3.15 Greenhouse Gas Emissions

The impact of all projects on climate change and the effect of climate change on projects are of growing concern. A major concern is that increases in greenhouse gases (GHGs) are causing global climate change. The accumulation of GHGs in the atmosphere regulates the earth's temperature; however, emissions from human activities such as electricity production and motor vehicles have elevated the concentration of GHGs in the atmosphere, and have contributed to an increase in the temperature of the earth's atmosphere. GHGs include all of the following gases: carbon dioxide (CO_2); methane (CH_4); nitrous oxide (N_2O); hydrofluorocarbons; perfluorocarbons; nitrogen trifluroide (NF_3); and sulfur hexafluoride (SF_6) (California Health and Safety Code section 38505(g)). To account for the warming potential of different GHGs, GHG emissions are quantified and reported as carbon dioxide equivalents (CO_2e).[1] The effects of GHG emission sources (i.e., individual projects) are reported in metric tons/year of CO_2e. This allows for convenient comparisons between projects that have different percentages of the seven GHGs.

3.15.1 Regulatory Setting

In 2005, in recognition of California's vulnerability to the potential effects of climate change, Governor Schwarzenegger issued Executive Order S-3-05, which sets forth a series of target dates by which statewide GHG emissions would be progressively reduced, as follows:

- By 2010, reduce GHG emissions to 2000 levels
- By 2020, reduce GHG emissions to 1990 levels
- By 2050, reduce GHG emissions to 80 percent below 1990 levels

California Air Resources Board (CARB) regulations required owners of gas insulated switchgear (GIS) to establish an initial, maximum emission rate of 10 percent of their nameplate capacity of SF_6 by January 1, 2012. GIS owners will be required to annually reduce SF_6 emission rates by one percent over the following nine year period. The maximum emission rate for SF_6 in 2020 is expected to be set at one percent.

3.15.1.1 Assembly Bill 32 (AB 32)

In 2006, California passed the California Global Warming Solutions Act of 2006 (Assembly Bill No. 32; California Health and Safety Code Division 25.5, Sections 38500, et seq., or AB 32),

[1] CO_2e determinations are based on the global warming potential (GWP) of the GHGs. GWP is a measure of how much a given mass of GHG is estimated to contribute to global warming. It is a relative scale which compares the gas in question to that of the same mass of carbon dioxide (whose GWP is by convention equal to 1). A GWP is calculated over a specific time interval and the value of this must be stated whenever a GWP is quoted or else the value is meaningless.

which requires CARB to design and implement emission limits, regulations, and other measures, such that statewide GHG emissions will be reduced to 1990 levels by 2020.

In December 2007, CARB approved the 2020 emission limit of 427 million metric tons of CO_2e of GHGs. The 2020 target of 427 million metric tons of CO_2e requires the reduction of 169 million metric tons of CO_2e, or approximately 30 percent, from the state's projected emissions of 596 million metric tons of CO_2e (business-as-usual) by year 2020.

AB 32 required development of a mandatory reporting rule for major sources of GHGs. The CARB reporting rule (California Code of Regulations Title 17, Subchapter 10, Article 2, §95100 to 95133) became effective in January 2009. The rule requires reporting of GHG emission for:

- Cement plants
- Petroleum refineries ($\geq$ 25,000 metric tons of CO_2e in any calendar year)
- Hydrogen plants ($\geq$ 25,000 metric tons of CO_2e in any calendar year)
- Electric generating facilities and cogeneration facilities (> 1 MW capacity and > 2,500 metric tons of CO_2e in any year)
- Electricity retail providers and marketers
- Other facilities that emit >25,000 metric tons of CO_2e, for stationary combustion sources, in any calendar year

Cement plants, oil refineries, fossil-fueled electric-generating facilities/providers, cogeneration facilities, and hydrogen plants and other stationary combustion sources that emit more than 25,000 metric tons/year CO_2e, make up 94 percent of the point source CO_2e emissions in California.

As part of AB 32, CARB approved the reduction of SF_6 emissions from electricity transmission and distribution equipment as an early action measure. Accordingly, CARB staff, in collaboration with interested stakeholders, are developing a control measure to address these emissions.

In June, 2008, CARB published its *Climate Change Draft Scoping Plan* that was approved and adopted by the CARB Board on December 11, 2008 as the *Climate Change Scoping Plan*. The *Climate Change Scoping Plan* reported that CARB met the first milestones set by AB 32 in 2007 by: (1) developing a list of early actions to begin sharply reducing GHG emissions; (2) assembling an inventory of historic emissions; and (3) establishing the 2020 emissions limit. Key elements of the *Climate Change Scoping Plan* include:

- Expanding and strengthening existing energy efficiency programs as well as building and appliance standards

- Achieving a statewide renewable 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
- 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 Low Carbon Fuel Standard
- Creating targeted fees, including a public goods charge on water use, fees on high global warming potential gases, and a fee to fund the administrative costs of the state's long-term commitment to AB 32 implementation

The *Climate Change Scoping Plan* notes that "after Board [CARB] approval of this plan, the measures in it will be developed and adopted through the normal rulemaking process, with public input."

The *Climate Change Scoping Plan* acknowledges that local governments are "essential partners" in the effort to reduce GHG emissions. Local governments have "broad influence and, in some cases, exclusive jurisdiction" over activities that contribute to GHG emissions through their planning and permitting processes, local ordinances, outreach and education efforts, and municipal operations. Many of the proposed measures to reduce GHG emissions rely on local government actions. The *Climate Change Scoping Plan* encourages local governments to reduce GHG emissions by approximately 15 percent from current levels by 2020.

The *Climate Change Scoping Plan* also includes recommended measures that were developed to reduce GHG emissions from key sources and activities while improving public health, promoting a cleaner environment, preserving natural resources, and ensuring that the impacts of the reductions are equitable and do not disproportionately impact low-income and minority communities. These measures, shown in Table 3.15-1 by sector, also put the state on a path to meet the long-term 2050 goal of reducing California's GHG emissions to 80 percent below 1990 levels.

Table 3.15-1. List of Recommended Actions by Sector

Measure No.	Measure Description	GHG Reductions (Annual Million Metric Tons CO_2e)
Transportation		
T-1	Pavley I and II – Light Duty Vehicle GHG Standards	31.7
T-2	Low Carbon Fuel Standard (Discrete Early Action)	15

Measure No.	Measure Description	GHG Reductions (Annual Million Metric Tons CO_2e)
T-3[1]	Regional Transportation-Related GHG Targets	5
T-4	Vehicle Efficiency Measures	4.5
T-5	Ship Electrification at Ports (Discrete Early Action)	0.2
T-6	Goods Movement Efficiency Measures. • Ship Electrification at Ports • System-Wide Efficiency Improvements	3.5
T-7	Heavy-Duty Vehicle GHG Emission Reduction Measure – Aerodynamic Efficiency (Discrete Early Action)	0.93
T-8	Medium- and Heavy-Duty Vehicle Hybridization	0.5
T-9	High Speed Rail	1
Electricity and Natural Gas		
E-1	Energy Efficiency (32,000 Gigawatt Hour (GWh) of Reduced Demand) • Increased Utility Energy Efficiency Programs • More Stringent Building & Appliance Standards Additional Efficiency and Conservation Programs	15.2
E-2	Increase Combined Heat and Power Use by 30,000 GWh (Net reductions include avoided transmission line loss)	6.7
E-3	Renewable Portfolio Standard (33% by 2020)	21.3
E-4	Million Solar Roofs (including California Solar Initiative, New Solar Homes Partnership and solar programs of publicly owned utilities) • Target of 3,000 Megawatts Total Installation by 2020	2.1
CR-1	Energy Efficiency (800 Million Therms Reduced Consumptions) • Utility Energy Efficiency Programs • Building and Appliance Standards • Additional Efficiency and Conservation Programs	4.3
CR-2	Solar Water Heating (AB 1470 goal)	0.1
Green Buildings		
GB-1	Green Buildings	26
Water		
W-1	Water Use Efficiency	1.4†
W-2	Water Recycling	0.3†
W-3	Water System Energy Efficiency	2.0†
W-4	Reuse Urban Runoff	0.2†
W-5	Increase Renewable Energy Production	0.9†
W-6	Public Goods Charge (Water)	TBD†
Industry		

Measure No.	Measure Description	GHG Reductions (Annual Million Metric Tons CO_2e)
I-1	Energy Efficiency and Co-Benefits Audits for Large Industrial Sources	TBD
I-2	Oil and Gas Extraction GHG Emission Reduction	0.2
I-3	GHG Leak Reduction from Oil and Gas Transmission	0.9
I-4	Refinery Flare Recovery Process Improvements	0.3
I-5	Removal of Methane Exemption from Existing Refinery Regulations	0.01
Recycling and Water Management		
RW-1	Landfill Methane Control (Discrete Early Action)	1
RW-2	Additional Reductions in Landfill Methane • Increase the Efficiency of Landfill Methane Capture	TBD†
RW-3	High Recycling/Zero Water • Commercial Recycling • Increase Production and Markets for Compost • Anaerobic Digestion • Extended Producer Responsibility • Environmentally Preferable Purchasing	9†
Forests		
F-1	Sustainable Forest Target	5
High Global Warming Potential (GWP) Gases		
H-1	Motor Vehicle Air Conditioning Systems: Reduction of Refrigerant Emissions from Non-Professional Services (Discrete Early Action)	0.26
H-2	SF_6 Limits in Non-Utility and Non-Semiconductor Applications (Discrete Early Action)	0.3
H-3	Reduction of Perfluorocarbons in Semiconductor Manufacturing (Discrete Early Action)	0.15
H-4	Limit High GWP Use in Consumer Products Discrete Early Action (Adopted June 2008)	0.25
H-5	High GWP Reductions from Mobile Sources • Low GWP Refrigerants for New Motor Vehicle Air Conditioning Systems • Air Conditioner Refrigerant Leak Test During Vehicle Smog Check • Refrigerant Recovery from Decommissioned Refrigerated Shipping Containers • Enforcement of Federal Ban on Refrigerant Release during Servicing or Dismantling of Motor Vehicle Air Conditioning Systems	3.3
H-6	High GWP Reductions from Stationary Sources • High GWP Stationary Equipment Refrigerant Management	10.9

Measure No.	Measure Description	GHG Reductions (Annual Million Metric Tons CO_2e)
	Program: o Refrigerant Tracking/Reporting/Repair Deposit Program o Specifications for Commercial and Industrial Refrigeration Systems • Foam Recovery and Destruction Program • SF Leak Reduction and Recycling in Electrical Applications • Alternative Suppressants in Fire Protection Systems • Residential Refrigeration Early Retirement Program	
H-7	Mitigation Fee on High GWP Gases	5
Agriculture		
A-1	Methane Capture at Large Dairies	1.0†

[1] This is not the Senate Bill (SB) 375 (Statutes 2008, Chapter 728, Steinberg) regional target. CARB will establish regional targets for each metropolitan planning organization (MPO) region following the input of the regional targets advisory committee and a consultation process with MPO's and other stakeholders per SB 375.

† GHG emission reduction estimates are not included in calculating the total reductions needed to meet the 2020 target.

The total reduction for the recommended measures is 174 million metric tons/year of CO_2e, slightly exceeding the 169 million metric tons/year of CO_2e of reductions estimated to be needed. The measures in the *Climate Change Scoping Plan* will be developed and be in place by 2012.

3.15.1.2 Senate Bill X1-2 Renewable Portfolio Standards

Senate Bill (SB) X1-2, signed April 2011, requires California's electric utilities to increase their renewable generation to 33 percent by 2020. In addition to increasing the Renewables Portfolio Standards (RPS) to 33 percent by 2020, SB X1-2 also makes a number of other significant changes to California's RPS. SBX1-2 requires California's electric utilities, including publicly owned utilities, to reach the 33 percent RPS in three compliance periods. By December 31, 2013, the utilities must procure renewable energy products equal to 20 percent of retail sales. By December 31, 2016, utilities must procure renewable energy products equal to 25 percent of retail sales, and by December 31, 2020, utilities must procure renewable energy products equal to 33 percent of retail sales and maintain that percentage in following years.

3.15.1.3 Senate Bill 97

The provisions of SB 97 (Statutes 2007, Chapter 185, Dutton), enacted in August 2007 as part of the state budget negotiations, directed the Office of Planning and Research (OPR) to propose

California Environmental Quality Act (CEQA) Guidelines "for the mitigation of GHG emissions or the effects of GHG emissions." SB 97 directed OPR to develop such guidelines by July 2009, and directed the Natural Resources Agency, the agency charged with adopting the CEQA Guidelines, to certify and adopt such guidelines by January 2010.

3.15.1.4 Office of Planning and Research Amendments to the CEQA Guidelines

The Legislature directed OPR to develop CEQA Guidelines pertaining to GHG emissions by July 1, 2009, and to adopt the guidelines by January 1, 2010. OPR submitted recommended Amendments to the CEQA Guidelines for GHG emissions to the Natural Resources Agency on April 13, 2009. On July 3, 2009, the Natural Resources Agency commenced the Administrative Procedure Act rulemaking process for certifying and adopting these amendments pursuant to Public Resources Code Section 21083.05. The Natural Resources Agency transmitted the adopted Amendments and the entire rulemaking file to the Office of Administrative Law (OAL) on December 31, 2009.

On February 16, 2010, OAL approved the Amendments, and filed them with the Secretary of State for inclusion in the California Code of Regulations. The Amendments became effective on March 18, 2010 (OPR, 2010). The amendments provide relatively modest changes to various portions of the existing CEQA Guidelines. Modifications address those issues where analysis of GHG emissions may differ in some respects from more traditional CEQA analysis.

The amendments include a new section (15064.4) to assist lead agencies in determining the significance of GHG impacts. This section urges lead agencies to quantify, where possible, the GHG emissions of proposed projects. In addition to quantification, this section recommends consideration of several other qualitative factors that may be used in determination of significance, including: (1) the extent to which the project may increase or reduce GHG emissions as compared to the existing environmental setting; (2) whether the GHG emissions exceed a threshold of significance that the lead agency determines applies to the project; and (3) 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.

The amendments include a new subdivision (15064.7(c)) to clarify that in developing thresholds of significance, a lead agency may consider thresholds of significance previously adopted or recommended by other public agencies or recommended by experts, provided the decision of the lead agency to adopt such thresholds is supported by substantial evidence.

In addition, the amendments add a new set of environmental checklist questions to the CEQA Guidelines Appendix G. The new set includes the following two questions for GHG emissions, which are the basis for the impact level of significance thresholds in this Draft Final Environmental Impact Report (EIR). Would the project:

a) Generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment?

b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of GHG?

3.15.2 Existing Conditions

Gases that trap heat in the atmosphere are referred to as GHGs because they capture heat radiated from the sun and re-radiated from the earth's surface as it is reflected back into the atmosphere, roughly analogous to the retention of heat energy in a greenhouse. The accumulation of GHGs has been implicated as a driving force for global climate change. Definitions of climate change vary between and across regulatory authorities and the scientific community, but in general can be described as the changing of the earth's climate caused by natural fluctuations and the impact of human activities that alter the composition of the global atmosphere. Both natural processes and human activities emit GHGs.

Global climate change is a change in the average weather on earth that can be measured by wind patterns, storms, precipitation and temperature. Although there is disagreement as to the speed of global warming and the extent of the impacts attributable to human activities, the majority of the scientific community now agrees that there is a direct link between increased emission of GHGs due to human activity and long-term global temperature. Potential global warming impacts in California may include, but are not limited to, loss in snow pack, sea level rise, more extreme heat days per year, more high ozone days, more large forest fires, and more drought years. Secondary effects are likely to include a global rise in sea level, impacts to agriculture, changes in disease vectors, and changes in habitat and biodiversity.

The accumulation of GHGs in the atmosphere regulates the Earth's temperature; however, emissions from human activities such as electricity production and motor vehicles have elevated the concentration of GHGs in the atmosphere.

3.15.3 Potential Environmental Impacts

3.15.3.1 Methodology

Four types of assessments are used to determining whether the Eagle Mountain Pumped Storage Project (Project) could be in conflict with the state goals for reducing GHG emissions. The assessments are shown below:

A. Identify any potential conflicts with CARB's 39 recommended actions.

B. Evaluate the relative size of the Project. The Project's GHG emissions will be compared to the size of major facilities that are required to report GHG emissions (≥25,000 metric

tons/year of CO_2e)[2] to the state; and the Project size will be compared to the state goal of reducing 169 million metric tons per year of projected CO_2e emissions in 2020. As noted above the 25,000 metric ton annual limit identifies the large stationary point sources in California that make up approximately 94 percent of the stationary emissions. If the Project's total emissions are below this limit, its total emissions are equivalent in size to the smaller projects in California that as a group only make up six percent of all stationary emissions. It is assumed that the activities of these smaller projects generally would not conflict with state's ability to reach AB 32 overall goals. In reaching its goals CARB will focus upon the largest emitters of GHG emissions.

C. Evaluate the basic energy efficiency parameters of the Project to determine whether its design is inherently energy efficient.

D. Identify any potential conflicts with any applicable plan, policy, or regulation of an agency adopted for the purpose of reducing the emissions of GHGs.

3.15.3.2 Thresholds of Significance

CEQA Checklist Appendix G regarding GHG emissions reflects OPR's recommended guidelines for analysis of GHG emissions in CEQA documents. For this Project, the Project would be considered to have a significant impact if the Project:

(a) Generates GHG emissions, either directly or indirectly, that may have a significant impact on the environment.

(b) Conflicts with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of GHGs.

3.15.3.3 Environmental Impact Assessment

With regard to Assessment Item A (potential conflicts with CARB's 39 recommended actions), the proposed Project does not pose any apparent conflict with the CARB recommended actions (*see* Table 3.15-1). The Project would support Measure E-3, the state of California's RPS by providing an effective means for full integration of renewable energy generated in periods of low electrical demand.

SF_6 is a GHG commonly used in the utility industry as an insulating gas in circuit breakers. SF_6, while comprising a small fraction of the total GHGs emitted annually world-wide, is a much more potent GHG with 23,900 times the global warming potential as CO_2. The proposed substation associated with the Project would likely require SF_6-insulating circuit breakers that could unintentionally leak SF_6. Although it is not yet known how many SF_6 containing circuit breakers would be required at the proposed substation to support the proposed Project, or how

[2] The state of California has not provided guidance as to quantitative significance thresholds for assessing the impact of GHG emissions on climate change concerns. Nothing in the CEQA Guidelines directly addresses this issue.

much SF_6 would be contained within each circuit breaker, a general estimate of Project-related SF_6 emissions can be made relative to other similar electric infrastructure projects.

The California Public Utilities Commission (CPUC) has recently indicated that for an electric transmission line project in Coachella Valley, new circuit breakers would each contain approximately 50 to 150 pounds of SF_6 (CPUC, 2010). Circuit breakers manufactured in 1999 or later tend to emit less than one percent of its nameplate capacity (USEPA, 2006), so it can be assumed that each SF_6-containing circuit breaker that would be installed under the Project would leak up to 1.5 pounds SF_6 per year. Given that SF_6 has a global warming potential 23,900 times that of CO_2, operation of each SF_6-containing circuit breaker would result in an increase of approximately 18 tons of CO_2e per year. Therefore, depending on the exact number of circuit breakers that would be associated with the proposed substation, Project SF_6 emissions would likely be less than 360 tons CO_2e per year (assumes 20 new circuit breakers installed).

The Project will be constructed and operated in conformance with all applicable federal, state, and local laws, ordinances, regulations and standards (LORS), including the CARB emission requirements regarding SF_6.

Southern California Edison (SCE), who would operate and maintain the proposed Project substation, is an existing member of the SF_6 Reduction Partnership for Electric Power Systems (Partnership). The Partnership is a collaborative effort that was formed between the USEPA and the electric power industry to help identify and reduce fugitive emissions of SF_6. Utilities that join the Partnership agree to: estimate current annual SF_6 emissions and annually inventory emissions of SF_6 using an emissions inventory protocol; establish a strategy for replacing older, leakier pieces of equipment; implement SF_6 recycling; ensure that only knowledgeable personnel handle SF_6; and submit annual progress reports to the United States Environmental Protection Agency (USEPA). In 2006, USEPA recognized SCE for its accomplishments in reducing SF_6 emissions. Since SCE joined the Partnership in 2001, the company has reduced its SF_6 emissions by 41 percent. Therefore, SCE operations, including those that will be associated with the Project are considered consistent with California's goals to reduce overall emissions of SF_6.

With regard to Assessment Item B (evaluate the relative size of the Project), Project construction GHG emissions during the maximum year would be approximately 8,467 metric tons/year of CO_2e and Project operations (i.e., employee trips) would be a maximum of approximately 303 metric tons/year of CO_2e. The Project would not be classified as a major source of GHG emissions.

In addition, Project operations would generate electricity during peak demand periods and as needed to support transmission grid operations. This electrical generation from the Project would offset electrical generation from fossil fueled plants. Typically, peaking power is provided by simple cycle natural gas generating plants (also known as "peaker plants"). Assuming the

proposed Project generates 2,278 Gwh/year, the Project would offset emissions from fossil fuel generation by as much as 1,115,000 metric tons/year of CO_2e.

The analysis of potential Project impacts is based on the assumption that the proposed Project generation will displace emissions from simple cycle power plants (natural gas-fired peaker plants). Two scenarios are analyzed as the potential source of pump-back power: renewable energy and combined cycle power plants.

Coal-fired power was not used in the assumption of the source of pump-back power for a variety of reasons. Coal-fired power represents less than two percent of California's in-state energy generation mix, and eight percent of California's total power supply in 2009 (Figure 3.15-1).

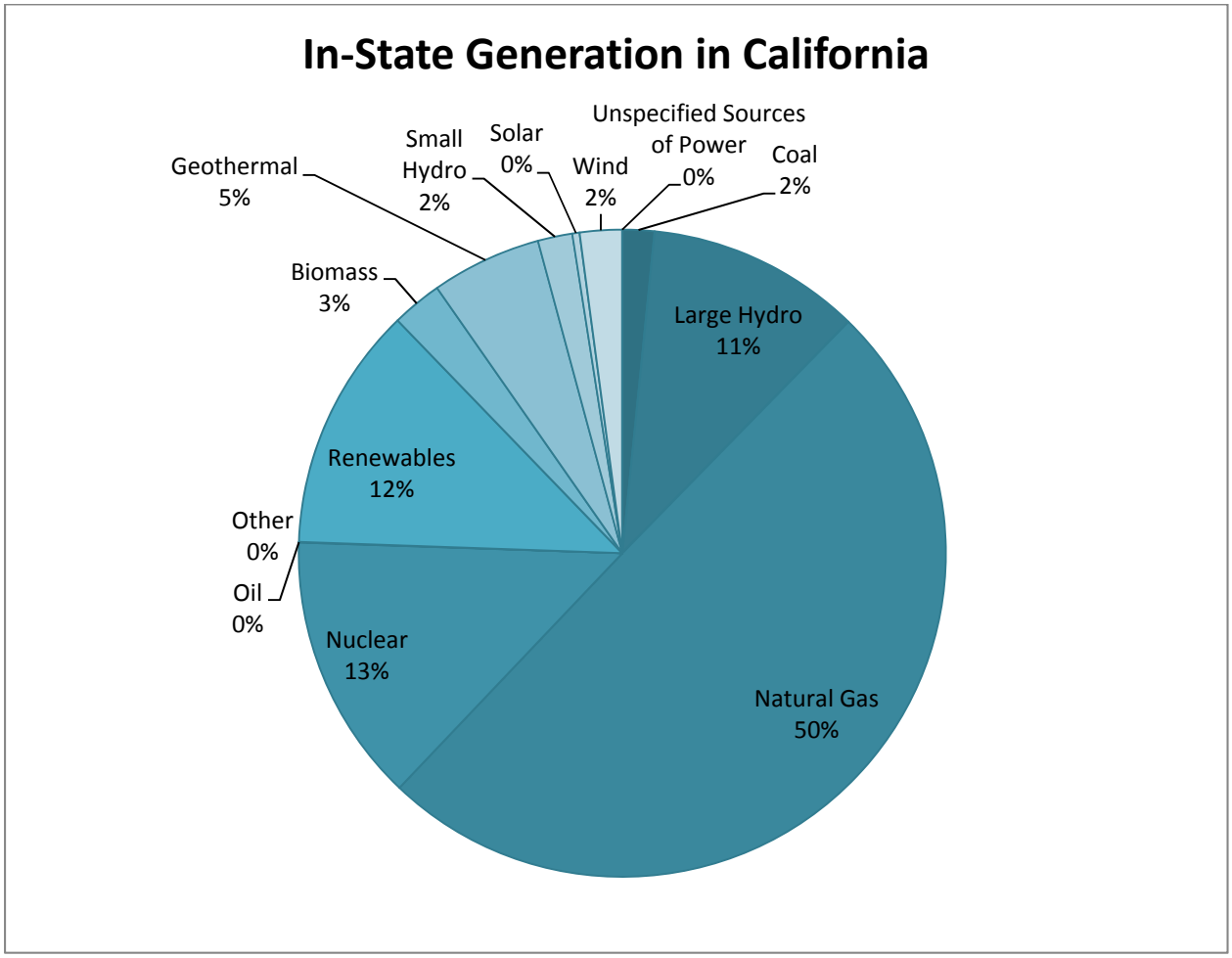

Figure 3.15-1. Percentage of in-state electrical energy generation in California in 2009. *Source*: California Energy Commission (CEC), California Energy Almanac.

Electricity produced by coal is declining as a percentage of California total energy generation mix (Figure 3.15-2). According to the CPUC's 2009 Integrated Energy Policy Report, the

publicly owned utilities are reporting an increase in renewable contracts and a decline in the use of coal resources as contracts with coal-fired power plants expire over time.

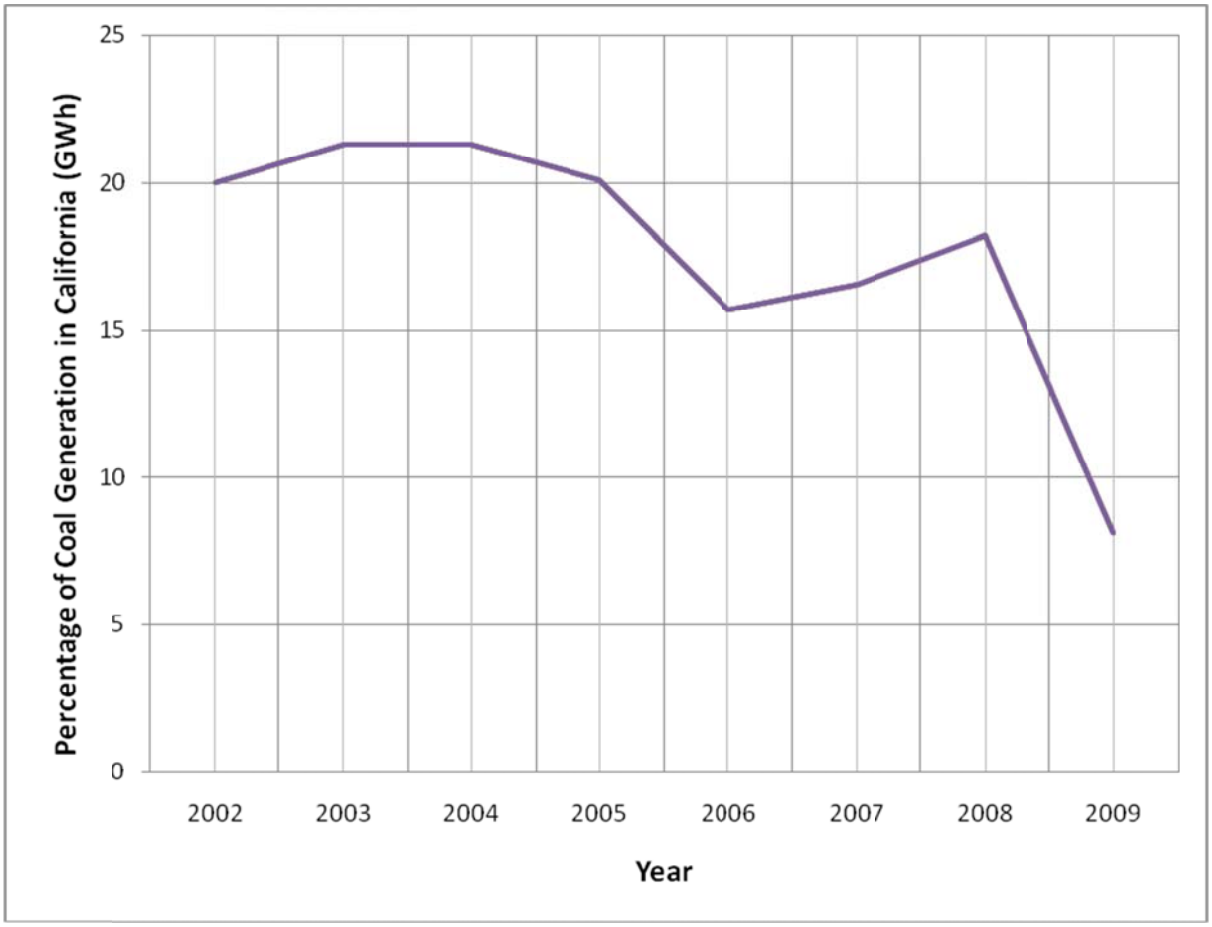

Figure 3.15-2. Percentage of coal generation in California 2002- 2009. *Source*: California Energy Commission, California Energy Almanac. Note: In 2002 -2006, the in-state coal number included coal fired power plants owned by California utilities located out-of-state.

Although the proposed Project will add additional energy demand to the system, there is very limited potential for GHG associated with coal to increase as a result. The reason for this is the structure of the 'supply stack' in California (Figure 3.15-3). The California Independent System Operator Corporation (CAISO) dispatches energy in order, based on cost. In California this means that each night all of the nuclear, hydropower, and coal power is dispatched to meet demand, and varying amounts of combined cycle gas is also needed to meet demand[3]. This is what is referred to as 'the margin' – the energy resource which is dispatched when additional

[3] Note that the structure of the supply stack is different in different regions depending on the amount of each energy resource available.

demand is added to the system. In California, the resource that is added to the system when additional load is added during baseload periods is combined cycle gas.

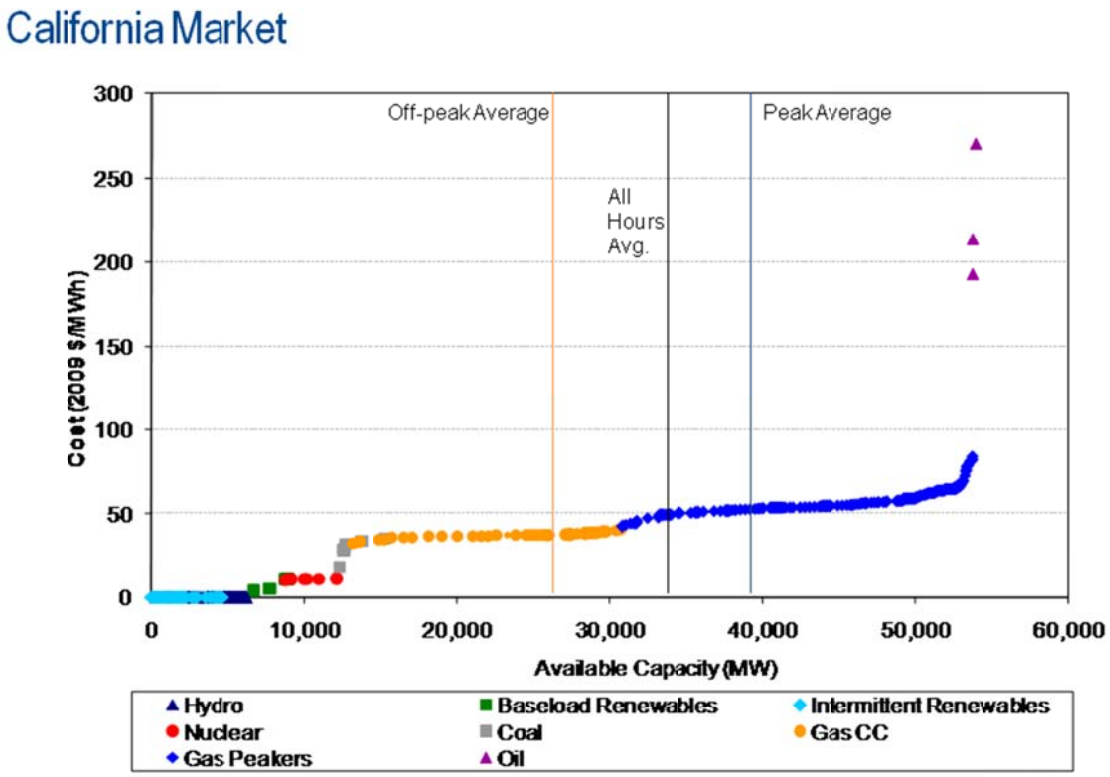

Figure 3.15-3. California energy supply curve. Costs are production costs, and do not include capital costs. Based on plant data from U.S. Energy Information Administration, North American Electric Reliability Corporation, CAISO and Pace Global estimates of current variable costs for each plant data. Source: Pace Global, 2010 and Ventyx Energy Velocity database.

Because of the way energy generation sources are dispatched in California, analysis of potential additional GHG emissions attributable to additional load must be considered on a system-wide basis rather than a single project basis. For example, if the Project were to contract directly with a wind power generator for its pump-back power, it would still be incorrect to claim that the additional load from the Project was GHG emission free. The wind in question would be dispatched by the CAISO regardless of the presence of this specific additional load, and the marginal generation resource that is still required to be added to the system to meet the additional load on a system-wide basis is combined-cycle natural gas.

Similarly, the system will not create more GHG emission related to coal when additional load is added to the California grid. The very limited available coal generation sources will have already been dispatched to meet base load demands in advance of the occurrence of the additional load, which then must be met by the next marginal cost source available to the system (combined cycle gas).

According to the CPUC (CPUC, 2010), the least-cost marginal source of power available on the California grid during night-time and weekend periods is combined-cycle natural-gas fired power[4]. Therefore, the most reasonably foreseeable scenario is that pump-back power would result in the dispatch of power from natural gas-fired combined-cycle power plants. Daytime peak power needs are met at present with simple-cycle natural gas-fired peaker[5] plants. For that reason, this source of power would be displaced by power generation from the proposed Project. On those bases, the GHG emissions analysis concluded that there would be a beneficial effect of net reduction of CO_2 from operation of the proposed Project, as shown in Table 3.15-2. CO_2 emission factors for simple-cycle and combined-cycle power plants used in the analysis were obtained from the CEC (CEC, 2010).

Table 3.15-2 shows overall emissions of CO_2 comparing power generation and pump-back power. The pump-back power required is greater than the power that is generated by the facility, however, due to the timing and source of power from which pump-back power (generally from plants with low air emissions) is derived, and the displacement of other peak power sources (generally peaker plants with higher emissions), overall emissions of CO_2 would be reduced by the overall system operation. Table 3.15-2 compares two scenarios for maximum and minimum displacement scenarios. Proposed Project generation is assumed to displace emissions from simple cycle power plants (natural gas-fired peaker plants). The difference in the scenarios is that pump-back power is assumed to be generated by renewable sources (generating no air pollutants) in the maximum displacement scenarios and by combined cycle power plants[6] in the minimum displacement scenarios.

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[4] A **combined cycle** power plant uses the exhaust of one heat engine as the heat source for another heat engine, thus extracting more useful energy from the heat, increasing the system's overall efficiency. This works because heat engines are only able to use a portion of the energy their fuel generates (usually less than 50%). Combining two or more thermodynamic cycles results in improved overall efficiency, reducing fuel costs and emissions. However, combined cycle power plants are more expensive to construct than simple cycle power plants.

[5] Natural gas peaker plants are operated only during high demand periods. The thermodynamic efficiency of simple-cycle gas turbine power plants ranges from 20 to 42%, with between 30 to 42% being average for a new plant. These plants are relatively inexpensive to build and the equipment can be operated for rapid changes in generation, but the efficiency is lower and emissions are higher than a combined cycle plant.

[6] In a combined cycle power plant a gas turbine generator generates electricity and the waste heat is used to make steam to generate additional electricity via a steam turbine; this last step enhances the efficiency of electricity generation. These types of plants are expensive to build and are generally used a base load plants, generating power during both peak and off-peak time periods.

In most cases, the pump-back power would probably include a mix of power from the combined cycle power plants and the renewable sources so the actual emissions displaced would fall between the maximum and minimum displaced amounts shown. As shown in Table 3.15-2, the proposed Project would be expected to have a net benefit for the state with regard to the generation of CO_2 pollutant emissions. The proposed Project power generation would reduce reliance on simple cycle power plants (displacing their CO_2 pollutant emissions) during peak periods of electricity demand and rely on cleaner power plants (including renewable power projects) for pump-back power during periods of low electricity demand.

Table 3.15-2. Annual Electrical Generation GHG Emissions (metric tons)

	Power Source		CO_2
Pump-back Power Used	Renewable Sources	GWh/Year	2,883
		Emission Factor (lbs/GWh)	0
		SF_6 Emissions from Substation (Co_2e metric tons)	360
	[A]	Annual Pollutants (metric tons)	360
	Combined Cycle	GWh/Year	2,883
		Emission Factor (lbs/GWh)	815,000
		SF_6 Emissions from Substation (Co_2e metric tons)	360
	[B]	Annual Pollutants (metric tons)	1,066,156
Generation Displaced	Simple Cycle	GWh/Year	2,278
		Emission Factor (lbs/GWh)	1,080,000
		SF_6 Emissions from Substation (Co_2e metric tons)	360
	[C]	Annual Pollutants (metric tons)	1,116,111
Summary of Displaced Emissions			
		Maximum Displaced Net Emissions Rows [C] - [A] (metric tons)	1,115,751
		Minimum Displaced Net Emissions Rows [C] - [B] (metric tons)	49,955

Notes: These emissions have been calculated using emissions factors from *Comparative Costs of California Central Station Electricity Generation* (CEC, 2010) for conventional simple cycle and combined cycle power plants. The analysis assumes 2,278 GWh of annual generation for the proposed Project (1.3 MW for 20% of the annual hours). The pump-back efficiency is 79%, resulting in more GWh/year required for the pump-back power requirements than are generated annually. Different amounts of annual generation would have directly proportional benefits of displacing CO_2 emissions. SF_6 emissions are a result of the transmission system, which is required for both pumping and generation.

In addition, by providing energy storage and ancillary services for transmission grid operations, the proposed Project would allow successful integration of reliable wind and solar power to meet the state's RPS for utilities to procure renewable energy products equal to 33 percent of retail sales. The proposed Project as an energy storage facility would leverage the increased use of alternative renewable sources of power such as wind and solar to displace generation of fossil-fueled power plants by firming the energy made from renewables. Storage of energy at Eagle Mountain would increase the value of renewable energy sources, especially wind but also solar, to the equivalent reliable capacity of fossil fuels because of the proposed Project's ability to store and dispatch that energy when needed and not just when the wind blows or the sun is shining. Essential benefits for efficiently operating the transmission grid with large scale (33 percent) integration of intermittent generation sources (wind and solar power), including voltage regulation, spinning reserves, and load following, would also be realized.

With regard to Assessment Item C (evaluate the basic energy efficiency parameters of a project), the proposed Project would assist in the state's ability to meet the AB 32 goals and overall state reduction goal of approximately 169 million metric tons/year of CO_2e, and achieving the statewide renewable energy mix of 33 percent.

With regard to Assessment Item D (identify any potential conflicts with any applicable plan, policy, or regulation), the proposed Project would not conflict with any applicable plan, policy, or regulation of an agency adopted for the purpose of reducing GHGs emissions.

The review of Assessment Items A, B, C, and D indicate that the proposed Project would not conflict with the state goals in AB 32 and therefore this potential impact would *be less than significant*.

Environmental Impact Assessment Summary:

(a) *Would the Project generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment*? No. The proposed Project would offset CO_2e production and enhance integration of wind and solar power.

(b) *Would the Project conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of GHGs?* No. The proposed Project would not conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions.

Impact 3.15-1 Generate GHG emissions, either directly or indirectly. This impact is *less than significant*. The proposed Project would offset CO_2e production and enhance integration of reliable of wind and solar power to meet the state's RPS, thus having a beneficial impact on GHG production. Although the impact is less than significant, the proposed Project includes Project Design Feature (PDF) GHG-1 which addresses the potential effect of the transmission line on GHGs.

Impact 3.15-2 Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of GHGs. Impacts would be *less than significant.* The proposed Project would not conflict with the state's ability to reach the overall goals of AB 32. Additionally, the proposed Project would not conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions.

3.15.4 Mitigation Program

In addition to not conflicting with state goals in AB 32 or SB 97, the proposed environmental measures associated with Section 3.12 Air Quality would also reduce the GHG emissions from the proposed Project, as would PDF GHG-1.

The mitigation program includes PDFs and mitigation measures (MMs). The PDFs are design elements inherent to the Project that reduce or eliminate potential impacts. MMs are provided to reduce impacts to below a level of significance, where applicable. As appropriate, performance standards have been built into MMs.

As mentioned under Regulatory Settings, LORS are based on local, state, or federal regulations or laws that are frequently required independent of CEQA review, yet also serve to offset or prevent certain impacts. The proposed Project will be constructed and operated in conformance with all applicable federal, state, and local LORS.

PDF GHG-1. SF_6 Monitoring. All SF_6-containing circuit breakers that are installed under the Project shall be cataloged and monitored pursuant to California state law and the recommendations of the SF_6 Reduction Partnership for Electric Power Systems.

3.15.5 Level of Impact after Implementation of Mitigation Program

Based upon the foregoing analysis, it is concluded that the proposed Project would not contribute to an increase in GHG emissions, and no mitigation for GHG emissions is required. This conclusion is based upon the analyses in Table 3.15-2. The most likely future scenario would be that power generation from the proposed Project would displace simple cycle power plants (natural gas-fired peaker plants) and that pump-back power would result in the dispatch of power from natural gas-fired combined cycle power plants. Under this scenario there would be a beneficial effect from each cycle of water through the proposed Project. Table 3.15-2 uses CO_2 emission factors for simple cycle and combined cycle power plants recommended by the CEC (CEC, 2010).

This analysis is based upon existing generation sources and conditions in California, and does not assume that cleaner generation sources would be available for the proposed Project's pump-back power in the future. Although it is not possible to accurately predict the energy generation mix in California over the next 50 years, it can be reasonably assumed that sources of generation

will become cleaner (i.e., lower GHG emissions) over decades to come, and the total emissions associated with pump-back power would likely decrease over the proposed 50-year life of the proposed Project, potentially resulting in a greater level of emissions offset than the amounts presented in Table 3.15.2.