4.10 Greenhouse Gas Emissions

This section describes the Project's contribution toward global climate change (GCC) through the creation of greenhouse gas (GHG) emissions that would be generated as a result of Project actions. GCC is expressed as changes in the average weather of the Earth as measured by change in wind patterns, storms, precipitation, and temperature. Much scientific research has indicated that the human-related emissions of GHGs above natural levels are likely a significant contributor to GCC. Because the direct environmental effect of GHG emissions is the increase in average global temperatures, which in turn has numerous indirect effects on the environment and humans, the area of influence for GHG impacts associated with the Project would be global. However, those cumulative global impacts would be manifested as impacts on resources and ecosystems in California, as well as across the United States. Additionally, because this analysis concerns cumulative global impacts, there is no separate cumulative impacts analysis for GCC.

The following discussion addresses existing environmental conditions in the affected area, identifies and analyzes environmental impacts for the proposed Project, and recommends measures to reduce or avoid adverse impacts anticipated from Project construction and operation. The applicable regulations are presented, and additional plans and policies are discussed, including the State CEQA Guidelines and other relevant planning documents, such as general plans, climate action plans, and GHG emissions reduction plans as applicable to the proposed Project. The Lompoc Wind Energy Project (LWEP) EIR provided only minimal information on this topic and no impact discussion. Therefore, this section is a new impact section that did not appear in the LWEP EIR.

4.10.1 Environmental Setting

4.10.1.1 Physical Setting

The global climate depends on the presence of naturally occurring greenhouse gases (GHG) to provide what is commonly known as the "greenhouse effect" that allows heat radiated from the Earth's surface to warm the atmosphere. The greenhouse effect is driven mainly by water vapor, aerosols, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), as well as other constituents. Globally, the presence of GHG affects temperatures, precipitation, sea levels, ocean currents, wind patterns, and storm activity. Human activity directly contributes to emissions of six primary anthropogenic GHGs: CO_2, CH_4, N_2O, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). The standard definition of anthropogenic GHG includes these six substances under the 1997 Kyoto Protocol (UNFCCC, 1998).

The most important and widely occurring anthropogenic GHG is CO_2, primarily from the use of fossil fuels as a source of energy. Other anthropogenic activities that are major sources of CO_2 include deforestation, other changes in land use, and cement production. Fertilizer use, agriculture, and land use change are also major sources of CH_4 and N_2O, which are also long lived and among the most important anthropogenic drivers of climate change. Global objectives on climate change are measured against a 1990 base year (UNFCCC, 1998) and emissions of CO_2 in 2011 were determined to be 54 percent above the 1990 level (IPCC, 2013).

Each GHG has a global warming potential (GWP) that is calculated to reflect how long each different gas remains in the atmosphere and how strongly the pollutant absorbs energy relative to CO_2. The GWP indicates the relative and cumulative ability of a given mass of emissions to absorb energy and force climate change over the time the emissions remain in the atmosphere. Methane in the

atmosphere over a 100-year horizon has a GWP of 25 according to the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report and 28 according to the IPCC Fifth Assessment Report. This GWP number means that one pound of CH_4 causes the equivalent warming potential of 25 to 28 pounds of CO_2. California regulators recognize the short-lived nature of CH_4 by using a GWP of 25 for CH_4 over the 100-year timespan and a GWP of 72 over a 20-year timespan (ARB, 2016). The GWP is used to quantify GHG emissions by multiplying the different GWP of each GHG pollutant by the mass of that pollutant to arrive at a CO_2-equivalent (CO2e) mass.

4.10.1.2 Physical Effects of GHG Emissions

Changing temperatures, precipitation, sea levels, ocean currents, wind patterns, and storm activity provide indicators and evidence of the effects of climate change. For the period 1950 onward, relatively comprehensive data sets of observations are available. Various indicators and evidence illustrate the many aspects of climate change, namely how temperature and precipitation are changing, and how these changes are affecting the environment, specifically freshwater and marine systems, as well as humans, plants, and animals (OEHHA, 2013; OEHHA, 2018). Consensus expressed by the Fifth Assessment Report of the IPCC shows that: "warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased." (IPCC, 2014)

Since California's initial GHG strategy set forth in the 2008 Climate Change Scoping Plan, scientific evidence has continued to indicate that the climate is changing. This evidence includes rising temperatures, shifting snow and rainfall patterns, and increased incidence of extreme weather events (ARB, 2014).

The Third U.S. National Climate Assessment, released on May 6, 2014, provides the most authoritative and comprehensive source of scientific information to date about climate-change impacts across all U.S. regions and on critical sectors of the economy. For the Southwestern U.S. region, including Santa Barbara County, the National Climate Assessment emphasizes the risks to scarce water resources as follows:

> *Climate changes pose challenges for an already parched region that is expected to get hotter and, in its southern half, significantly drier. Increased heat and changes to rain and snowpack will send ripple effects throughout the region's critical agriculture sector, affecting the lives and economies of 56 million people — a population that is expected to increase 68 percent by 2050, to 94 million. Severe and sustained drought will stress water sources, already over-utilized in many areas, forcing increasing competition among farmers, energy producers, urban dwellers, and plant and animal life for the region's most precious resource.* (Melillo et. al., 2014)

The effects of global climate change on California's public health, infrastructure, and natural resources are described in the *California's Fourth Climate Change Assessment Statewide Summary Report* (Bedsworth et al., 2018). According to this report, which builds upon the first three climate change assessment reports, the updated projections reinforce past findings regarding the potential for more extreme events from heat waves, floods, droughts, and wildfires. These extreme climate event impacts along with reduced improvements in air quality will create an increase in human mortality and damage to property that together will cost in the order of tens of billions of dollars.

In addition to the Statewide summary report, this fourth assessment report also includes regional reports. The Central Coast Region Report provides the following specific regional effects of climate change (Landridge, 2018):

- *Maximum and minimum temperatures for the Central Coast will continue to increase through the next century, with greater increases in the inland region. Precipitation is expected to increase slightly, but precipitation variability will increase substantially.*
- *The future of fog is uncertain because system feedbacks and their response to climate change are not well characterized. Fog can be intercepted by coastal zone flora (which obtain up to one-third of their moisture from fog) and can also prevent low stream flows, which can keep salmonids from drying out during dry periods.*
- *Periodic El Niño events dominate coastal hazards across the Central Coast while atmospheric rivers, expected to increase, are the dominant drivers of locally-extreme rainfall events.*
- *Recently observed and projected acceleration in sea level rise (SLR) poses a significant threat to the regions' coastal communities. Future flooding is also a serious concern. A recent study suggests that approximately 12,000 residents and $2.4 billion in property could be exposed to flooding due to SLR and storms in Santa Barbara County by the end of the century. A similar level of exposure was predicted for Monterey County.*
- *Projected future droughts are likely to be a serious challenge to the region's already stressed water supplies.*
- *Frequent and sometimes large wildfires will continue to be a major disturbance and post-fire recovery time may be lengthened. The 2017-2018 Thomas Fire led to tragic loss of life and huge social cost, and may be representative of future devastating fires and post-fire effects from climate change*
- *Central Coast native plants are a large part of the world's floristic provinces. Plant species responses to climate change will in general depend on the climate in which a population evolved and its own unique climate tolerances. Coastal shrublands resilience depends on climate effects to physiological responses that are modified by biotic interactions and the extent of anthropogenic land use. Grasslands closer to the coast will be less affected than interior grasslands where warming is already documented.*
- *Climate change outcomes for forests will depend largely on multiple abiotic drivers (increased air temperatures, altered fog patterns, changes in winter precipitation), and biotic factors (invasive species and insect and pest outbreaks).*
- *Terrestrial wildlife is already experiencing local extinctions. Species may have robust climate refugia in the region's mountains characterized by cooler temperatures and higher levels of precipitation.*
- *The aquatic life of streams and rivers are threatened by projected extreme swings from drought to floods, and exacerbated by fire and erosion that buries habitat in sediments. Climate impacts can threaten the survival of already endangered Steelhead and Coho salmon, and further reduce the diversity and abundance of sensitive aquatic insects.*
- *Estuarine systems will be affected by accelerated SLR, warming of water and air, ocean acidification, and changes in runoff. Some Central Coast marshes may drown or become shallow mudflats, leading to a loss of the ecosystem services that marshes provide, including carbon sequestration.*
- *Many beaches will narrow considerably. As many as two-thirds will be completely lost over the next century, along with the ecosystems supported by those beaches. The landward erosion of beaches will*

be driven by accelerating SLR combined with a lack of ample sediment, effectively drowning the beaches between the rising ocean and the backing cliffs and/or urban hardscape.

- *Water supply shortages, already common during drought, will be exacerbated. Higher temperatures may result in increases in water demand for agriculture and landscaping. Reduced surface water will lead to increases in groundwater extractions that may result in increased saltwater intrusion. Lower surface flows will lead to higher pollutant concentrations and will impact aquatic species.*
- *Impacts to the region's public health include increases in heat-related illnesses for agricultural workers, harmful particulate matter from wildfires, and an increase in ground-level ozone. Infectious/Vector-borne diseases include an increase in Valley Fever and Pacific Coast tick fever, and an increase in harmful algal blooms will have detrimental effects on animals and people exposed to toxins released from the algae.*
- *Residential electricity demand is likely to be affected by more frequent heat waves due to increases in cooling requirements, and warming temperatures are likely to affect electricity supply from gas-fired plants.*
- *Agricultural production is highly sensitive to climate change, including amounts, forms, and distribution of precipitation, changes in temperatures, and increased frequency and intensity of climate extremes. The Salinas Valley is identified as one of the most vulnerable agricultural regions under climate change.*

Additional research by the CalEPA Office of Environmental Health Hazard Assessment (OEHHA) documented effects of climate change including impacts on terrestrial, marine, and freshwater biological systems, with resulting changes in habitat, agriculture, and food supply. These changes are occurring in conjunction with the potential to impact human well-being (OEHHA, 2018). The OEHHA categorizes climate change indicators as: changes in California's climate; impacts to physical systems including oceans, lakes, rivers, and snowpack; and impacts to biological systems including humans, vegetation and wildlife. The primary observed changes in California's climate include increased annual average air temperatures, more-frequent extremely hot days and nights, and increasingly severity of drought. Impacts to physical systems affected by warming temperatures and changing precipitation patterns show decreasing snowmelt runoff, shrinking glaciers, and rising sea levels (OEHHA, 2018). Examples of the terrestrial effects include increasing tree mortality, large wildfires, and changes in vegetation density and distribution (OEHHA, 2013). Land use planning decisions that take into account the effects of climate change would contemplate potential effects to biological resources, water resources, and agricultural resources.

4.10.1.3 California Inventory of GHG Sources

California first formalized a strategy to achieve GHG reductions in 2008, when California produced approximately 487 million metric tons of CO_2 equivalent (MMTCO2e), an amount equal to about 537 million tons (aka short tons) for 2008, according to the Air Resources Board inventory (ARB, 2018a). One metric ton (MT) equals 1,000 kilograms, which is 2,204.6 pounds or about 1.1 short tons. By 2016, California's emissions had declined to approximately 429.4 MMTCO2e (ARB, 2018a). In a global context, California emits less than one percent of the 49,000 MMTCO2e emitted globally (IPCC, 2014). Table 4.10-1 summarizes the current GHG inventory for California.

Table 4.10-1. California GHG Emissions Inventory (million metric tons per year, MMTCO2e)

Source Category	2008	2010	2012	2014	2016
Transportation [1]	177.58	165.07	161.22	162.28	169.38
Industrial [2]	90.54	91.50	91.07	93.96	89.61
Electric Power	120.14	90.34	95.09	88.24	68.58
Commercial and Residential	43.52	45.05	42.89	37.37	39.36
Agriculture	35.79	34.27	36.08	35.95	33.84
High GWP	11.65	13.52	15.54	17.70	19.78
Recycling and Waste	8.11	8.37	8.49	8.59	8.81
Total Emissions	487.34	448.11	450.38	444.10	429.35

Source: ARB, 2018a. California Greenhouse Gas Inventory for 2000-2016, by Category as Defined in the 2008 Scoping Plan.
Notes:

1 - Transportation category includes off-road equipment used in construction, mining, oil drilling, and other vehicles and mobile sources.

2 - Industrial category includes refineries, oil and gas extraction, and other industries including combustion of fuels plus fugitive emissions.

Most GHG emissions related to electric power generation come from the consumption of fossil fuels, primarily natural gas from large gas turbine power plants in California. As Table 4.10-1 shows, the emissions from electric power generation have been dropping at a rate that is quicker than any of the other emissions source categories and that emissions reductions from electric power generation is the primary reason the state's GHG emissions have dropped over 10 percent from 2008 to 2016. The proportion of electric power generation emissions to the total emissions dropped from nearly 25 percent in 2008 to less than 16 percent in 2016. The proposed Project would enable additional emissions reductions in the electric power generation sector.

Globally, anthropogenic activity results in approximately 49,000 MMTCO2e of annual GHG emissions (IPCC, 2014), and the U.S. GHG inventory for 2014 was 6,763 MMTCO2e (U.S. EPA, 2018) or roughly 14 percent of the global emissions. The U.S. EPA's "Electric Power Sector" category that includes power production and transmission across the U.S. emitted over 2,000 MMTCO2e in 2014 or over 30 percent of the U.S. total (U.S. EPA, 2018).

4.10.1.4 County GHG Inventory

Pursuant to the direction provided by the County's Board of Supervisors in March of 2009 (BOS Resolution 09-059), the County has developed a Climate Action Strategy (CAS) to address GHG emissions. The CAS outlines a two-phase process to reduce emissions; Phase 1 included the preparation of a Climate Action Study and Phase 2 included the development and adoption of an Energy and Climate Action Plan (ECAP). As part of the Climate Action Study, a GHG inventory including future forecasts for the unincorporated County was developed. This GHG inventory used 2007 numbers to establish a baseline for community-wide emissions in unincorporated Santa Barbara County to measure ECAP progress. The inventory excludes incorporated cities, the University of California, Santa Barbara, the Chumash reservation, and state and federal lands, including Los Padres National Forest and Vandenberg Air Force Base, and offshore oil and gas production facilities. Additionally, the County excludes industrial stationary source facilities from the GHG emissions inventory included in the ECAP because these industrial stationary source facilities are required to

inventory and mitigate their own GHG emissions pursuant to a County-identified threshold on a project-specific basis and, therefore, do not rely on the programmatic mitigation strategies contained in the ECAP.

The County GHG inventory for unincorporated areas totaled 1,192,970 MTCO2e in 2007 as published in the ECAP (Santa Barbara County, 2015):

- Transportation: 521,160 MTCO2e
- Residential energy: 195,490 MTCO2e
- Commercial energy: 121,580 MTCO2e
- Off-road: 102,140 MTCO2e
- Solid waste: 91,920 MTCO2e
- Agriculture: 62,110 MTCO2e
- Water and wastewater: 49,520 MTCO2e
- Industrial energy: 46,780 MTCO2e
- Aircraft: 2,270 MTCO2e

Emissions from stationary sources in the unincorporated areas that were not included within the GHG inventory in the ECAP were found to emit approximately 315,890 MTCO2e in the 2007 baseline year. The ARB maintains public reports of GHG from stationary source facilities in the County that are large enough to be subject to ARB's Mandatory GHG Reporting Requirements. The ARB data shows that GHG from the stationary source facilities have declined to 143,323 MTCO2e in 2016 (ARB, 2018b).

4.10.2 Regulatory Setting

Federal, State, and local agencies have enacted standards and regulations relating to greenhouse gas emissions and climate change. A summary of the regulatory setting for GHG, as applicable to the proposed Project, is provided below.

4.10.2.1 Federal

There are no federal regulations relating to GHG emissions or climate change that would apply to the proposed Project.

4.10.2.2 State

California Governor's Office of Planning and Research, Guidelines on GHG (SB 97)

In late December 2009, the California Natural Resources Agency adopted certain amendments to the State CEQA Guidelines for reviewing the environmental impacts of greenhouse gas emissions to implement the California Legislature's directive in PRC Section 21083.05 (enacted as part of SB 97 (Chapter 185, Statutes, 2007)). These amendments became effective in March 2010. As part of the administrative rulemaking process, the Natural Resources Agency developed a Final Statement of Reasons explaining the legal and factual bases, intent, and purpose of the CEQA Guidelines amendments. The Final Statement of Reasons guides the scope of GHG analyses for CEQA documents and addresses the subject of life-cycle analysis.

Life-cycle analysis (i.e., assessing economy-wide GHG emissions from the processes in manufacturing and transporting all raw materials used in developing a given project and infrastructure) depends on emission factors or econometric factors that are not well established for all processes. The basis of State CEQA Guidelines set forth by the California Natural Resources Agency indicate that a full life-cycle analysis would be beyond the scope of a given CEQA document because of a lack of consensus guidance on life-cycle analysis methodologies.

California Governor's Executive Orders on GHG Emissions

The California Governor's Executive Order S-3-05 (June 2005) declared California's particular vulnerability to climate change and sets a target of an 80 percent reduction of California greenhouse gas emissions from 1990 levels by 2050 and a target to achieve 1990 levels by 2020. In response to Executive Order S-3-05 and increasing societal concern about the effects of climate change, the California Legislature enacted California Global Warming Solutions Act of 2006, Assembly Bill 32 (AB 32). In passing the bill, the California Legislature found that:

> 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 [HSC Section 38501, Division 25.5, Part 1].

In September 2018, Executive Order B-55-18 established a new statewide goal to achieve carbon neutrality as soon as possible, and no later than 2045, and achieve and maintain net negative emissions thereafter. The ARB was directed to develop the framework for implementing the goal of carbon neutrality. Executive Order B-30-15 (April 2015) established a California greenhouse gas reduction target of 40 percent below 1990 levels by 2030. One purpose of this interim target is to ensure California meets its target of reducing greenhouse gas emissions to 80 percent below 1990 levels by 2050. This executive order also specifically addresses the need for climate adaptation and directs state agencies to update the California Climate Adaptation Strategy to identify how climate change will affect California infrastructure and industry and what actions the state can take to reduce the risks posed by climate change. Senate Bill 32 (SB 32) of 2016 codified the GHG emissions target to 40 percent below the 1990 level by 2030.

California Renewables Portfolio Standard (RPS) Program

Electric utilities in California must procure a minimum quantity of the sales from eligible renewable energy resources as specified by RPS requirements. The Clean Energy and Pollution Reduction Act of 2015 (SB 350), signed into law on October 7, 2015, established California's state policy objectives on long-term energy planning and procurement. The 100 Percent Clean Energy Act of 2018 [Senate Bill 100 (SB 100)] revised the RPS targets to establish the policy that eligible renewable energy resources and zero-carbon resources supply 100 percent of retail sales of electricity to California end-use customers and 100 percent of electricity procured to serve all state agencies by December 31, 2045. With SB 350 and SB 100, California's renewable energy objectives include:

- To set the Renewable Portfolio Standard (RPS) for the procurement of California's electricity from renewable sources at 33 percent by 2020, 50 percent by 2026, and 60 percent by 2030;

- To plan for 100 percent of total retail sales of electricity in California to come from eligible renewable energy resources and zero-carbon resources by December 31, 2045; and
- To double the energy efficiency savings in electricity and natural gas end uses by retail customers by 2030.

AB 32 Climate Change Scoping Plan and Scoping Plan Updates

With AB 32, the 2020 GHG emissions reduction goal became law and requires California to maintain and continue reductions beyond 2020. AB 32 also directed the ARB to develop regulations and market mechanisms to reduce GHG and prepare a scoping plan to identify how best to reach the 2020 limit. AB 32 requires ARB to update the Scoping Plan at least every five years. Accordingly, the 2017 Scoping Plan Update, approved on December 14, 2017, provides the strategy for achieving California's 2030 target in SB 32 (ARB, 2017).

The initial AB 32 Climate Change Scoping Plan (ARB, 2008) identified the strategies for achieving the maximum technologically feasible and cost-effective GHG reductions by 2020, and to maintain and continue reductions beyond 2020. The first statewide AB 32 Scoping Plan was adopted by ARB in December 2008, and the ARB approved the First Update to the Scoping Plan in May 2014 (ARB, 2014). The Project itself conforms with the renewable energy objectives of the Scoping Plan, and at least one regulation that has come from enacting the climate change strategies in the Scoping Plan, the Low Carbon Fuel Standard (LCFS), would cause a small reduction in the direct GHG emissions during Project construction and operation.

4.10.2.3 Local

County Energy and Climate Action Plan (ECAP)

In March 2009, the County Board of Supervisors directed County staff "to take immediate, cost-effective and coordinated steps to reduce the County's collective greenhouse gas (GHG) emissions." In response to this direction, the County's Climate Action Strategy (CAS) was developed, which includes a two-phase strategy to reduce GHG emissions comprising (1) the Climate Action Study (2011), including a countywide GHG inventory, forecast, and evaluation of potential emission reduction measures, and (2) an Energy and Climate Action Plan (2015), which seeks to reduce the GHG emissions through implementation of specific selected measures with the goal of achieving a GHG reduction target of 15 percent below 2007 baseline levels by 2020.

The ECAP adopted by the Board of Supervisors in May 2015 identifies strategies, or GHG emission reduction measures, that the County can implement. Measure RE 4 (Utility-Scale Renewable Energy Projects) would promote the use of clean energy production by encouraging development of utility-scale renewable electrical generation facilities, like the proposed Project. Two other plan measures that may apply to the proposed Project are Measure BE 10 (Construction Equipment Operations) that would implement best management practices for construction equipment; and Measure WR2 (Construction and Demolition Waste Recycling) that would increase the recycling and reuse of construction wastes.

4.10.3 Significance Thresholds

The Santa Barbara County Environmental Thresholds and Guidelines Manual (Santa Barbara County, 2018) specifies that:

- All industrial stationary-source projects shall be subject to a numeric, bright-line threshold of 1,000 MTCO2e per year to determine if greenhouse gas emissions constitute a significant cumulative impact. Annual GHG emissions that are equivalent to or exceed the threshold are determined to have a significant cumulative impact on global climate change unless mitigated.

However, the Project is not a County-defined industrial stationary source. The County has no other numeric significance thresholds identified for assessing other project types in the Guidelines Manual. For a previous renewable energy project (Cuyama Solar), the County used the Bay Area Air Quality Management District (BAAQMD) GHG emissions thresholds to evaluate the Project. BAAQMD has a stationary source threshold (10,000 MTCO2e per year) and three other thresholds for non-stationary source projects (BAAQMD, 2017). These other three thresholds include: compliance with a Qualified GHG Reduction Strategy, an annual emissions threshold of 1,100 MTCO2e per year, and a service population (SP) based threshold of 4.6 MT CO2e/SP/year (residents plus employees). The service population threshold best suits residential and commercial project types, not a renewable energy project, so the non-stationary source annual threshold approach (1,100 MTCO2e per year) would apply most appropriately to the SWEP Project. It would also be appropriate to identify that a utility-scale renewable energy project complies with the County's 2015 Energy and Climate Action Plan Strategy (RE-4 Utility-Scale Renewable Energy Projects); however, application of this measure has not previously been used for County utility-scale renewable energy projects.

Renewable energy projects, such as solar and wind projects, may be credited for reductions in greenhouse gas emissions during Project operation that would otherwise be emitted by natural gas-fueled electrical generation, based on consistency with California greenhouse gas reduction strategies to increase statewide reliance on renewable energy.

All of the BAAQMD GHG thresholds mentioned above are applicable to operation emissions only, BAAQMD does not have GHG emissions thresholds for construction-related emissions. The BAAQMD suggests quantifying and disclosing GHG emissions that would occur during construction and determining significance in relation to meeting AB 32 GHG reduction goals. This approach has been used for accessing the Project's construction emissions impacts.

4.10.4 Environmental Impacts and Mitigation Measures

Greenhouse gas emissions impacts were not evaluated in the LWEP EIR, so there were no previous construction and operation GHG emissions estimates, significance determinations, or mitigation measures provided in the LWEP EIR. The GHG impacts of the proposed SWEP are discussed below.

GHG-1 **Reduction in GHG Emissions.** The Project would result in GHG emissions reductions in the power generation sector, resulting in a beneficial effect related to greenhouse gas emissions.

The proposed Project's construction and operation GHG emissions were estimated, and those estimates are provided in Appendix B – Air Quality Emissions Estimate that is included as part of this SEIR. These estimates are based on revisions and additions to the emissions calculations that were completed by the Applicant using the SBCAPCD-approved CalEEMod emissions estimating model and separate calculations. These emission estimates and revisions were made to align the CalEEMod inputs and address other emissions sources for consistency with the Applicant's project description information.

In addition to the revised Applicant CalEEMod and separate emission estimates provided in Appendix B, the following indirect GHG emissions sources were separately estimated and included in the Project GHG emissions totals:

- **Electricity-use based indirect emissions from construction water use.** Water has a GHG emissions profile related to the electricity necessary to deliver water using electric pumps to where it is eventually used. CalEEMod does not estimate emissions from this water use, unlike water use during operation where water-use electricity based GHG emissions are estimated. This estimate is based on the CalEEMod emissions factor of 0.041 Metric Tons of CO2e (MTCO2e) per 1,000 gallons, and a worst-case estimate of construction water use that is conservatively rounded up to 17.7 million gallons.
- **Electricity production indirect emissions reduction.** This calculation provides results based on the assumption of what the renewable power source would offset. This can be done by comparing emissions from thermal technologies, such as gas-fired power plants, using current average utility emissions rate, or considering the reduction in utility average emissions rates during the 30-year Project life as the State works towards a 100 percent renewable energy portfolio standard by the year 2050. The current reduction estimate basis used is the latest available (2016) PG&E average metric tons of carbon dioxide equivalent CO2e per Megawatt-hour (MTCO2e/MWh) emissions rate of 0.133 (TCR, 2018) and a project annual generation rate of 303,800 MWh. The actual Project-life reduction would decrease as other renewable energy sources replace fossil-fuel power plants along the path to the 100 percent renewable or zero carbon energy by 2050. This reduction is estimated as a linear reduction to essentially zero by the end of the Project life, which means the Project-life average emissions reduction rate would be 0.0665 MTCO2e/MW.

Appendix B includes a list of the emission estimate additions and revisions that were performed. A summary of the Project's estimated emissions is provided in Table 4.10-2.

The GHG emissions included in Table 4.10-2 including known and quantifiable direct and indirect emissions sources. Certain known direct and indirect emissions sources cannot be reasonably quantified. These known sources include the loss of CO_2 uptake that will occur due to the land use change from current rangeland and wild ecological conditions, including the loss of oak trees that will be removed for the new access roads and WTG sites, that will reduce plant-based CO_2 uptake. However, these additional known but unquantifiable sources while not insignificant would be orders of magnitude lower than the GHG emissions reductions that occur from the wind power generation. Additionally, the emissions provided in Table 4.10-2 do not include a complete life-cycle GHG emissions estimate, such as estimating the GHG emissions emitted to manufacture the WTG, which is not required to be completed under CEQA. This emissions estimate is similar to the emissions estimates, and federal and state agency emissions factors, derived for other forms of energy production, such as natural gas-fired turbines or coal-fired boilers, where their emissions factors do not include the entirety of the life-cycle mining, extraction, transportation, etc. emissions related to those forms of energy production.

The proposed Project has an anticipated life of 30 years. At the end of the Project's useful life, it could be repowered, renovated, upgraded, or decommissioned. The GHG emissions impacts of these activities would be similar to, although likely smaller than, Project construction. Given the over-whelming GHG emissions reductions during Project operations, whatever option is chosen at the end of the Project's useful live does not affect the GHG emissions findings for the Project.

Table 4.10-2. Estimated Project Annual GHG Emission Rates (MTCO2e per year)

Project Phase/Source	Proposed Project Emissions
Construction	
Construction Direct Emissions (CalEEMod Output)	3482.4
Construction Helicopter Emissions	1019.1
Construction Water Use Indirect Emissions	724.2
Total Construction Emissions (10-month Construction period)[1]	5,225.7
Annualized Construction Emissions [a]	174.2
Operation	
Off-Road Equipment Direct Emissions	27.1
Area Sources Direct Emissions	0.0
Mobile Sources Direct Emissions	13.9
Energy Use Indirect Emissions	6.7
Solid Waste Indirect Emissions	2.6
Water Use Indirect Emissions	3.7
Total Annual Operation Direct/Indirect Emissions Increases (CalEEMod Output)	54.0
SF_6 Leakage	3.6
Onsite O&M Mobile Sources	2.6
Total Annual Operation Direct/Indirect Emissions Increases	60.2
Indirect Electricity Production Emission Reduction (Annualized 30-year Average)	-20,203
Total Annual Operation Emissions	-20,142
Significance Threshold	1,100
Significant?	No
Project-Life Emissions (Average MTCO2e per year)[b]	-19.968

Source: Appendix B and addition indirect emissions calculation notes provided above the table.

[a] – Based on amortizing the construction emissions over a 30-year project life.

[b] – Based on including the amortized construction emissions (amortized over a 30-year project life).

The proposed Project's construction emissions have been quantified and disclosed above in Table 4.10-2. The construction emissions include the use of best management practices as required in air quality

[1] As discussed in Sec. 4.10.2.2, a full, life-cycle analysis of GHG emissions is beyond the scope of this SEIR. However, it should be recognized that emissions from WTG manufacturing, raw and intermediate manufacturing materials transportation, and eventual demolition of WTGs and other Project elements entail unquantified, but potentially substantial, cumulative GHG emissions that are not accounted for in this SEIR. Examples of GHG-producing activities include mining, processing, and fabricating the steel WTG towers; oil extraction, processing and plastic resin production for WTG blades, and blade fabrication; transport of materials to factory, and the entirety of the global transportation of WTG parts and other Project components to Project site, whose emissions are assessed from the last point of origin prior to deliver (such as the Port of Stockton).

Mitigation Measure AQ-1. Therefore, the Project's construction emissions are determined to be in conformance with AB 32 GHG emissions reduction goals.

The proposed Project's operation would enable significant GHG emissions reductions in the power generation sector, and so would result in beneficial greenhouse gas emissions impacts (Class IV).

Compliance with applicable plans, policies, and regulation adopted for the purpose of reducing the emissions of greenhouse gases

The proposed Project, as a renewable energy project, would conform to the California plans and policies related to increasing the amount of available renewable energy, specifically the Renewable Portfolio Standard (RPS) goals for California's electricity procurement at 33 percent by 2020, 50 percent by 2026, 60 percent by 2030, and the plan for 100 percent of total retail sales of electricity in California to come from eligible renewable energy resources and zero-carbon resources by December 31, 2045. The proposed Project would play a part in the helping to achieve the new statewide goal to achieve carbon neutrality as soon as possible, and no later than 2045, and achieve and maintain net negative emissions thereafter. The Project also conforms to the County ECAP Measure RE 4 that encourages the development of utility-scale renewable energy projects.

There are a few other plans and policies, which are minor in comparison to the emissions reduction potential related to the renewable energy policies that would directly or indirectly apply to the proposed Project. These include:

- **Construction waste reduction (ECAP Measure WR 2)**. The proposed Project does not include substantial demolition activities or demolition waste streams, but will include a substantial amount of excavation, where the excavated materials would be reused on site as much as possible to create a balanced cut and fill to reduce the amount of waste hauled to landfills. Additionally, the vegetative green wastes would be recycled/reused as wood chips/mulch products or would be sent to composting facilities and reused as soil amendment products.
- **Low Carbon Fuel Standard (ARB Regulations)**. The proposed Project would indirectly conform with these regulations by using available California motor vehicle fuels that conform with this standard.
- **Best Management Practices for Construction Equipment (ECAP Measure BE 10)**. The proposed Project would conform with this policy through the implementation of Air Quality MM AQ-1.

While the above measures identified in the County's ECAP and ARB regulations would be used to reduce the generation of greenhouse gases associated with the Project's construction phase to the extent feasible, the proposed Project would, on balance, through its operation serve to reduce the production of greenhouse gases by directly generating renewable energy for local consumption.

At the end of the Project's life, it could be repowered, upgraded, renovated, or decommissioned. The greenhouse gas emissions reduction plans, policies, and regulations that would be approved at this future time are unknown; however, the Project owner would be required to meet all applicable laws and regulations. Therefore, it is anticipated that the end-of-project-life actions would continue to conform with all applicable GHG emissions reductions plans, policies, and regulations.

Therefore, the Project would not conflict with applicable greenhouse gas emissions reductions plans, policies, or regulations.

4.10.5 Cumulative Effects

This GHG and GCC analysis (presented above) addresses cumulative global impacts; therefore, there is no separate cumulative effects analysis.

4.10.6 Residual Impacts

No residual adverse impacts associated with GHG emissions would occur. Long-term effects would be beneficial as the Project's operation would promote GHG emission reductions in the power generation sector.

4.10.7 Impact and Mitigation Summary

Table 4.10-3 below provides a summary of the SWEP's impacts related to greenhouse gas emissions. The table also indicates the mitigation measures if required to reduce a significant impact.

Table 4.10-3. SWEP Impact and Mitigation Summary – Greenhouse Gas Emissions

Impact No.	Impact Statement	Mitigation Measures	Significance Conclusion
GHG-1	Reduction in GHG Emissions. The Project would result in GHG emissions reductions in the power generation sector, resulting in a beneficial effect related to greenhouse gas emissions.	None required.	Class IV

Class I. Significant unavoidable adverse impact.
Class II. Significant environmental impacts that can be feasibly mitigated or avoided.
Class III. Adverse impacts found not to be significant.
Class IV. Impacts beneficial to the environment.

4.10.8 References

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