

3.7 Greenhouse Gas Emissions

3.7.1 Existing Conditions

Environmental Setting

This section provides a discussion of global climate change and GHG emissions as they relate to the Initial and Full Repower phases. Information presented in this section is based on the *Air Quality and Greenhouse Gas Analysis Report* provided in Appendix C.

Climate Change

Climate change is a change in the average weather of the earth that is measured by alterations in wind patterns, storms, precipitation, and temperature. These changes are assessed using historical records of temperature changes occurring in the past, such as during previous ice ages. Many of the concerns regarding climate change use this data to extrapolate a level of statistical significance specifically focusing on temperature records from the last 150 years (the Industrial Age) that differ from previous climate changes in rate and magnitude.

The United Nations Intergovernmental Panel on Climate Change (IPCC) constructed several emission trajectories of GHG needed to stabilize global temperatures and climate change impacts. The IPCC predicted that global mean temperature change from 1990 to 2100, given six scenarios, could range from 1.1 degrees Celsius (°C) to 6.4°C. Regardless of analytical methodology, global average temperatures and sea levels are expected to rise under all scenarios (Intergovernmental Panel on Climate Change 2007a).

In California, climate change may result in consequences such as the following (from California Climate Change Center 2006 and Moser et al. 2009).

- A reduction in the quality and supply of water from the Sierra snowpack. If heat-trapping emissions continue unabated, more precipitation will fall as rain instead of snow, and the snow that does fall will melt earlier, reducing the Sierra Nevada spring snowpack by as much as 70–90 percent. This can lead to challenges in securing adequate water supplies. It can also lead to a potential reduction in hydropower.
- Increased risk of large wildfires. If rain increases as temperatures rise, wildfires in the grasslands and chaparral ecosystems of southern California are estimated to increase by approximately 30 percent toward the end of the twenty-first century because more winter rain will stimulate the growth of more plant *fuel* available to burn in the fall. In contrast, a hotter, drier climate could promote up to 90 percent more northern California fires by the end of the century by drying out and increasing the flammability of forest vegetation.
- Reductions in the quality and quantity of certain agricultural products. The crops and products likely to be adversely affected include wine grapes, fruit, nuts, and milk.
- Exacerbation of air quality problems. If temperatures rise to the medium warming range, there could be 75–85 percent more days with weather conducive to ozone formation in Los Angeles and the San Joaquin Valley, relative to today's conditions. This is more than twice the increase expected if rising temperatures remain in the lower warming range.

- A rise in sea levels resulting in the displacement of coastal businesses and residences. During the past century, sea levels along California's coast have risen about 7 inches. If heat-trapping emissions continue unabated and temperatures rise into the higher anticipated warming range, sea level is expected to rise an additional 22–35 inches by the end of the century. Elevations of this magnitude would inundate coastal areas with salt water, accelerate coastal erosion, threaten vital levees and inland water systems, and disrupt wetlands and natural habitats.
- Damage to marine ecosystems and the natural environment.
- An increase in infections, disease, asthma, and other health-related problems.
- A decrease in the health and productivity of California's forests.

Greenhouse Gases

Gases that trap heat in the atmosphere are referred to as GHGs. The effect is analogous to the way a greenhouse retains heat. Common GHGs include water vapor, carbon dioxide, methane, nitrous oxides, chlorofluorocarbons, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, ozone, and aerosols. Natural processes and human activities emit GHGs. The presence of GHGs in the atmosphere affects the earth's temperature. It is believed that emissions from human activities, such as electricity production and vehicle use, have elevated the concentration of these gases in the atmosphere beyond the level of naturally occurring concentrations.

Climate change is driven by forcings and feedbacks. Radiative forcing is the difference between the incoming energy and outgoing energy in the climate system. Positive forcing tends to warm the surface while negative forcing tends to cool it. Radiative forcing values are typically expressed in watts per square meter. A feedback is a climate process that can strengthen or weaken a forcing. For example, when ice or snow melts, it reveals darker land underneath which absorbs more radiation and causes more warming. The global warming potential is the potential of a gas or aerosol to trap heat in the atmosphere. The global warming potential of a gas is essentially a measurement of the radiative forcing of a GHG compared with the reference gas, carbon dioxide.

Individual greenhouse gas compounds have varying global warming potential and atmospheric lifetimes. Carbon dioxide, the reference gas for global warming potential, has been recognized by climate scientists as having a global warming potential of *one*, as a basis for comparing other gas compounds. The calculation of the carbon dioxide equivalent is a consistent methodology for comparing greenhouse gas emissions since it normalizes various greenhouse gas emissions to a consistent metric. Methane's warming potential of 21 indicates that methane has a 21 times greater warming affect than carbon dioxide on a molecule per molecule basis. A carbon dioxide equivalent is the mass emissions of an individual greenhouse gas multiplied by its global warming potential.

GHGs as defined by AB 32 include the following gases: carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. GHGs as defined by AB 32 are summarized in Table 3.7-1.

GHGs not defined by AB 32 include water vapor, ozone, and aerosols. Water vapor is an important component of our climate system and is not regulated. Ozone and aerosols are short-lived GHGs; global warming potentials for short-lived GHGs are not defined by the IPCC. Aerosols can remain suspended in the atmosphere for about a week and can warm the atmosphere by absorbing heat and cool the atmosphere by reflecting light. Black carbon is a type of aerosol that can also cause warming from deposition on snow.

Table 3.7-1. Greenhouse Gases

Greenhouse Gas	Description and Physical Properties	Sources
Nitrous oxide	Nitrous oxide is also known as laughing gas and is a colorless greenhouse gas. It has a lifetime of 114 years. Its global warming potential is 310.	Microbial processes in soil and water, fuel combustion, and industrial processes.
Methane	Methane is a flammable gas and is the main component of natural gas. It has a lifetime of 12 years. Its global warming potential is 21.	Methane is extracted from geological deposits (natural gas fields). Other sources are landfills, fermentation of manure, decay of organic matter, and cattle.
Carbon dioxide	Carbon dioxide is an odorless, colorless, natural greenhouse gas. Carbon dioxide's global warming potential is 1. The concentration in 2005 was 379 ppm, which is an increase of about 1.4 ppm per year since 1960.	Natural sources include decomposition of dead organic matter; respiration of bacteria, plants, animals, and fungus; evaporation from oceans; and volcanic outgassing. Anthropogenic sources are from burning coal, oil, natural gas, and wood.
Chlorofluorocarbons	These are gases formed synthetically by replacing all hydrogen atoms in methane or ethane with chlorine and/or fluorine atoms. They are nontoxic, nonflammable, insoluble, and chemically unreactive in the troposphere (the level of air at the earth's surface). Global warming potentials range from 3,800 to 8,100.	Chlorofluorocarbons were synthesized in 1928 for use as refrigerants, aerosol propellants, and cleaning solvents. They destroy stratospheric ozone. The Montreal Protocol on Substances that Deplete the Ozone Layer prohibited their production in 1987.
Hydrofluorocarbons	Hydrofluorocarbons are a group of GHGs containing carbon, chlorine, and at least one hydrogen atom. Global warming potentials range from 140 to 11,700.	Hydrofluorocarbons are synthetic manmade chemicals used as a substitute for chlorofluorocarbons in applications such as automobile air conditioners and refrigerants.
Perfluorocarbons	Perfluorocarbons have stable molecular structures and only break down by ultraviolet rays about 60 kilometers above Earth's surface. Because of this, they have long lifetimes, between 10,000 and 50,000 years. Global warming potentials range from 6,500 to 9,200.	Two main sources of perfluorocarbons are primary aluminum production and semiconductor manufacturing.
Sulfur hexafluoride	Sulfur hexafluoride is an inorganic, odorless, colorless, and nontoxic, nonflammable gas. It has a lifetime of 3,200 years. It has a high global warming potential, 23,900.	This gas is manmade and used for insulation in electric power transmission equipment, in the magnesium industry, in semiconductor manufacturing, and as a tracer gas.

Sources: Intergovernmental Panel on Climate Change 2007a, 2007b.

There are no adverse health effects from the concentration of GHGs in the atmosphere at the current levels, with the exception of ozone and aerosols (particulate matter). The potential health effects of ozone and particulate matter are discussed in criteria pollutant analyses. At very high concentrations, carbon dioxide, methane, sulfur hexafluoride, and some chlorofluorocarbons can cause suffocation as the gases can displace oxygen (National Institute for Occupational Safety and Health 2005, Occupational Safety and Health Administration 2003).

Emissions Inventories

Emissions worldwide were approximately 49,000 million metric tons of carbon dioxide equivalents (MMTCO₂e) in 2004 (Intergovernmental Panel on Climate Change 2007b). Greenhouse gas emissions in 2007, 2008, and 2009 are shown in Table 3.7-2.

Table 3.7-2. Greenhouse Gas Emissions Inventories

Emissions Inventory	CO ₂ e (metric tons)
2004 IPCC Global GHG Emissions Inventory	49,000,000,000
2011 EPA National GHG Emissions Inventory	6,702,300,000
2009 ARB State GHG Emissions Inventory	451,600,000
2007 SFBAAB GHG Emissions Inventory	95,800,000

Sources: Intergovernmental Panel on Climate Change 2007a; U.S. Environmental Protection Agency 2013; California Air Resources Board 2013; Bay Area Air Quality Management District 2010.

CO₂e = carbon dioxide equivalent.
 IPCC = Intergovernmental Panel on Climate Change.
 EPA = U. S. Environmental Protection Agency.
 ARB = California Air Resources Board.
 SFBAAB = San Francisco Bay Area Air Basin.

Regulatory Setting

This section describes the regulatory setting for GHG emissions and climate change that are applicable to the Initial and Full Repower. It also describes impacts on GHG emissions and climate change that would result from implementation of the Initial and Full Repower.

Federal

Greenhouse Gas Endangerment

Massachusetts v. EPA (Supreme Court Case 05-1120) was argued before the United States Supreme Court on November 29, 2006, in which it was petitioned that the EPA regulate four GHGs, including carbon dioxide, under Section 202(a)(1) of the Clean Air Act. A decision was made on April 2, 2007, in which the Supreme Court found that GHGs are air pollutants covered by the Clean Air Act. The Court held that the Administrator must determine whether emissions of GHGs from new motor vehicles cause or contribute to air pollution, which may reasonably be anticipated to endanger public health or welfare, or whether the science is too uncertain to make a reasoned decision. On December 7, 2009, the EPA Administrator signed two distinct findings regarding GHGs under section 202(a) of the Clean Air Act.

- **Endangerment Finding:** The Administrator finds that the current and projected concentrations of the six key well-mixed GHGs—carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride—in the atmosphere threaten the public health and welfare of current and future generations.
- **Cause or Contribute Finding:** The Administrator finds that the combined emissions of these well-mixed GHGs from new motor vehicles and new motor vehicle engines contribute to the GHG pollution which threatens public health and welfare.

Clean Vehicles

Congress first passed the Corporate Average Fuel Economy law in 1975 to increase the fuel economy of cars and light duty trucks. The law has become more stringent over time. On May 19, 2009, President Obama put in motion a new national policy to increase fuel economy for all new cars and trucks sold in the United States. On April 1, 2010, EPA and the U. S. Department of Transportation's National Highway Safety Administration announced a joint final rule establishing a national program that would reduce GHG emissions and improve fuel economy for new cars and trucks sold in the United States.

The first phase of the national program would apply to passenger cars, light-duty trucks, and medium-duty passenger vehicles, covering model years 2012 through 2016. They require these vehicles to meet an estimated combined average emissions level of 250 grams of carbon dioxide per mile, equivalent to 35.5 miles per gallon if the automobile industry were to meet this carbon dioxide level solely through fuel economy improvements. Together, these standards would cut carbon dioxide emissions by an estimated 960 MMT and 1.8 billion barrels of oil over the lifetime of the vehicles sold under the program (model years 2012–2016). EPA and the National Highway Safety Administration are working on a second-phase joint rulemaking to establish national standards for light-duty vehicles for model years 2017 and beyond.

On October 25, 2010, EPA and the U. S. Department of Transportation proposed the first national standards to reduce GHG emissions and improve fuel efficiency of *heavy-duty trucks and buses*. For combination tractors, the agencies are proposing engine and vehicle standards that begin in the 2014 model year and achieve up to a 20 percent reduction in carbon dioxide emissions and fuel consumption by the 2018 model year. For heavy-duty pickup trucks and vans, the agencies are proposing separate gasoline and diesel truck standards, which phase-in starting in the 2014 model year and achieve up to a 10 percent reduction for gasoline vehicles and 15 percent reduction for diesel vehicles by 2018 model year (12 and 17 percent, respectively, if accounting for air conditioning leakage). Lastly, for vocational vehicles, the agencies are proposing engine and vehicle standards starting in the 2014 model year, which would achieve up to a 10-percent reduction in fuel consumption and carbon dioxide emissions by 2018 model year.

Mandatory Reporting of Greenhouse Gases

The Consolidated Appropriations Act of 2008, passed in December 2007, requires the establishment of mandatory GHG reporting requirements. On September 22, 2009, EPA issued the Final Mandatory Reporting of Greenhouse Gases Rule. The rule requires reporting of GHG emissions from large sources and suppliers in the United States, and is intended to collect accurate and timely emissions data to inform future policy decisions. Under the rule, suppliers of fossil fuels or industrial GHGs, manufacturers of vehicles and engines, and facilities that emit 25,000 MT or more per year of GHG emissions are required to submit annual reports to the EPA.

New Source Review

EPA issued a final rule on May 13, 2010 that establishes thresholds for GHGs that define when permits under the New Source Review Prevention of Significant Deterioration and Title V Operating Permit programs are required for new and existing industrial facilities. This final rule *tailors* the requirements of these Clean Air Act permitting programs to limit which facilities will be required to obtain Prevention of Significant Deterioration and Title V permits. In the preamble to the revisions to the CFR, EPA states:

This rulemaking is necessary because without it the Prevention of Significant Deterioration and Title V requirements would apply, as of January 2, 2011, at the 100 or 250 tons per year levels provided under the Clean Air Act, greatly increasing the number of required permits, imposing undue costs on small sources, overwhelming the resources of permitting authorities, and severely impairing the functioning of the programs. EPA is relieving these resource burdens by phasing in the applicability of these programs to greenhouse gas sources, starting with the largest greenhouse gas emitters. This rule establishes two initial steps of the phase-in. The rule also commits the agency to take certain actions on future steps addressing smaller sources, but excludes certain smaller sources from Prevention of Significant Deterioration and Title V permitting for greenhouse gas emissions until at least April 30, 2016.

EPA estimates that facilities responsible for nearly 70 percent of the national GHG emissions from stationary sources will be subject to permitting requirements under this rule. This includes the nation's largest GHG emitters—power plants, refineries, and cement production facilities.

State

Pavley Regulations

California Assembly Bill (AB) 1493, enacted on July 22, 2002, required ARB to develop and adopt regulations that reduce GHGs emitted by passenger vehicles and light duty trucks. The regulation was stalled by automaker lawsuits and by the EPA's denial of an implementation waiver. On January 21, 2009, ARB requested that EPA reconsider its previous waiver denial. On January 26, 2009, President Obama directed EPA to assess whether the denial of the waiver was appropriate. On June 30, 2009, EPA granted the waiver request.

The first standards implementing AB 1493, referred to as Pavley I, will be phased in during the 2009 through 2016 model years. When fully phased in, the near-term (2009–2012) standards will result in about a 22-percent reduction compared with the 2002 fleet, and the mid-term (2013–2016) standards will result in about a 30-percent reduction. Several technologies stand out as providing significant reductions in emissions at favorable costs. These include discrete variable valve lift or camless valve actuation to optimize valve operation rather than relying on fixed valve timing and lift as has historically been done; turbocharging to boost power and allow for engine downsizing; improved multi-speed transmissions; and improved air conditioning systems that operate optimally, leak less, and/or use an alternative refrigerant. Pavley II was incorporated into the Amendments to the Low-Emission Vehicle Program referred to as LEV III. The amendments, effective August 7, 2012, apply to vehicles for model years 2017 through 2025. The regulation will reduce GHGs from new cars by 34 percent from 2016 levels by 2025.

Executive Order S-3-05

Former California Governor Arnold Schwarzenegger announced on June 1, 2005, through Executive Order S-3-05, the following reduction targets for GHG emissions.

- 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.

The 2050 reduction goal represents what scientists believe is necessary to reach levels that will stabilize the climate. The 2020 goal was established to be an aggressive, but achievable, mid-term target. Because this is an executive order, the goals are not legally enforceable for local governments or the private sector.

Low Carbon Fuel Standard—Executive Order S-01-07

The Governor signed Executive Order S-01-07 on January 18, 2007. The order mandates that a statewide goal shall be established to reduce the carbon intensity of California's transportation fuels by at least 10 percent by 2020. In particular, the executive order established a Low Carbon Fuel Standard and directed the Secretary for Environmental Protection to coordinate the actions of CEC, ARB, the University of California, and other agencies to develop and propose protocols for measuring the *life-cycle carbon intensity* of transportation fuels. This analysis supporting development of the protocols was included in the SIP for alternative fuels (State Alternative Fuels Plan adopted by CEC on December 24, 2007) and was submitted to ARB for consideration as an *early action* item under AB 32. ARB adopted the Low Carbon Fuel Standard on April 23, 2009. The Low Carbon Fuel Standard was challenged in the United States District Court in Fresno in 2011. The court's ruling issued on December 29, 2011 included a preliminary injunction against ARB's implementation of the rule. The Ninth Circuit Court of Appeals stayed the injunction on April 23, 2012 pending final ruling on appeal, allowing ARB to continue to implement and enforce the regulation.

Senate Bill 97 and the State CEQA Guidelines Update

Passed in August 2007, Senate Bill (SB) 97 added Section 21083.05 to the PRC. The code states "(a) On or before July 1, 2009, the Office of Planning and Research shall prepare, develop, and transmit to the Resources Agency guidelines for the mitigation of greenhouse gas emissions or the effects of greenhouse gas emissions as required by this division, including, but not limited to, effects associated with transportation or energy consumption. (b) On or before January 1, 2010, the Resources Agency shall certify and adopt guidelines prepared and developed by the Office of Planning and Research pursuant to subdivision (a)." Section 21097 was also added to the PRC. On February 16, 2010, the Office of Administrative Law approved the amendments, and filed them with the Secretary of State for inclusion in the CCRs. The amendments became effective on March 18, 2010.

The CEQA Amendments provide guidance to public agencies regarding the analysis and mitigation of the effects of GHG emissions in CEQA documents. The CEQA Amendments fit within the existing CEQA framework by amending existing State CEQA Guidelines to reference climate change.

A new section, State CEQA Guidelines Section 15064.4, was added to assist agencies in determining the significance of GHG emissions. The new section allows agencies the discretion to determine whether a quantitative or qualitative analysis is best for a particular project. However, little guidance is offered on the crucial next step in this assessment process—how to determine whether the project's estimated GHG emissions are significant or cumulatively considerable.

Also amended were State CEQA Guidelines Sections 15126.4 and 15130, which address mitigation measures and cumulative impacts respectively. GHG mitigation measures are referenced in general terms, but no specific measures are championed. The revision to the cumulative impact discussion requirement (Section 15130) simply directs agencies to analyze GHG emissions in an EIR when a project's incremental contribution of emissions may be cumulatively considerable; however, it does not answer the question of when emissions are cumulatively considerable, as no significance thresholds are defined.

Section 15183.5 permits programmatic GHG analysis and later project-specific tiering, as well as the preparation of Greenhouse Gas Reduction Plans. Compliance with such plans can support a determination that a project's cumulative effect is not cumulatively considerable, according to proposed Section 15183.5(b).

In addition, the amendments revised Appendix F of the State CEQA Guidelines, which focuses on Energy Conservation. The sample environmental checklist in Appendix G was amended to include GHG questions.

Assembly Bill 32

The California State Legislature enacted AB 32, the California Global Warming Solutions Act of 2006. AB 32 requires that GHG emitted in California be reduced to 1990 levels by the year 2020. *Greenhouse gases* as defined under AB 32 include CO₂, methane, NO_x, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. ARB is the state agency charged with monitoring and regulating sources of GHG. AB 32 states the following.

Global warming poses a serious threat to the economic well-being, public health, natural resources, and the environment of California. The potential adverse impacts of global warming include the exacerbation of air quality problems, a reduction in the quality and supply of water to the state from the Sierra snowpack, a rise in sea levels resulting in the displacement of thousands of coastal businesses and residences, damage to marine ecosystems and the natural environment, and an increase in the incidences of infectious diseases, asthma, and other human health-related problems.

The ARB Board approved a calculated determination that the 1990 GHG emissions level was 427 MMTCO₂e on December 6, 2007 (California Air Resources Board 2007). Therefore, emissions generated in California in 2020 are required to be equal to or less than 427 MMTCO₂e. Emissions in 2020 in a *business as usual* scenario are estimated to be 596 MMTCO₂e.

Under AB 32, ARB published its Final Expanded List of Early Action Measures to Reduce Greenhouse Gas Emissions in California. Discrete early action measures became enforceable as of January 1, 2010. ARB has 44 early action measures that apply to the transportation, commercial, forestry, agriculture, cement, oil and gas, fire suppression, fuels, education, energy efficiency, electricity, and waste sectors. Of these early action measures, nine are considered discrete early action measures, as they are regulatory and enforceable as of January 1, 2010. ARB estimates that the 44 recommendations are expected to result in reductions of at least 42 MMTCO₂e by 2020, representing approximately 25 percent of the 2020 target.

ARB's Climate Change Scoping Plan (Scoping Plan) contains measures designed to reduce the state's emissions to 1990 levels by the year 2020 (California Air Resources Board 2008). The Scoping Plan identifies recommended measures for multiple GHG emission sectors and the associated emission reductions needed to achieve the year 2020 emissions target—each sector has a different emission reduction target. Most of the measures target the transportation and electricity sectors. As stated in the Scoping Plan, the key elements of the strategy for achieving the 2020 GHG target include the following.

- 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.
- 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.

In addition, the Scoping Plan differentiates between *capped* and *uncapped* strategies. *Capped* strategies are subject to the proposed cap-and-trade program. The Scoping Plan states that the inclusion of these emissions within the cap-and-trade program will help ensure that the year 2020 emission targets are met despite some degree of uncertainty in the emission reduction estimates for any individual measure. Implementation of the capped strategies is calculated to achieve a sufficient amount of reductions by 2020 to achieve the emission target contained in AB 32. *Uncapped* strategies that will not be subject to the cap-and-trade emissions caps and requirements are provided as a margin of safety by accounting for additional GHG emission reductions.

On March 17, 2011, the San Francisco Superior Court issued a final decision in *Association of Irrigated Residents v. California Air Resources Board* (Case No. CPF-09-509562). While the Court upheld the validity of the ARB Scoping Plan for the implementation of AB 32, the Court enjoined ARB from further rulemaking under AB 32 until ARB amends its CEQA environmental review of the Scoping Plan to address the flaws identified by the Court. On May 23, 2011, ARB filed an appeal. On June 24, 2011, the Court of Appeal granted ARB's petition staying the trial court's order pending consideration of the appeal. In the interest of informed decision-making, on June 13, 2011, ARB released the expanded alternatives analysis in a draft Supplement to the AB 32 Scoping Plan Functional Equivalent Document. The ARB Board approved the Scoping Plan and the CEQA document on August 24, 2011.

Senate Bill 375

Passing the Senate on August 30, 2008, SB 375 was signed by the Governor on September 30, 2008. According to SB 375, the transportation sector is the largest contributor of GHG emissions, which emits over 40 percent of the total GHG emissions in California. SB 375 states, "Without improved land use and transportation policy, California will not be able to achieve the goals of AB 32." SB 375 does the following: (1) requires metropolitan planning organizations to include sustainable community strategies in their regional transportation plans for reducing GHG emissions, (2) aligns planning for transportation and housing, and (3) creates specified incentives for the implementation of the strategies.

Renewable Electricity Standards

On September 12, 2002, Governor Gray Davis signed SB 1078 requiring California to generate 20 percent of its electricity from renewable energy by 2017. SB 107 changed the due date to 2010 instead of 2017. On November 17, 2008, Governor Arnold Schwarzenegger signed Executive Order

S-14-08, which established a RPS target for California requiring that all retail sellers of electricity serve 33 percent of their load with renewable energy by 2020. Governor Schwarzenegger also directed ARB (Executive Order S-21-09) to adopt a regulation by July 31, 2010, requiring the state's load serving entities to meet a 33 percent renewable energy target by 2020. ARB approved the Renewable Electricity Standard on September 23, 2010 by Resolution 10-23.

Executive Order S-13-08

Executive Order S-13-08 indicates that “climate change in California during the next century is expected to shift precipitation patterns, accelerate sea level rise and increase temperatures, thereby posing a serious threat to California’s economy, to the health and welfare of its population and to its natural resources.” Pursuant to the requirements in the order, the 2009 California Climate Adaptation Strategy (California Natural Resources Agency 2009) was adopted, which is the “. . . first statewide, multi-sector, region-specific, and information-based climate change adaptation strategy in the United States.” Objectives include analyzing risks of climate change in California, identifying and exploring strategies to adapt to climate change, and specifying a direction for future research.

Local

Bay Area Air Quality Management District

BAAQMD established a Climate Action Program in 2005 to integrate climate protection activities into existing BAAQMD programs. As part of this program, BAAQMD developed the Climate Action Web Portal for local governments to access tools and resources for climate change activities, including best practices, case studies, and news and events from local governments. In addition, BAAQMD prepared a GHG emissions inventory for the area under its jurisdiction, along with a county-level breakdown of GHG emissions in the basin.

In 2008, BAAQMD approved a fee on stationary air pollution sources in its jurisdiction to help defray the costs associated with the BAAQMD’s climate protection activities and programs, including environmental review, air pollution regulations, and emissions inventory development. Industrial facilities and businesses that are currently required to submit an air quality permit to operate will have a fee of 4.4 cents per MT of GHG emissions added to their permit bill.

In addition, BAAQMD updated its CEQA Air Quality Guidelines in 2010 to include both numeric and qualitative GHG thresholds and recommended assessment methodologies for project- and plan-level analyses. However, an Alameda Superior Court ruled in January 2012 in *California Building Industry Association v. Bay Area Air Quality Management District*, that BAAQMD had violated CEQA by adopting thresholds without appropriate CEQA review and documentation. The Court ruled that the new thresholds (including new thresholds for TACs and PM2.5) are considered a *project* under CEQA, and thus the BAAQMD should have prepared the required CEQA review and documentation.

In August 2013, the California First District Court of Appeal ruled that BAAQMD was not arbitrary in establishing their thresholds and that the agency did not violate CEQA. Consequently, the BAAQMD’s CEQA thresholds can be recommended to lead agencies.

Alameda County

Alameda County (Unincorporated Areas) Community Climate Action Plan

The *Alameda County (Unincorporated Areas) Community Climate Action Plan (CAP)* was approved by the County Board of Supervisors in June 2011 but is not in effect pending completion of environmental review that is currently in process. The CAP outlines a course of action to reduce GHG emissions generated within the unincorporated areas of Alameda County, and sets targeted GHG emissions reductions of 15 percent below 2005 levels by 2020. The Plan sets goals and actions in six areas: transportation, land use, building energy, water, waste, and green infrastructure.

3.7.2 Environmental Impacts

This section includes a discussion of each impact as it corresponds to the significance criteria presented below.

Determination of Significance

State CEQA Guidelines

Based on Appendix G of the State CEQA Guidelines, the Initial and Full Repower would be considered to have a significant effect if they would result in any of the conditions listed below.

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

BAAQMD CEQA Air Quality Guidelines

BAAQMD does not have an adopted threshold of significance for construction-related GHG emissions. BAAQMD still recommends that the emissions be quantified and disclosed, and significance should be determined based on the impact the construction GHG emissions may have in relation to AB 32 GHG reduction goals.

BAAQMD has established three alternative significance thresholds for GHGs that are applicable to the operational phase of the Initial and Full Repower. These thresholds are listed below.

- Compliance with a qualified GHG reduction strategy.
- 1,100 MTCO₂e per year emission level.
- 4.6 MTCO₂e/service population per year (residents plus employees).

In the case of the reduction strategy, compliance or conformity would indicate a project would not have a significant GHG impact for the purposes of CEQA. The latter two indices define levels for which a project would be deemed to have significant GHG impacts were its emissions to exceed the identified quantities.

Impacts and Mitigation Measures

GHG emissions for the Sand Hill Wind Project were quantified using the methods and assumptions described in the methods for analysis in Chapter 3.3, *Air Quality*. Additional modeling details are provided in this section for construction and operational emissions. The following analysis presents the project-level evaluation of the Initial Repower phase and is followed by a discussion of the Full Repower under *Program-Level Discussion*.

This analysis is restricted to GHGs identified by AB 32, which include carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. The Initial Repower and Full Repower would generate a variety of GHGs during construction and operation, including several defined by AB 32 such as carbon dioxide, methane, and nitrous oxide.

Both the Initial Repower and Full Repower may also emit GHGs that are not defined by AB 32. For example, the project may generate aerosols. Aerosols are short-lived particles, as they remain in the atmosphere for about 1 week. Black carbon is a component of aerosol. Studies have indicated that black carbon has a high global warming potential; however, IPCC states that it has a low level of scientific certainty (Intergovernmental Panel on Climate Change 2007a). Water vapor could be emitted from evaporated water used for landscaping, but this is not a significant impact because water vapor concentrations in the upper atmosphere are primarily due to climate feedbacks rather than emissions from project-related activities. In addition, no introduced landscaping or irrigation is associated with either the Initial Repower phase or the Full Repower, except as may be required on a very temporary basis for certain site restoration activities. The project would emit NO_x and VOCs, which are ozone precursors. Ozone is a GHG; however, unlike the other GHGs, ozone in the troposphere is relatively short-lived and can be reduced in the troposphere on a daily basis. Stratospheric ozone can be reduced through reactions with other pollutants.

Certain GHGs defined by AB 32 would not be emitted by the project. Perfluorocarbons and sulfur hexafluoride are typically used in industrial applications, none of which would be used by the repower. Therefore, it is not anticipated that either the Initial Repower or the Full Repower phase would emit perfluorocarbons or sulfur hexafluoride.

An upstream emission source (also known as life cycle emissions) refers to emissions that were generated during the manufacture of products to be used for construction of a project. Upstream emission sources for the project include, but are not limited to, emissions from the manufacture of cement, emissions from the manufacture of steel, and/or emissions from the transportation of building materials to the material wholesaler. The upstream emissions were not estimated because they are not within the control of the project proponent and to do so would be speculative. Additionally, the California Air Pollution Control Officers Association White Paper on CEQA and climate change supports this conclusion by stating, "The full life-cycle of GHG [greenhouse gas] emissions from construction activities is not accounted for . . . and the information needed to characterize [life-cycle emissions] would be speculative at the CEQA analysis level" (California Air Pollution Control Officers Association 2008). Therefore, pursuant to State CEQA Guidelines Sections 15144 and 15145, upstream/ life-cycle emissions are speculative and no further discussion is necessary.

Initial Repower

Impact GHG-1: Generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment (significant and unavoidable)

Construction

The project would emit GHGs from upstream emission sources and direct sources (combustion of fuels from worker vehicles and construction equipment). For assumptions used in estimating these emissions, please refer to the methods for analysis in Section 3.3, *Air Quality*. Unmitigated GHG emissions from construction equipment and worker vehicles for the Initial Repower are shown in Table 3.7-3.

BAAQMD does not have thresholds for construction-related GHG emissions, and therefore no specific construction-related emissions can be specifically determined (although such thresholds could be established after 2020, when the 1990-level GHGs is to be met). The construction emissions shown in Table 3.7-3 can be compared to the BAAQMD operational threshold of 1,100 MTCO₂e for informational purposes. Because the construction emissions exceed the operational threshold by more than 100 percent, construction GHG emissions would be significant. BAAQMD does recommend BMPs to minimize construction-related GHG emissions, which would be implemented during the construction phase of the Initial Repower. These measures are described in Mitigation Measure GHG-1. Even with the implementation of the measures described in Mitigation Measure GHG-1, construction GHG emissions would remain significant. This impact would be significant and unavoidable.

Table 3.7-3. Initial Repower Construction Greenhouse Gas Emissions

Phase		Emissions (pounds CO ₂ e per day)			Days	Total MTCO ₂ e
		Onsite	Offsite	Subtotal		
Site Preparation	Site Preparation 1	9,846	760	10,606	65	345
	Site Preparation 2	9,800	85	9,885	85	420
	Site Preparation 3	6,533	53	6,587	130	428
Tower Construction	Tower Construction 1	1,796	1,410	3,206	65	104
	Tower Construction 2	5,828	2,369	8,196	130	533
	Tower Construction 3	4,396	3,238	7,634	105	401
Project Total		-	-	-	-	2,231

MTCO₂e = metric tons of carbon dioxide.
 Equivalent = pounds per day x days x 0.0005.

Operation

As discussed in methods for analysis in Chapter 3.3, *Air Quality*, the Initial Repower would replace 4 MWs of existing wind turbines with newer technology wind turbines equivalent to 4 MWs of generating capacity. The GHG emissions offset by the Initial Repower would not differ substantially from the emissions offset by the current wind turbines, as the generating capacity would remain unchanged. Therefore, operational GHG impacts would be less than significant. No mitigation is necessary.

Mitigation Measure GHG-1: Implement BAAQMD BMPs for construction

The project applicant will require all construction contractors to implement the BMPs recommended by BAAQMD to reduce GHG emissions. Emission reduction measures will include, at a minimum, the following three measures.

- Use alternative-fueled (e.g., biodiesel, electric) construction vehicles/equipment for at least 15 percent of the fleet.
- Recycle or reuse at least 50 percent of the construction waste or demolition materials.
- Use local-sourced building materials of at least 10 percent of total.

Impact GHG-2: Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of GHGs (less than significant)**Alameda County (Unincorporated Areas) Community Climate Action Plan**

As discussed in the regional regulatory section, Alameda County's CAP is currently awaiting environmental review. Project consistency with the CAP may be evaluated by considering the extent in which the Initial Repower supports the actions identified in the CAP, the consistency with the ABAG population growth projections, and the extent to which the Initial Repower would interfere with the actions identified in the CAP.

The Initial Repower would involve repowering wind turbines, which is consistent with the CAP's Renewable Energy Strategies and Measures. The CAP measures under this strategy area focus on solar power measures, but the use of wind power as a renewable energy source is consistent with the CAP's Renewable Energy Strategies. The Initial Repower is not anticipated to be growth inducing, and therefore, would be consistent with ABAG population projections. The Initial Repower would be consistent with the CAP and impacts would be less than significant.

Assembly Bill 32 Scoping Plan

AB 32 focuses on reducing GHGs (CO, methane, NO_x, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride) to 1990 levels by the year 2020. Pursuant to the requirements in AB 32, ARB adopted the Scoping Plan in 2008, which outlines actions recommended to obtain that goal.

The Scoping Plan contains a variety of strategies to reduce the state's emissions. Scoping Plan Measure 4 (RPS) may be applicable to the Initial Repower. The Initial Repower would involve the repowering of wind turbines for energy generation; however, this would not add additional renewable energy generating capacity. As shown in Table 3.7-4, the remainder of the strategies would not be applicable to the Initial Repower.

The impact would be less than significant. No mitigation is required.

Table 3.7-4. Inapplicable ARB Scoping Plan Reduction Measures

Scoping Plan Reduction Measure	Reason Why Not Applicable
1. California Cap-and-Trade Program Linked to Western Climate Initiative. Implement a broad-based California Cap-and-Trade program to provide a firm limit on emissions. Link the California cap-and-trade program with other Western Climate Initiative Partner programs to create a regional market system to achieve greater environmental and economic benefits for California. Ensure California's program meets all applicable AB 32 requirements for market-based mechanisms.	When this cap-and-trade system begins, products or services (such as electricity) would be covered and the cost of the cap-and-trade system would be transferred to the consumers. Because the Initial Repower does not result in any net electricity generation, it would not be a suitable project for emissions trading under cap-and-trade.
2. California Light-Duty Vehicle Greenhouse Gas Standards. Implement adopted standards and planned second phase of the program. Align zero-emission vehicle, alternative and renewable fuel and vehicle technology programs with long-term climate change goals.	This is a statewide measure that cannot be implemented by a project applicant or lead agency.
3. Energy Efficiency. Maximize energy efficiency building and appliance standards; pursue additional efficiency including new technologies, policy, and implementation mechanisms. Pursue comparable investment in energy efficiency from all retail providers of electricity in California.	This is a measure for the state to increase its energy efficiency standards and cannot be implemented by a project applicant.
4. Renewable Portfolio Standard. Achieve 33 percent renewable energy mix statewide. Renewable energy sources include (but are not limited to) wind, solar, geothermal, small hydroelectric, biomass, anaerobic digestion, and landfill gas.	This is a statewide measure that cannot be implemented by a project applicant or lead agency. Pacific Gas and Electric obtains 19 percent of its power supply from renewable sources such as geothermal.
5. Low Carbon Fuel Standard. Develop and adopt the Low Carbon Fuel Standard.	This is a statewide measure that cannot be implemented by a project applicant or lead agency. When this measure is initiated, the standard would be applicable to the fuel used by vehicles that would access the project site.
6. Regional Transportation-Related Greenhouse Gas Targets. Develop regional GHG emissions reduction targets for passenger vehicles. This measure refers to SB 375.	The Initial Repower is not related to developing GHG emission reduction targets.
7. Vehicle Efficiency Measures. Implement light-duty vehicle efficiency measures.	When this measure is initiated, the standards would be applicable to the light-duty vehicles that would access the project area.
8. Goods Movement. Implement adopted regulations for the use of shore power for ships at berth. Improve efficiency in goods movement activities.	The Initial Repower does not propose any changes to maritime, rail, or intermodal facilities or forms of transportation.
9. Million Solar Roofs Program. Install 3,000 MW of solar-electric capacity under California's existing solar programs.	This measure is to increase solar throughout California, which is being done by various electricity providers and existing solar programs.

Scoping Plan Reduction Measure	Reason Why Not Applicable
10. Medium/Heavy-Duty Vehicles. Adopt medium and heavy-duty vehicle efficiency measures.	This is a statewide measure that cannot be implemented by a project applicant or lead agency. When this measure is initiated, the standards would be applicable to the vehicles that access the project area.
11. Industrial Emissions. Require assessment of large industrial sources to determine whether individual sources within a facility can cost-effectively reduce GHG emissions and provide other pollution reduction co-benefits. Reduce GHG emissions from fugitive emissions from oil and gas extraction and gas transmission. Adopt and implement regulations to control fugitive methane emissions and reduce flaring at refineries.	This measure would apply to the direct GHG emissions at major industrial facilities emitting more than 500,000 MTCO _{2e} per year.
12. High Speed Rail. Support implementation of a high-speed rail system.	This is a statewide measure that cannot be implemented by a project applicant or lead agency.
13. Green Building Strategy. Expand the use of green building practices to reduce the carbon footprint of California's new and existing inventory of buildings.	The State is to increase the use of green building practices. The Initial Repower would not result in the construction of new buildings.
14. High Global Warming Potential Gases. Adopt measures to reduce high global warming potential gases.	When this measure is initiated, it would be applicable to the high global warming potential gases.
15. Recycling and Waste. Reduce methane emissions at landfills. Increase waste diversion, composting, and commercial recycling. Move toward zero-waste.	The Initial Repower would not contain a landfill.
16. Sustainable Forests. Preserve forest sequestration and encourage the use of forest biomass for sustainable energy generation.	No forested lands exist onsite.
17. Water. Continue efficiency programs and use cleaner energy sources to move and treat water.	This is a measure for state and local agencies.
18. Agriculture. In the near-term, encourage investment in manure digesters and at the five-year Scoping Plan update determine if the program should be made mandatory by 2020.	No grazing, feedlot, or other agricultural activities that generate manure occur onsite or are proposed to be implemented by the project applicant.

Full Repower

Impact GHG-1[F]: Generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment (significant and unavoidable)

Construction

The Full Repower emissions are based on the same modeling assumptions and results as those identified for the Initial Repower described above, but scaled to address the larger number of turbines that would be decommissioned and constructed for the Full Repower. The estimated GHG emissions from construction equipment and worker vehicles for the Full Repower are provided in Table 3.7-5. The analysis includes estimates of GHG emissions during the construction of the Full Repower and the total emissions from the Initial Repower and the Full Repower phases.

Table 3.7-5. Full Repower and Total Construction Greenhouse Gas Emissions

Full Repower Phase	Total MTCO _{2e}
Site Preparation	8,948
Tower Construction	7,785
Full Repower Project Total	16,733
Initial Repower Project Total	2,231
Total for Initial and Full Repower Project	18,694

MTCO_{2e} = metric tons of carbon dioxide.
Equivalents = pounds per day x days x 0.0005.

BAAQMD does not have thresholds for construction-related GHG emissions, but the air district does have an operational GHG threshold of 1,100 MTCO_{2e}. Comparing the total construction emissions (18,694 MTCO_{2e}) to the operational threshold, for informational purposes, shows that construction emissions would be substantially higher than the only available BAAQMD GHG threshold. As a result, total construction GHG emissions would be significant. BAAQMD does recommend BMPs to minimize construction-related GHG emissions, which are included in Mitigation Measure GHG-1. The measures would be implemented during the construction phases of the Initial Repower and Future Repower. Even with implementation of the measures described in Mitigation Measure GHG-1, construction GHG emissions would still be significant. This impact would be significant and unavoidable.

Operation

The Full Repower would install new, shrouded turbines with generating capacity of 30 MWs by the end of 2016 (for a total of 34 MWs). The GHG emissions offset by the newer shrouded turbines under the Full Repower would not differ substantially from the emissions offset by conventional turbines under the Full Repower, as the generating capacity would remain unchanged. Therefore, operational GHG impacts under the Full Repower would be less than significant. No mitigation is necessary.

Mitigation Measure GHG-1: Implement BAAQMD BMPs for construction

Please refer to the discussion of Mitigation Measure GHG-1 under *Initial Repower*, Impact GHG-1.

Impact GHG-2[F]: Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of GHGs (less than significant)

As described above for the Initial Repower, the Full Repower would involve repowering wind turbines, which would be consistent with Alameda County CAP's Renewable Energy Strategies and Measures. The CAP measures under this strategy area focus on solar power measures, but the use of wind power as a renewable energy source is consistent with the CAP's Renewable Energy Strategies. The Full Repower would not be anticipated to be growth inducing, and therefore, would be consistent with ABAG population projections. The Full Repower would be consistent with the CAP and impacts would be less than significant.

As discussed above for the Initial Repower, AB 32 Scoping Plan Measure 4 (RPS) may be applicable to the Full Repower (Table 3.7.4). The Full Repower would involve the repowering of wind turbines for energy generation; however, this would not add additional renewable energy generating capacity. Scoping Plan Measure 13 may be applicable to the proposed O&M building that would be

constructed under the Full Repower. This building may be subject to the state's green building standards. As shown in Table 3.7-4 above, the other ARB Scoping Plan strategies would not be applicable to the Full Repower.

The impact would be less than significant. No mitigation is required.

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