIA gasoline projection estimates the pump price of gasoline in California will be $4.00 per gallon in 2020 and $6.00 per gallon in 2035.

The EPIC mitigation calculator measures emissions reductions from changes in fuel consumption as a result of gasoline price increases. The reductions in GHG emissions based on the EIA gasoline prices are shown in Table 3.4-6.

Emissions Reductions

The annual reductions from the above referenced state and federal actions—RPS, Pavley I Fuel Economy Standards, LCFS, Title 24 building efficiency improvements, and the reductions in VMT from rising gasoline prices—were combined to determine the total annual reductions from all state and federal actions that would reduce GHG emissions. Table 3.4-6 lists the total SEEC community forecast for years 2020 and 2035, juxtaposed with reductions from state and federal actions not accounted for in the SEEC forecast: the LCFS, Title 24 Building Standards, reductions in VMT from higher gasoline prices, and the assumed continuation of the RPS after the year 2020.

Table 3.4-6: Community Forecast with State and Federal Actions ($MTCO_2e$)

Year	*Community Forecast Emissions with General Plan Land Use and New Roadways*	*Low Carbon Fuel Standard Reduction*	*Title 24 Building Efficiency Improvements*	*Reductions in VMT from Rising Gasoline Prices*	*Continuation of Renewable Portfolio Standard, 2020 to 2035*	*Total Forecast Emissions with General Plan Land Use and New Roadways & State and Federal Actions*
2020	565,873	20,545	1,836	12,201	48,962	484,124
2035	589,837	14,906	3,582	71,316	36,160	467,374

*RPS considered in SEEC forecast through 2020.

Source: Draft Carlsbad Climate Action Plan, 2014

Modified Baseline: GHG Reductions from Additional General Plan Policies and Actions

This section describes proposed General Plan policies and actions that reduce GHG emissions, quantifies emissions reductions, and explains how these policies and actions will be implemented. These reductions are from policies and actions in addition to the proposed General Plan land use and circulation system, reductions from which are already reflected in the SANDAG modeling

discussed previously. The proposed General Plan policies and actions are organized according to the following categories:

1. Bikeway System Improvements
2. Pedestrian Improvements and Increased Connectivity
3. Traffic Calming
4. Parking Facilities and Policies
5. Transportation Improvements

CAPCOA's *Quantifying Greenhouse Gas Mitigation Measures* report was developed as a resource for local governments to assess emissions reductions from GHG mitigation measures. The CAP uses the methodology outlined in the CAPCOA report for each category to quantify emissions reductions from the proposed General Plan policies and actions.[41] The reductions are applied to the community forecast in the following section to get the "modified baseline" forecast. GHG reductions from proposed General Plan policies are provided in Table 3.4-7.

Bikeway System Improvements

The Carlsbad Bicycle Master Plan, referenced in the proposed General Plan, recommends the enhancement of the existing bicycle network with the implementation of approximately 6.5 miles of new Class I bike paths, 2.8 miles of new Class II bike lanes, and 4.2 miles of new Class III bike routes. In total, the recommended enhancements will create a total of 13.5 miles of new bike paths, to result in a total of 111.5 miles of bike paths.

An estimated 0.05 percent reduction in transportation GHG emissions is assumed to occur for every 2 miles of bike lane per square mile in areas with density greater the 2,000 people per square mile. Carlsbad currently has approximate 2,700 people per square mile, greater than the threshold of 2,000 people per square mile. With the total bicycle improvements, there would be approximately 2.85 bike lanes per square mile, which corresponds to a 0.07 percent reduction in VMT emissions, or about 164 $MTCO_2e$ in 2020, and 147 $MTCO_2e$ in 2035.[42] See Table 3.4-7 for policy reductions.

Proposed General Plan Policies that Reduce the Impact

The following policies pertain to *bikeway system improvements*:

Land Use and Community Design Element Policies

2-P.22 Build and operate commercial uses in such a way as to complement but not conflict with adjoining residential areas. This shall be accomplished by:

[41] While many of the policies and actions quantified in the CAP are project-level in nature, much of the supporting literature is from studies on a citywide, countywide, or regional context. The methodology in the CAP is based on these regional studies, which is therefore applicable to the General Plan policies and actions listed in the CAP.

[42] Draft Climate Action Plan, 2014

a. Controlling lights, signage, and hours of operation to avoid adversely impacting surrounding uses.

b. Requiring adequate landscaped buffers between commercial and residential uses.

c. Providing bicycle and pedestrian links between commercial centers and surrounding residential uses, and providing bicycle parking racks.

d. Ensuring building mass does not adversely impact surrounding residences.

2-P.23 Ensure that commercial development is designed to include:

a. Integrated landscaping, parking, signs, and site and building design

b. Common ingress and egress, safe and convenient access and internal circulation, adequate off-street parking and loading facilities. Each commercial site should be easily accessible by pedestrians, bicyclists, and automobiles to nearby residential development.

c. Architecture that emphasizes establishing community identity while presenting tasteful, dignified and visually appealing designs compatible with their surroundings.

d. A variety of courtyards and pedestrian ways, bicycle facilities, landscaped parking lots, and the use of harmonious architecture in the construction of buildings.

2-P.43 Evaluate each discretionary application for development of property with regard to the following specific criteria:

a. Site design and layout of the proposed buildings in terms of size, height and location, to foster harmony with landscape and adjacent development.

b. Site design and landscaping to provide buffers and screening where appropriate, conserve water, and reduce erosion and runoff.

c. Building design that enhances neighborhood quality, and incorporates considerations of visual quality from key vantage points, such as major transportation corridors and intersections, and scenic vistas.

d. Site and/or building design features that will reduce greenhouse gas emissions over the life of the project, as outlined in the Climate Action Plan.

e. Provision of public and/or private usable open space and/or pathways designated in the Open Space, Conservation, and Recreation Element.

f. Contributions to and extensions of existing systems of streets, foot or bicycle paths, trails, and the greenbelts provided for in the Mobility, and Open Space, Conservation, and Recreation elements of the General Plan.

g. Compliance with the performance standards of the Growth Management Plan.

h. Development proposals which are designed to provide safe, easy pedestrian and bicycle linkages to nearby transportation corridors.

i. Provision of housing affordable to lower and/or moderate income households.

j. Policies and programs outlined in Local Coastal Program where applicable.

k. Consistency with applicable provisions of the Airport Land Use Compatibility Plan for McClellan-Palomar Airport.

2-P.44 Require new residential development to provide pedestrian and bicycle linkages, when feasible, which connect with nearby shopping centers, community centers, parks, schools, points of interest, major transportation corridors and the Carlsbad Trail System.

2-P.51 Plan and design Carlsbad Boulevard and adjacent public land (Carlsbad Boulevard coastal corridor) according to the following guiding principles:

a. Carlsbad Boulevard shall become more than a road. This transportation corridor shall provide for recreational, aesthetic and community gathering opportunities that equal the remarkable character of the land.

b. Community safety shall be a high priority. Create destination that provides a safe public environment to recreate.

c. Strategic public access and parking is a key to success. Development shall capitalize on opportunities to add/enhance multiple public access points and public parking for the beach and related recreational amenities.

d. Open views are desirable and important to maintaining the character of the area. Preservation and enhancement of views of ocean, lagoons, and other water bodies and beaches shall be a high priority in road, landscaping, and amenity design and development.

e. Enhance the area's vitality through diversity of recreational land uses. Carlsbad Boulevard development shall provide for amenities, services and goods that attract a diversity of residents and visitors.

f. Create vibrant and sustainable public spaces. Development shall provide for unique and vibrant coastal gathering spaces where people of all age groups and interests can gather to enjoy recreational and environmental amenities and supporting commercial uses.

g. Connect community, place and spirit. Design shall complement and enhance connectivity between existing community and regional land uses.

h. Environmentally sensitive design is a key objective. Environmentally sensitive development that respects existing coastal resources is of utmost importance.

i. A signature scenic corridor shall be created through design that honors the coastline's natural beauty. The resulting improvements will capture the 'essence' of Carlsbad; making it a special place for people from throughout the region with its natural beauty and vibrant public spaces. Properly carried out, the realigned boulevard will maximize public views and encourage everyone to slow down and enjoy the scenery.

j. Reimagining of Carlsbad Boulevard shall be visionary. The reimagined Carlsbad Boulevard corridor will incorporate core community values articulated in the Carlsbad Community Vision by providing: a) physical connectivity through multi-modal mobility improvements including bikeways, pedestrian trails, and a traffic-calmed street; b) social connectivity through creation of memorable public spaces; and c) economic vitality through a combination of visitor and local-serving commercial, civic, and recreational uses and services.

2-P.85 Allow small pockets of higher density residential at the edges of the corridor, as shown on the Land Use Map, to enable residents to live closer to jobs, with opportunities for enhanced bicycle and pedestrian paths that link residential and employment uses. Ensure that residential uses incorporate noise attenuation criteria in accordance with the Airport Land Use Compatibility Plan.

Mobility Element Policies

3-P.6 Utilize transportation demand management strategies, non-automotive enhancements (bicycle, pedestrian, transit, train, trails, and connectivity), and traffic signal management techniques as long-term transportation solutions and traffic mitigation measures to carry out the Carlsbad Community Vision.

3-P.11 Evaluate implementing a road diet to three lanes or fewer for existing four-lane streets currently carrying or projected to carry 25,000 average daily traffic

volumes or less in order to promote biking, walking, safer street crossings, and attractive streetscapes.

3-P.12 Design new streets, and explore funding opportunities for existing streets, to minimize traffic volumes and/or speed, as appropriate, within residential neighborhoods without compromising connectivity for emergency first responders, bicycles, and pedestrians consistent with the city's Carlsbad Active Transportation Strategies. This should be accomplished through management and implementation of livable streets strategies and such programs like the Carlsbad Residential Traffic Management Plan.

3-P.13 Consider innovative design and program solutions to improve the mobility, efficiency, connectivity, and safety of the transportation system. Innovative design solutions include, but are not limited to, traffic calming devices, roundabouts, traffic circles, curb extensions, separated bicycle infrastructure, pedestrian scramble intersections, high visibility pedestrian treatments and infrastructure, and traffic signal coordination. Innovative program solutions include, but are not limited to, webpages with travel demand and traffic signal management information, car and bike share programs, active transportation campaigns, and intergenerational programs around schools to enhance safe routes to schools. Other innovative solutions include bicycle friendly business districts, electric and solar power energy transportation systems, intelligent transportation systems, semi- or full autonomous vehicles, trams, and shuttles.

3-P.16 Engage Caltrans, the Public Utilities Commission, transit agencies, the Coastal Commission, and railroad agency(s) regarding opportunities for improved connections within the city, including:

- Improved connections across the railroad tracks at Chestnut Avenue and other locations
- Completion and enhancements to the Coastal Rail Trail and/or equivalent trail along the coastline
- Improved connectivity along Carlsbad Boulevard for pedestrians and bicyclists, such as a trail
- Improved access to the beach and coastal recreational opportunities
- Improved crossings for pedestrians across and along Carlsbad Boulevard

3-P.17 Implement connections and improvements identified in this Mobility Element, including those identified in policy 3-P.15, as well as:

- Extension of College Boulevard from Cannon Road to El Camino Real
- Completion of the Poinsettia Lane connection near El Camino Real (Reach E)

- Extension of Camino Junipero to the eastern city boundary
- A bicycle/pedestrian trail/pathway connecting the eastern terminus of Marron Road to the east
- A bicycle/pedestrian trail/pathway connecting the eastern terminus of Cannon Road to the east, and coordination with adjacent agencies to appropriately link to their facilities

3-P.18 Support pedestrian and bicycle facilities at all Interstate-5 and State Route 78 interchanges.

3-P.20 Update the pedestrian, trails and bicycle master plans, as necessary, to reflect changes in needs, opportunities and priorities.

3-P.21 Implement the projects recommended in the pedestrian, trails and bicycle master plans through the city's capital improvement program, private development conditions and other appropriate mechanisms.

3-P.22 Identify and implement necessary pedestrian improvements on pedestrian-prioritized streets with special emphasis on providing safer access to schools, parks, community and recreation centers, shopping districts, and other appropriate facilities.

3-P.23 Implement the Safe Routes to School and Safe Routes to Transit programs that focus on pedestrian and bicycle safety improvements near local schools and transit stations. Prioritize schools with access from arterial streets for receiving Safe Routes to School projects.

3-P.24 Improve and enhance parking, connectivity, access, and utilization for pedestrians and bicycles to COASTER stations, utility corridors, and open spaces consistent with city planning documents.

3-P.25 Evaluate incorporating pedestrian and bicycle infrastructure within the city as part of any planning or engineering study, private development, or capital project where bicyclists or pedestrians are a prioritized or non-prioritized mode.

3-P.26 Complete the Carlsbad Active Transportation Strategies to assist in identifying livable street implementation parameters within the city.

3-P.27 Engage the community in the policy setting and planning of street, bicycle, pedestrian, transit, and connectivity studies, plans and programs.

3-P.28 Require developers to improve pedestrian and bicycle connectivity consistent with the city's bicycle and pedestrian master plans and trails master planning efforts. In addition, new residential developments should demonstrate that a safe route to school and transit is provided to nearby schools and transit stations within a half mile walking distance.

3-P.29 Work with existing neighborhoods and businesses to improve pedestrian and bicycle connectivity and safety consistent with the city's pedestrian and bicycle master plans and trails master planning efforts.

3-P.30 Actively pursue grant programs such as SANDAG's Active Transportation Grant Program and Smart Growth Incentive Program to improve non-automotive connectivity throughout the city. The emphasis of grant-funded projects shall be on implementation, which includes planning documents that guide and prioritize implementation, programs that encourage the use of active transportation modes, education for the use of active transportation modes, or physical improvements themselves.

3-P.36 Assist Village businesses to manage parking in the Village area to maximize parking efficiency. Any potential parking-related revenues generated in this area should be reinvested into the Village area for implementing livable streets and other parking, pedestrian, and bicycle enhancements, including way-finding signage and maintenance of associated infrastructure.

Open Space, Conservation, and Recreation Element Policies

4-P.39 Coordinate with other agencies and private entities to investigate methods of improving service, implementing a quiet zone, and enhancing connectivity and safety along the rail corridor.

Pedestrian Improvements and Increased Connectivity

Carlsbad has adopted several programs and plans related to improving the walking environment. The city's Pedestrian Master Plan guides the future development and enhancement of pedestrian facilities to ensure that walking becomes an integral mode of transportation in Carlsbad. The Carlsbad Residential Traffic Management Program provides a mechanism for community members to report issues relating to speeding and traffic volumes on residential roadways, assisting the city in "calming" traffic in these areas to make them more comfortable for pedestrian travel. Additionally, there are a number of improvements described in the proposed General Plan that will enhance connectivity for bicycles and pedestrians.

Providing an improved pedestrian network and increasing connectivity encourages people to walk more and results in people driving less, causing a reduction in VMT. An estimate of a 1 percent reduction in VMT from pedestrian improvements and connectivity was assumed,[43] which corresponds to a reduction of 2,341 $MTCO_2e$ in 2020 and 2,106 $MTCO_2e$ in 2035. See Table 3.4-7 for policy reductions.

The following policies from the proposed General Plan pertain to *pedestrian improvements*:

[43] Draft Carlsbad Climate Action Plan, 2014.

Land Use and Community Design Element Policies

Policies 2-P.22, 2-P.23, 2-P.43, 2-P.44, 2-P.51, and 2-P.85 listed above.

2-P.45 At the time existing shopping centers are renovated or redeveloped, where feasible, require connections to existing residential neighborhoods through new pedestrian pathways and entrances, mid-block crossings, new or wider sidewalks, and pedestrian-scaled street lighting.

2-P.46 Enhance walkability on a citywide scale by installing benches and transit shelters and adding landscaping, wayfinding and pedestrian scaled lighting. Consider ways to improve rail and freeway overpass/underpass areas, with lighting, sidewalk improvements and art installations.

2-P.48 Improve beach access through a variety of mechanisms, including:

a. In the Village and adjacent areas, identify the primary pedestrian connections and entrances to the beach through signage, a consistent landscaping scheme, change in paving materials, wider sidewalks and preservation of view corridors. Identify opportunities for additional access points as improved connectivity and facilities are provided, particularly if new beachfront activity areas are established.

b. In the Barrio neighborhood, provide a pedestrian crossing under or over the rail corridor at Chestnut Avenue.

c. Identify and implement more frequent pedestrian crossings along Carlsbad Boulevard. Identify and prioritize crossings from residential neighborhoods and existing bicycle and pedestrian trails.

2-P.68 Enhance the walkability and pedestrian orientation of the Village, including along Carlsbad Village Drive, to enhance the small, beach town atmosphere and improve access to and utilization of transit.

2-P.75 Create a cohesive, pedestrian-scale streetscape that includes improved sidewalks, streetscape, signage and way-finding, and which celebrates the Barrio's heritage and provides better connections between the Barrio and Village and across the railroad at Chestnut Avenue.

Mobility Element Policies

Policies 3-P.6, 3-P.12, 3-P.13, 3-P.16, 3-P.17, 3-P.18, 3-P.20, 3-P.21, 3-P.22, 3-P.23, 3-P.24, 3-P.25, 3-P.27, 3-P.28, 3-P.29, and 3-P.36 as listed above.

Open Space, Conservation, and Recreation Element Policies

Policy 4-P.39 as listed above.

Traffic Calming

As mentioned above, the Carlsbad Residential Traffic Management Program provides a mechanism for community members to report issues relating to speeding and traffic volumes on residential roadways, assisting the city in "calming" traffic in these areas to make them more safe and comfortable for pedestrian travel. Traffic calming devices include speed tables, speed bumps and other devices that encourage people to drive more slowly or to walk or bike instead of using a vehicle, especially for short trips in and around residential neighborhoods.

CAPCOA's *Quantifying Greenhouse Gas Mitigation Measures* report was used to quantify the effect of traffic calming devices. A 0.25 percent reduction in VMT was assumed to occur from these improvements, which corresponds to a reduction of 585 $MTCO_2e$ in 2020 and 526 $MTCO_2e$ in 2035. See Table 3.4-7 for policy reductions.

The following policies from the proposed General Plan pertain to *traffic calming*:

Land Use and Community Design Element Policies

2-P.51 Plan and design Carlsbad Boulevard and adjacent public land (Carlsbad Boulevard coastal corridor) according to the following guiding principles:

a. Carlsbad Boulevard shall become more than a road. This transportation corridor shall provide for recreational, aesthetic and community gathering opportunities that equal the remarkable character of the land.

b. Community safety shall be a high priority. Create destination that provides a safe public environment to recreate. c. Strategic public access and parking is a key to success. Development shall capitalize on opportunities to add/enhance multiple public access points and public parking for the beach and related recreational amenities.

d. Open views are desirable and important to maintaining the character of the area. Preservation and enhancement of views of ocean, lagoons, and other water bodies and beaches shall be a high priority in road, landscaping, and amenity design and development.

e. Enhance the area's vitality through diversity of recreational land uses. Carlsbad Boulevard development shall provide for amenities, services and goods that attract a diversity of residents and visitors.

f. Create vibrant and sustainable public spaces. Development shall provide for unique and vibrant coastal gathering spaces where people of all age groups and interests can gather to enjoy recreational and environmental amenities and supporting commercial uses.

g. Connect community, place and spirit. Design shall complement and enhance connectivity between existing community and regional land uses.

h. Environmentally sensitive design is a key objective. Environmentally sensitive development that respects existing coastal resources is of utmost importance.

i. A signature scenic corridor shall be created through design that honors the coastline's natural beauty. The resulting improvements will capture the 'essence' of Carlsbad; making it a special place for people from throughout the region with its natural beauty and vibrant public spaces. Properly carried out, the realigned boulevard will maximize public views and encourage everyone to slow down and enjoy the scenery.

j. Reimagining of Carlsbad Boulevard shall be visionary. The reimagined Carlsbad Boulevard corridor will incorporate core community values articulated in the Carlsbad Community Vision by providing: a) physical connectivity through multi-modal mobility improvements including bikeways, pedestrian trails, and a traffic-calmed street; b) social connectivity through creation of memorable public spaces; and c) economic vitality through a combination of visitor and local-serving commercial, civic, and recreational uses and services.

Mobility Element Policies

Policies 3-P.12 and 3-P.13 listed above.

Parking Facilities and Policies

The city's Zoning Ordinance provides standards for parking facilities based on development types within the city. To promote "right sizing" of parking facilities, techniques such as shared parking, collective parking, "unbundled" parking, in-lieu parking fees, and parking management strategies are included as part of the proposed General Plan Mobility Element. Refer to the CAP for additional details regarding parking demand strategies.

According to CAPCOA's *Quantifying Greenhouse Gas Mitigation Measures* report, parking strategies have estimated VMT reductions. Reduced parking standards and other policies reducing parking availability have an estimated 5 to 12.5 percent VMT reduction, unbundled parking cost has a 2.6 to 13 percent VMT reduction, and parking management strategies have a 2.8 to 5.5 percent VMT projection.[44] Conservatively assuming the combined effect of these parking reduction strategies would result in the lower end of the strategies results, and considering that the strategies would be most applicable in focus areas, the cumulative reduction from implementation would result in a 2 percent VMT reduction to give an estimated 4,682

[44] The maximum reduction provided from the combination of all parking policies in the CAPCOA report is a 20 percent reduction in VMT.

$MTCO_2e$ reduction by 2020, and a 4,211 $MTCO_2e$ reduction by 2035. See Table 3.4-7 for policy reductions.

The following policies from the proposed General Plan pertain to *parking facilities and policies*:

Land Use and Community Design Element Policies

2-P.71 Address parking demand by finding additional areas to provide parking for the Village and beach areas, and by developing creative parking management strategies, such as shared parking, maximum parking standards, "smart" metering, utilizing on-street parking for re-use of existing buildings, etc.

2-P.79 West of the railroad tracks:

- Decommission, demolish, remove and remediate the Encina Power Station site, including the associated structures, the black start unit and exhaust stack according to the provisions of a settlement agreement dated January 14, 2014, between and among the City of Carlsbad and the Carlsbad Municipal Water District (CMWD), Cabrillo Power I LLC and Carlsbad Energy Center LLC, and San Diego Gas and Electric Company (SDG&E).
- The desalination plant shall remain on approximately 11 acres (six acres for the desalination plant and approximately five acres of nonexclusive easements) west of the railroad tracks.
- Redevelop the Encina Power Station site, along with the SDG&E North Coast Service Center site, with a mix of visitor-serving commercial uses, such as retail and hotel uses, and with new community-accessible open spaces along Agua Hedionda Lagoon and the waterfront (Carlsbad Boulevard). Encourage community gathering spaces, outdoor dining, and other features to maximize potential views of the ocean and the lagoon. Encourage shared parking arrangements so that a greater proportion of development can be active space rather than parking.
- Determine specific uses, development standards, infrastructure, public improvements, site planning and amenities through a comprehensive planning process (e.g., specific plan, master plan, etc.) resulting in a redevelopment plan approved by the City Council. The redevelopment plan boundaries should include the Encina Power Station and the SDG&E North Coast Service Center sites.
- Work with SDG&E to identify a mutually acceptable alternative location for Its North Coast Service Center. Work with SDG&E, as part of a long-term plan, to identify and ultimately permit an alternate site for its Encina substation.

Mobility Element Policies

3-P.24 Improve and enhance parking, connectivity, access, and utilization for pedestrians and bicycles to COASTER stations, utility corridors, and open spaces consistent with city planning documents.

3-P.34 Develop flexible parking requirements to provide the "right amount" of on-site vehicle parking. Such requirements will include implementation of innovative parking techniques, implementing effective TDM programs to reduce parking demand, and consideration of other means to "right size" the parking supply.

3-P.35 Require new employment development to provide secure bicycle parking on-site. Major employers should provide shower and changing rooms for employees as appropriate.

3-P.36 Assist Village businesses to manage parking in the Village area to maximize parking efficiency. Any potential parking-related revenues generated in this area should be reinvested into the Village area for implementing livable streets and other parking, pedestrian, and bicycle enhancements, including way-finding signage and maintenance of associated infrastructure.

3-P.37 Consider supporting new development and existing businesses with various incentives (such as parking standards modifications) for implementing TDM programs that minimize the reliance on single-occupant automotive travel during peak commute hours.

Transportation Improvements

Transit in Carlsbad includes bus service, Americans with Disabilities Act (ADA) paratransit service, Amtrak rail service, and the COASTER commuter rail; indirectly, transit service is also provided by the Sprinter light rail system, and Metrolink commuter rail. Future transit service in the city will primarily be coordinated by the North County Transit District (NCTD). In addition, there are several planned transit improvements for Carlsbad that are part of SANDAG regional planning efforts. These are reflected in the General Plan Mobility Element:

- Coastal rail improvements are proposed for the tracks serving the COASTER and Surfliner trains in San Diego County along the Los Angeles to San Diego Rail Corridor. These proposed improvements include double tracking, bridge replacements, and station improvements. Improvements to the COASTER service (2020 and 2030) are also proposed and would increase service and reduce headways.
- Route 471 (2020) is a proposed rapid bus providing frequent service between Carlsbad and San Marcos via Palomar Airport Road. This route will operate with 10 minute headways during peak and off-peak hours. In the city, this rapid bus route is envisioned to be supported by signal priority at intersections (Policy 3-P.15).
- Adding Amtrak service to Carlsbad.

- Improving transit use is improving the "first mile/last mile" access and experience for transit users. This typically includes end of trip facilities (bike racks, showers, changing rooms, etc.) and better connectivity from the transit stop to the ultimate destination via bicycle facilities, pedestrian facilities, local transit circulators, etc.
- Carlsbad's future transit effectiveness will depend on major employers assisting with providing some of these "first mile/last mile" facilities through transportation demand management (TDM) measures. TDM is envisioned to include shuttle circulators to major employers and destinations, showers and changing rooms at those locations, and a host of other typical TDM techniques that would support transit usage and the connection to the ultimate destination.
- Improving transit use in the city by working with NCTD to improve the transit experience, particularly along the bus routes. This includes improving bus stops in the city to ensure that they are well lit, have seating, and are covered to protect users from inclement weather.

The following policies from the proposed General Plan pertain to *transportation improvements*:

Land Use and Community Design Element Policies

Policies 2-P.46 and 2-P.68 as shown above.

Mobility Element Policies

3-P.15 Encourage Caltrans, SANDAG, NCTD, and adjacent cities to improve regional connectivity and service consistent with regional planning efforts. This includes expansion of Interstate-5 with two HOV lanes in each direction and associated enhancements, a Bus Rapid Transit (BRT) route along Palomar Airport Road, shuttle bus services from COASTER stations, and other enhancements to improve services in the area.

Policies 3-P.6, 3-P.16, 3-P.23, 3-P.27, 3-P.28, 3-P.31, and 3-P.32 as shown above.

Transportation system improvements can result in VMT reductions. According to CAPCOA's *Quantifying Greenhouse Gas Mitigation Measures* report, transit system improvements can result in the following reductions: 0.02 to 3.2 percent VMT reduction from a bus rapid transit system, 0.1 to 8.2 percent VMT reduction from expanding the transit network, 0.02 to 2.5 percent VMT reduction from increasing transit service frequency and speed, and 0.5 to 24.6 percent VMT reduction from increasing transit accessibility. Conservatively assuming the combined effect of these strategies, summing the low end of the VMT reduction ranges gives a 0.63 percent reduction in VMT emissions. See Table 3.4-7 for policy reductions.

Emissions Reductions

Table 3.4-7 shows the GHG reductions from each of the above proposed General Plan policies and actions. The largest reduction comes from parking facilities and policies, followed by pedestrian improvement and increased connectivity, transportation improvements, traffic

calming, and bikeway system improvements. VMT emissions are projected to fall in the future due to higher fuel efficiency standards; however, as the efficiency gains are expected to be largely achieved by 2020, the VMT is projected to continue climbing in the future. The effect of the VMT reductions are greater in 2020 than in 2035 for all proposed General Plan policies and actions considered. For example, the reductions from traffic calming in 2035 are 526 $MTCO_2e$, which is less than the reduction in 2020 of 585 $MTCO_2e$.

Table 3.4-7: GHG Reductions from Additional General Plan Policies and Actions ($MTCO_2e$)

Year	*Bikeway System Improvements*	*Pedestrian Improvements and Increased Connectivity*	*Traffic Calming*	*Parking Facilities and Policies*	*Transportation Improvements*	*Total GHG Reductions from Additional General Plan Policies and Actions*
2020	164	2,341	585	4,682	1,475	9,247
2035	147	2,106	526	4,211	1,327	8,317

Source: Draft Carlsbad Climate Action Plan, 2014.

Modified Baseline and GHG Emissions "Gap"

Table 3.4-8 shows the total community emissions with the reductions from the following policies and actions:

- Proposed General Plan land use and circulation system
- State and federal actions
- Additional proposed General Plan policies and actions.

Emissions drop steeply leading up to 2020 from the combined effect of GHG reduction policies and actions, continue a gradual decline to 2030, but then start rising again after that, given that no increases in federal or state standards relating to fuel efficiency or renewable energy are assumed, even though these may well occur by that time. With the effect of all the GHG reductions considered, the total community forecast emissions are 474,877 $MTCO_2e$ in 2020, and 459,057 $MTCO_2e$ in 2035.

Table 3.4-8 shows that Carlsbad will meet its target for 2020 (and actually until close to 2030) without any additional measures. However, by 2035, there is a GHG emissions "gap" of 137,599 $MTCO_2e$ —over one-third of the total projected community emissions.

Table 3.4-8: Modified Baseline Forecast (Forecast Community Emissions with General Plan Land Use and Roadways, State and Federal Actions, and Additional General Plan Policies and Actions)

Year	*Total Modified Baseline Forecast (MT CO_2e)*	*GHG Emissions Targets (Linear Scaling of AB 32/S-3-05) ($MTCO_2e$)*	*Emissions "Gap" ($MTCO_2e$)*
2020	473,082	535,763	Target Met
2035	455,556	321,458	134,098

Source: Draft Carlsbad Climate Action Plan, 2014.

The emissions targets are met in the year 2020, with forecast emissions of 473,082 $MTCO_2e$ meeting the target by about 63,000 $MTCO_2e$. There is an emissions "gap" in the year 2035 of about 134,000 $MTCO_2e$ between the forecast emissions of 455,556 $MTCO_2e$ and the emissions target of 321,458 $MTCO_2e$. Chapter 4 of the CAP describes GHG reduction measures to close the gap between forecast emissions and emissions targets in the year 2035, as described below.

CAP GHG Reduction Measures

The forecast emissions described previously incorporate reductions from (1) state and federal actions, (2) proposed General Plan land use and roadways, and (3) additional proposed General Plan policies and actions. Additional GHG reduction measures are provided in the CAP to close the emissions "gap" between emissions targets and forecast emissions for 2035. These are:

- Residential, commercial, and industrial photovoltaic systems
- Building cogeneration
- Single-family, multifamily, and commercial efficiency retrofits
- Commercial commissioning
- CALGreen building code
- Solar water heater/heat pump installation
- Efficient lighting standards
- Increased zero-emissions vehicle travel
- Transportation Demand Management (TDM)
- Citywide renewable projects
- Water delivery and conservation

The GHG reductions from these measures were quantified using the Energy Policy Initiatives Center (EPIC) mitigation calculator, a tool developed by the University of San Diego for cities within San Diego County, and other approaches, as described in the CAP. The EPIC mitigation calculator includes a "business as usual" (BAU) forecast for each measure estimating GHG reductions from trends already underway that will occur without any additional city intervention,

based on regional San Diego Gas & Electric (SDG&E) forecasts. For example, under the BAU forecast for residential photovoltaic (PV) systems, the EPIC mitigation calculator estimates that by the year 2035, energy produced by residential PV systems in Carlsbad will be about 15.9 megawatts (MW), which will offset about 6,233 $MTCO_2e$.

Table 3.4-9 provides a summary of the GHG reduction measures outlined in the CAP, and Table 3.4-10 provides a summary of forecast community emissions with reduction measures and targets. For detailed information regarding each reduction measure, refer to Section 4 of the CAP.

Table 3.4-9: Draft Climate Action Plan GHG Reduction Measures Summary

Measure Letter	*GHG Reduction Measures*	*GHG Reduction in 2035 ($MTCO_2e$)*
A	Install residential PV systems	10,136
B	Install commercial and industrial PV systems	13,336
C	Promote building cogeneration for large commercial and industrial facilities	1,067
D	Encourage single-family residential efficiency retrofits	1,132
E	Encourage multifamily residential efficiency retrofits	351
F	Encourage commercial efficiency retrofits	18,377
G	Promote commercial commissioning, or improving building Operations	18,377
H	Implementation of Green Building Code	179
I	Replace incandescent bulbs with LED bulbs	21,900
J	New construction residential and commercial solar water heater/heat pump installation and retrofit of existing residential	11,604
K	Promote Transportation Demand Management	23,549
L	Increase electric vehicle travel	54,158
M	Develop more citywide renewable energy projects	4,580
N	Reduce the GHG intensity of water supply conveyance, treatment and delivery	5,968
O	Encourage the installation of greywater and rainwater systems	1,205
Total GHG Reductions		**185,919**

Source: Draft Carlsbad Climate Action Plan, 2014.

Table 3.4-10: Forecast Community Emissions with Draft Climate Action Plan GHG Reduction Measures and Targets

Year	Modified Baseline Forecast ($MTCO_2e$)	CAP GHG Reduction Measures ($MTCO_2e$)*	Forecast Community Emissions with CAP GHG Reduction Measures ($MTCO_2e$)	GHG Emission Targets (Linear Scaling of AB 32/S-3-05) ($MTCO_2e$)	Emission Target Met?
2020	473,082	53,120	419,962	535,763	Yes
2035	455,556	185,919	269,638	321,458	Yes

*Phased in linearly to 2035.

Source: Draft Carlsbad Climate Action Plan, 2014.

As a whole, the CAP GHG reduction measures were designed to enable Carlsbad to achieve its GHG reduction target in the year 2035. The combined GHG reduction from these measures is 185,920 $MTCO_2e$ in 2035, which cover the emissions "gap" identified in Chapter 3 of the CAP.

Table 3.4-10 adds the effect of the CAP GHG reduction measures to the community forecast, and compares the resulting forecast with CAP GHG reduction measures to emission targets. As proposed, the CAP meets the emissions targets for both 2020 and 2035. Section 5 of the CAP provides information regarding measure implementation and monitoring, including project compliance with the CAP. As the proposed General Plan would meet all emissions targets through 2035, and would reduce GHG emissions from BAU and the Modified Baseline Forecast beyond 28.3 percent, impacts would be considered less than significant.

Proposed General Plan Policies that Reduce the Impact

Refer to the City of Carlsbad CAP GHG reduction measures.

Mitigation Measures

None required.

Impact 3.4-4 Development under the proposed General Plan would not conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases. (*Less than Significant*)

Through implementation of the proposed General Plan goals and policies aimed at reducing citywide GHG emissions, and the city's CAP that would serve as the implementation tool for GHG reduction measures throughout the city, the proposed General Plan would serve to implement a number of strategies and measures aimed at improving air quality while also addressing global climate change. Additionally, the SANDAG 2050 Regional Transportation Plan/Sustainable Community Strategy (RTP/SCS) includes a set of policy objectives related to mobility, reliability, system preservation and safety, social equity, healthy environment, and

economic growth. The RTP will assist in SANDAG's implementation of SB 375, California's state planning priorities (AB 857 adopted in 2002), the California Global Warming Solutions Act of 2006, and regional GHG targets. With implementation of the proposed General Plan's goals and policies related to sustainability and multi-modal transportation objectives, and implementation of the city's CAP, the proposed General Plan would complement the goals and policies of the RTP/SCS and would continue to carry out the goals of AB 32 and SB 375. Therefore, future development projects and land uses proposed under the proposed General Plan would, by nature, result in reduced VMT and associated GHG emissions, which achieve the overarching goals of local, regional and state plans to reduce GHG emissions. As such, the proposed General Plan would not conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of GHGs. Impacts would be less than significant.

Proposed General Plan Policies that Reduce the Impact

See **Goal 9-G.3** and **Policies 3-P.6, 3-P.30, 3-P.31, 3-P.32, 3-P.33, 9-P.2, 9-P.8, 9-P.10, 9-P.12,** and **9-P.13** from the proposed General Plan Mobility and Sustainability Elements as described in Impact 3.4-1 and Impact 3.4-3.

Mitigation Measures

None required.

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