III.3 METEOROLOGY AND CLIMATE CHANGE

This chapter describes meteorology and climate change for the Land Use Plan Amendment (LUPA) Decision Area, which includes the entire Desert Renewable Energy Conservation Plan (DRECP) area. This chapter addresses both the regulatory framework pertaining to climate change and the existing climate conditions and affected environment of the LUPA Decision Area.

Climate varies significantly across the region and is influenced by variations in elevation, latitude, topographic features, moisture source, and proximity to water bodies. The meteorological elements of temperature and wind and hydrologic components of precipitation, snowpack, and runoff affect atmospheric circulation patterns at both micro- and macro-scales. The climate of an area, in turn, influences the composition and resilience of biological resources because of effects from important ecological processes. Most notably, climate affects hydrologic patterns, the volume and pollutant and sediment load of runoff, soil stability and moisture, dust and erosion, and the timing, length, and intensity of the fire cycle.

Several decades of evidence, summarized by the Intergovernmental Panel on Climate Change (IPCC), show that changes in the climate are occurring and that human influence has been a dominant cause. The IPCC Fifth Assessment Report (IPCC 2013) states:

> 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.
>
> Human influence on the climate system is clear. This is evident from the increasing greenhouse gas concentrations in the atmosphere, positive radiative forcing, observed warming, and understanding of the climate system.
>
> Human influence has been detected in warming of the atmosphere and the ocean, in changes in the global water cycle, in reductions in snow and ice, in global mean sea level rise, and in changes in some climate extremes. This evidence for human influence has grown since (the Fourth Assessment Report ([2007]) AR4. It is extremely likely that human influence has been the dominant cause of the observed warming since the mid-20th century.

Other changes include substantial increases in precipitation in some regions of the world and decreases in other regions. Within California, atmospheric concentrations of greenhouse gases (GHG) carbon dioxide and methane have increased consistent with global trends (California Environmental Protection Agency [EPA] 2013). Regional climate change also affects changes in natural physical systems (e.g., shifts in the ranges of plant and animal species, conditions more favorable to the spread of invasive species and of some diseases, and changes in the amount and timing of water availability) (Karl et al. 2009, pp. 27, 79–88; California EPA 2013).

The IPCC Fifth Assessment Report (IPCC 2013) analyses conclude it is extremely likely that the anthropogenic (human-caused) increase in GHG concentrations and other human sources caused more than half of the observed increase in global average surface temperature from 1951 to 2010.

Scientists use multiple climate models—including both natural processes and variability and different scenarios of potential levels and timing of GHG emissions–to evaluate the causes of changes already observed and project future changes in temperature and other climate conditions (Ganguly et al. 2009, pp. 11555, 15558; Prinn et al. 2013). All combinations of models and emissions scenarios yield similar projections of average global warming until about 2030. Although projections of the magnitude and rate of warming differ after about 2030, the overall trajectory of all the projections is one of increased global warming through the end of this century, even for projections based on scenarios that assume GHG emissions will stabilize or decline. There is strong scientific support for projections that warming will continue through the twenty-first century and that the magnitude and rate of change will be influenced substantially by the extent of GHG emissions (Ganguly et al. 2009, pp. 15555–15558; Prinn et al. 2013).

Climate, particularly temperature and precipitation, strongly influence biological systems. Some examples of biological responses influenced by warming temperatures include shifts in the habitat elevation or latitude, changes in the timing of growth stages, changes in abundance and community composition, and increased vulnerability to wildfires or pathogens (California EPA 2013).

The changes in climate may have direct or indirect effects on species. These effects may be positive, neutral, or negative and may change over time, depending on the species and other relevant considerations, such as interactions of climate with other variables like habitat fragmentation (Franco et al. 2006; Galbraith et al. 2010; Chen et al. 2011). In addition to evaluating individual species, scientists are evaluating possible climate change-related impacts on, and responses of, ecological systems, habitat conditions, and groups of species. These studies acknowledge uncertainty (Deutsch et al. 2008; Berg et al. 2009; Euskirchen et al. 2009; McKechnie and Wolf 2009; Sinervo et al. 2010; Beaumont et al. 2011; McKelvey et al. 2011; Rogers and Schindler 2011).

Vulnerability refers to the degree to which a species (or system) is susceptible to, and unable to cope with, adverse effects of stressors stemming from climate change, including climate variability and extremes. Vulnerability is a function of the type, magnitude, and rate of climate change and variation to which a species is exposed, its physiological sensitivities, and its adaptive capacity (Glick et al. 2011, pp. 19–22). There is no single method for conducting vulnerability analyses that applies to all situations (Glick et al. 2011, p. 3). The DRECP lead agencies used expert judgment and appropriate analytical approaches to weigh relevant information, including uncertainty, when considering aspects of climate change.

Adaptation to climate change is part of the conservation strategy of the DRECP, while renewable energy furthers the goal of mitigating climate change by reducing GHG emissions. This is consistent with The President's Climate Action Plan to cut carbon pollution and prepare for the impacts of climate change (Executive Office of the President 2013). Cutting carbon pollution relates to the president's goal to double renewable electricity generation by 2020 through accelerating clean energy permitting and expanding and modernizing the electric transmission grid. The president's plan also states that the federal government will consume 20% of its electricity from renewable sources by 2020. Preparing for the impacts of climate change also includes conserving land and water resources by implementing climate-adaptation strategies that promote resilience in fish and wildlife populations, forests, and other plant communities (Executive Office of the President 2013).

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 Southwest United States, including the LUPA Decision Area, the National Climate Assessment emphasizes the risks to scarce water resources and states:

> 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.

The 2009 California Climate Adaptation Strategy recommends that state agencies meet projected population growth and increased energy demand with greater energy conservation and renewable energy (California Natural Resource Agency 2009). Energy planners must also consider the effects of climate change on electricity transmission. Key transmission corridors are especially vulnerable to wildfires. In addition to the issues of reduced thermal efficiency in fossil-fueled power plants, reduced hydroelectric generation, line losses at substations, and increasing electricity demand during the hottest periods—transmission lines themselves lose 7% to 8% of their load in high temperatures when the lines typically carry higher loads to meet peak consumer demand (California Climate Change Center 2012).

For a discussion of climate change science as it applies to the LUPA Decision Area, see Appendix P. The Climate Change report in Appendix P provides information to support the long-term adaptive management strategy of the DRECP landscape. Climate change adaptation strategies are considered in the assessment of effects to Biological Resources in Chapters III.7 and IV.7.

Appendix R1.3 includes a table that summarizes the baseline GHG emissions as reported for existing renewable energy projects in the DRECP area and meteorological data giving monthly climate summaries for locations within the DRECP area.

III.3.1 Regulatory Setting

III.3.1.1 Federal

III.3.1.1.1 The President's Climate Action Plan

A synopsis of The President's Climate Action Plan, as it relates to the DRECP, is described in the following sections.

Executive Order 13693 (2015) – Planning for Federal Sustainability in the Next Decade directs Federal agencies to reduce targeted direct (scope 1 and 2)[1] greenhouse gas emissions 40% from 2008 levels, by 2050. Reductions of scope 1, 2 and 3 emissions in absolute terms and, where appropriate, the target shall exclude direct emissions from excluded vehicles and equipment and from electrical power produced and sold commercially to other parties as the primary business of the agency.

III.3.1.1.2 Greenhouse Gas Reporting Program Implementation

On October 30, 2009, the EPA published a rule for mandatory reporting of GHG from sources emitting 25,000 or more metric tons of carbon dioxide equivalent (CO_2e) per year. The regulation at Title 40 Code of Federal Regulations, Part 98, is referred to as the Greenhouse

[1] Executive Order 13693 includes the following definitions: Scope 1 emissions are those direct greenhouse gas emissions from sources that are owned or controlled by the agency; Scope 2 emissions are those direct greenhouse gas emissions resulting from the generation of electricity, heat, or steam purchased by an agency.

Gas Reporting Program. This rule applies to direct GHG emitters, fossil fuel suppliers, industrial gas suppliers, and facilities that inject carbon dioxide underground for sequestration or other purposes. The Greenhouse Gases Reporting Program Implementation Fact Sheet (EPA 2013) states that 41 industrial categories are required to report, which is an increase from the 29 categories required to report in 2010. This reporting program applies to electricity generation sources that burn fossil fuels, except portable equipment and emergency power generators.

III.3.1.1.3 National Fish, Wildlife, and Plants Climate Adaptation Strategy

The National Fish, Wildlife, and Plants Climate Adaptation Strategy outlines the first joint effort of three levels of government (federal, state, and tribal) with primary authority and responsibility for the living resources within the United States. The intent of the strategy is to identify how these resources can become more resilient, adapt to, and survive a warming climate. The seven major goals of the strategy are to: (1) conserve and connect habitat, (2) manage species and habitats, (3) enhance management capacity, (4) support adaptive management, (5) increase knowledge and information, (6) increase awareness and motivate action, and (7) reduce nonclimate stressors (U.S. Fish and Wildlife Service 2012). Implementation of the National Fish, Wildlife, and Plants Climate Adaptation Strategy was initiated in November 2013 with the first meeting of a Joint Implementation Working Group.

III.3.1.1.4 CEQ Revised Draft NEPA Guidance for GHG Emissions and Climate Change Impacts

On December 18, 2014, the Council on Environmental Quality (CEQ) released revised draft guidance for public comment that describes how federal departments and agencies should consider the effects of GHG emissions and climate change in their NEPA reviews. The revised draft guidance supersedes the draft greenhouse gas and climate change guidance released by CEQ in February 2010. This revised guidance explains that agencies should consider both the potential effects of a proposed action on climate change, as indicated by its estimated greenhouse gas emissions, and the implications of climate change for the environmental effects of a proposed action.

The guidance also emphasizes that agency analyses should be commensurate with projected greenhouse gas emissions and climate impacts, and should employ appropriate quantitative or qualitative analytical methods to ensure useful information is available to inform the public and the decision-making process in distinguishing between alternatives and mitigations. The guidance identifies a reference level of emissions at 25,000 metric tons of carbon dioxide equivalent emissions on an annual basis, above which a quantitative disclosure would be appropriate. This guidance has not yet been finalized.

III.3.1.2 State

The following summarizes state guidance regarding greenhouse gas emissions and provides context for the environmental baseline and potential future development scenarios. There are no regulatory requirements for the BLM to comply with regarding state greenhouse gas emissions plans, policies, and objectives. However, BLM planning-scale actions often consider the state's emissions inventories and projected targets (based on plan and policy goals) in developing the environmental baseline and assessing whether proposed actions have benefits and/or impacts to plan objectives, when relevant to the comparison of alternatives.

III.3.1.2.1 Executive Order S-3-05—Statewide Greenhouse Gas Emission Targets

Executive Order S-3-05, signed by Governor Arnold Schwarzenegger on June 1, 2005, established the following GHG emission reduction targets for the state of California:

1. By 2010, reduce GHG emissions to 2000 levels.
2. By 2020, reduce GHG emissions to 1990 levels.
3. By 2050, reduce GHG emissions to 80% below 1990 levels.

This Executive Order directs the secretary of California EPA to oversee the efforts made to reach these targets and to prepare biannual reports on the progress made. The Executive Order also directs the secretary of California EPA to prepare and report on mitigation and adaptation plans to combat the impacts. To ensure that California meets its target of reducing greenhouse gas emissions to 80% below 1990 levels by 2050, Governor Edmund G. Brown Jr. signed Executive Order B-30-15 on April 29, 2015 and established a California greenhouse gas reduction target of 40% below 1990 levels by 2030.

III.3.1.2.2 Assembly Bill 32—California Global Warming Solutions Act

Assembly Bill 32 (Nuñez), the California Global Warming Solutions Act of 2006, requires the California Air Resources Board (CARB) to adopt rules and regulations to reduce GHG emissions to 1990 levels by 2020. The CARB is required to publish a list of discrete GHG emission reduction measures.

III.3.1.2.3 2009 California Climate Adaptation Strategy

The 2009 California Climate Adaptation Strategy report summarizes the science on climate change impacts in the state to assess vulnerability and outline possible solutions that could be implemented within and across state agencies to promote resiliency (California Natural

Resources Agency 2009). The adaptation strategy incorporates existing state-specific climate science and impacts research led by the California Energy Commission's Energy Research and Development program. Its framework includes the AB 32 Climate Change Scoping Plan (CARB 2008). A key recommendation within the adaptation strategy is to meet projected population growth and increased energy demand with greater energy conservation and more renewable energy generation.

III.3.1.2.4 California Air Resources Board – Mandatory Reporting of GHGs Rule

Starting on January 1, 2010, large emitters of heat-trapping gases began collecting GHG data and reporting their annual emissions to CARB. The first reports were generally due in 2011. This mandatory reporting applies to facilities emitting 10,000 metric ton (MT) CO_2e or more per year. Facilities that emit more than 25,000 $MTCO_2e$ per year must verify their emissions through a third-party verifier. The reporting rule does not apply to electricity generating facilities powered solely by nuclear, hydroelectric, wind, or solar energy, unless on-site stationary combustion emissions equal or exceed 10,000 $MTCO_2e$.

III.3.1.2.5 Renewables Portfolio Standard

The Renewables Portfolio Standard promotes diversification of the state's electricity supply. It was originally enacted in 2002 with the goal to achieve a 20% renewable energy mix by 2017. In 2008, the goal date was accelerated to 2010. Subsequent directives, including Executive Orders S-14-08 and S-21-09, similarly increased the targets to a goal of 33% by 2020. Signed in April 2011, Senate Bill X1-2 expressly applies the 33% Renewables Portfolio Standard requirement by December 31, 2020, to all retail sellers, including publicly owned utilities. The purpose of the Renewables Portfolio Standard is to economically achieve the 33% renewable energy mix statewide in a manner consistent with the Assembly Bill 32 Climate Change Scoping Plan (CARB 2008). Renewable energy includes wind, solar, geothermal, small hydroelectric, biomass, anaerobic digestion, and landfill gas.

III.3.2 Climate Change Trends for the LUPA Decision Area

III.3.2.1 Understanding Climate Change

Climate change refers to changes in the long-term average of climate, generally based on 30 years. This averaging period minimizes the influence of natural variability and facilitates the analysis of long-term trends (California EPA 2013). Climate change differs from climate variability, which refers to short-term deviations from the average climate. Throughout geologic history, the earth's climate has changed (experienced periodic warming and cooling cycles) as a result of natural factors, but current science demonstrates that climate change is now occurring as a result of high concentrations of GHGs in the earth's atmosphere due to human activities (IPCC 2013).

Climate is affected by human factors (such as changes in land cover and emissions of certain pollutants), natural factors (such as solar radiation and volcanic eruptions), and its own internal dynamics (California EPA 2013).

Table III.3-1 summarizes the most common GHGs. Each GHG has both a variable atmospheric lifetime and a global warming potential (GWP). The atmospheric lifetime of the GHG is the average time the molecule stays stable in the atmosphere. Most GHGs stay in the atmosphere hundreds or thousands of years. The potential of a gas to trap heat and warm the atmosphere is measured by its GWP. Specifically, GWP is defined as "the cumulative radiative forcing—both direct and indirect effects—integrated over a period of time from the emission of a unit mass of gas relative to some reference gas" (EPA 2010).

Table III.3-1
Global Warming Potentials and Atmospheric Lifetimes (Years)

GHG	Atmospheric Lifetime	Reporting Program GWP	100-year GWP	20-year GWP	500-year GWP
Carbon dioxide (CO_2)	50–200	1	1	1	1
Methane	12 ±3	25	21	56	6.5
Nitrous oxide	120	298	310	280	170
Sulfur hexafluoride (SF_6)	3,200	22,800	23,900	16,300	34,900

Source: Global Warming Potentials for Mandatory GHG Reporting Program, 100-year horizon (40 CFR Part 98, Table A-1) and EPA 2010, Annex 6.
The methane GWP includes the direct effects and those indirect effects due to the production of tropospheric ozone and stratospheric water vapor. The indirect effect due to the production of CO_2 is not included.

The reference gas for establishing GWP is carbon dioxide, which—as shown in Table III.3-1—has a GWP of 1. As an example, methane has a shorter atmospheric lifetime than carbon dioxide, but a greater 100-year GWP. The 100-year GWP values are used for calculating CO_2e values, which are the measurement units for complying with reporting requirements (CARB 2014).

The main GHGs listed in Table III.3-1 are CO_2, methane, and nitrous oxide, which are driven by anthropogenic increases in fossil fuel use, fertilizer use, and land use and land use change, in particular, agriculture (CARB 2014). Hydrofluorocarbons are synthetic, human-made chemicals used as substitutes for ozone-depleting chlorofluorocarbons used in air conditioners and as refrigerants (CARB 2014). Perfluorocarbons such as tetrafluoromethane are used primarily in aluminum production and semiconductor manufacture. Sulfur hexafluoride (SF_6) is used for insulation in electric power transmission and distribution equipment.

III.3.2.2 Statewide Greenhouse Gas Inventory

The CARB performs inventories of statewide GHG emissions. These inventories are divided into the following broad categories of economic activity, or sources of emissions: agriculture, commercial, electricity generation, high GWP emitters, industrial, recycling and waste, residential, and transportation. Emissions are quantified in millions of $MTCO_2e$. Table III.3-2 shows the estimated statewide GHG emissions for 2011.

Table III.3-2
2011 California GHG Inventory

Sector	2011 Emissions in Millions of $MTCO_2E$ (% total)
Agriculture	32.2 (7%)
Commercial	15.6 (3.5%)
Electricity Generation	86.6 (19.3%)
High GWP Emitters	15.2 (3.4%)
Industrial	93.2 (20.8%)
Recycling and Waste	7.0 (1.6%)
Residential	29.9 (6.7%)
Transportation	168.4 (37.6%)
Total	**448.1**

Source: CARB 2013.
Percentages may not total 100 due to rounding.

III.3.2.3 Climate Change Trends for the State

The California Climate Change Center's summary report, Our Changing Climate 2012, includes the following findings in California:

- The state's electricity system is more vulnerable than previously understood.
- The Sacramento–San Joaquin Delta is subsiding, putting levees at growing risk.
- Wind and waves, in tandem with faster-rising seas, will worsen coastal flooding.
- Animals and plants need connected "migration corridors" to allow them to move to more suitable habitats to avoid serious impacts.
- Native freshwater fish are particularly threatened by climate change.
- Minority and low-income communities face the greatest risk from climate change.

- Local governments face many barriers in adapting to climate change. (California Climate Change Center 2012)

Temperatures in California will rise significantly during this century as a result of the GHGs humans release into the atmosphere; this conclusion holds regardless of the climate model used to project future warming (California Climate Change Center 2012).

Cal-Adapt is a Web-based climate adaptation planning tool that synthesizes data from research labs in California so users can identify potential climate change risks in specific geographic areas in the state. It projects temperature increases in California for both low-GHG and high-GHG emissions scenarios. These increases are the projected difference in temperature between a baseline period (1961–1990) and an end-of-the-century period (2070–2090) (Cal-Adapt 2013). Under the low-emissions scenario, temperatures within California would increase up to 4°F. Under the high-emissions scenario, temperatures within California would increase up to 7.2°F.

Cal-Adapt calculates wildfire impacts for low- and high-GHG emissions scenarios. There are parts of the state where a 10-fold increase is expected in burn areas under high- and low-emissions scenarios. Multiple counties contain a range between three- and ten-fold increases in burn areas by 2085 under both the low- and high-emissions scenarios (Cal-Adapt 2013).

Cal-Adapt calculates California snow-pack projections in April as snow water equivalency under low- and high-GHG emissions scenarios. The projected difference in the snow water equivalency compares the baseline period (1961-1990) with an end-of the-century period (2070-2090). The tendency for a lower spring snowpack grows over the decades of the twenty-first century, reducing the Sierra Nevada spring snowpack by as much as 70% to 90% by 2100 with diminishing snowpack in Southern California ranges (Cal-Adapt 2013).

III.3.2.4 Climate Change Trends for the DRECP Area

Appendix R1.3-2 contains a summary of meteorological data for the 10 ecoregion subareas in the two desert regions. Appendix P, Climate Change, presents a range of climate scenarios for temperature and precipitation in the DRECP area along with modeled results. Most data for climate change predictions are still at a continental scale. "Downscaling" refers to a reinterpretation of the data to make predictions for smaller geographic areas, such as regional or subregional areas. For the DRECP analysis, climate change data have been scaled down to an ecoregion subarea scale. Climate change trends for the DRECP area are summarized in this section.

The range of possible scenarios allows land managers to understand the level of uncertainty in the projections and to implement adaptive management that has the flexibility to adjust to changing conditions. Temperature increases and variable precipitation trends appear in the results.

The part of the LUPA Decision Area exposed to an average annual maximum temperature of 40°C is currently small but would expand to at least 33% of the DRECP by 2100. Mean annual minimum temperatures would also substantially increase (see Figure 10 in Appendix P). Temperature change projections in the Mojave and Sonoran deserts indicate mean annual, monthly median, and minimum and maximum temperature increases over 2°C in both the Mojave and Sonoran deserts. Projections also show a change in the distribution of precipitation in the DRECP area, but the direction of change differs between climate models. For example, one model projects a decrease in monsoon season or summer rain in the northeastern corner of the DRECP area, while another projects an increase in this same area (see Figure 11 in Appendix P). Trends for snowpack generally show decreases under scenarios for both drier and wetter weather, although one model projects slightly higher snowpack at higher elevations of the Sierra Nevada range through the twenty-first century.

An additional trend at the state and DRECP area levels will be vegetation shift due to climate change, based on the capacity of species to migrate and keep up with geographic changes. The identification of species migration corridors has important implications for land use planning within the DRECP area. Appendix P, Climate Change, presents modeled results for coarse-scale vegetation changes in the DRECP area, including a 2% to 3% increase in the broad desert scrub category in the Sonoran Desert and a 4% to 6% increase in desert scrub in the Mojave Desert by the end of the century. Appendix P indicates that scenarios of both increases and decreases in rainfall can increase fire risks (frequency and/or intensity) because buildup of fuels may occur under increased precipitation and drying out of fuels may occur under decreased precipitation with year-to-year variability.

III.3.3 Meteorology and Climate—Greenhouse Gas Baseline Analysis for the DRECP Area

The environmental baseline includes over 50 existing renewable energy projects in the DRECP area (see Appendix O). These projects are not all included in the 2011 CARB GHG inventory (CARB 2013) because some became operational or were under construction during 2012 and 2013. The 2011 CARB GHG inventory covers all of the sectors mentioned in Section III.3.2, Statewide GHG Inventory: agriculture, commercial, electricity generation, high GWP emitters, industrial, recycling and waste, residential, and transportation.

The 2011 GHG inventory includes emissions from all anthropogenic sources within California's boundaries. These emissions are then used to determine GHG emissions trends

(California EPA 2013). The 2011 statewide GHG emissions are 448 MMTCO_2e. This baseline incorporates broad GHG-producing sectors throughout California and serves as a point of comparison for all of the alternatives analyzed for the LUPA Decision Area.

The baseline GHG emission rates from electricity use in California are available from the EPA for 2009. The national Emissions & Generation Resource Integrated Database includes electricity generated within the state and electricity imported from outside California. CARB gives an estimate of 830 pounds CO_2e per megawatt-hour (CARB 2010) for the GHG emission reduction achieved by adding wind and solar generation on the premise that nonbaseload generation would be needed to integrate the renewable energy. Table III.3-3 shows the baseline GHG emissions from electricity use and the nonbaseload emission rates that can be used to estimate GHG emissions reductions from decreases in electricity use (EPA 2012; CARB 2010).

Table III.3-3
California Existing GHG Emission Rates From Electricity Use

GHG	Data Year (Reference)	Annual Total Electricity Emissions (pound/ megawatt hour)	Nonbaseload Electricity Emissions (pound/ megawatt hour)
Carbon dioxide (CO_2)	2009 (EPA 2012)	658.68	993.89
Methane	2009 (EPA 2012)	0.02894	0.03352
Nitrous oxide	2009 (EPA 2012)	0.00617	0.00407
Carbon dioxide equivalent	2008 (CARB 2010)	—	830

Source: EPA 2012, Emissions & Generation Resource Integrated Database 2012; CARB 2010.

III.3.3.1 GHG Emissions From Existing Renewable Energy Projects

The DRECP area's 50 existing renewable energy projects listed in Appendix O create GHG emissions as a result of construction, operation and maintenance, and decommissioning activities. Project-specific GHG emissions estimates from several of the existing renewable energy projects in the DRECP area are listed as examples in Appendix R1.3-1. Each of these projects was analyzed in separate, recent environmental documents, under different methodologies for direct emissions. Project-specific estimates normally exclude external or life-cycle emissions such as those from raw materials and manufacturing, which vary little from project to project. The examples in Appendix R1.3-1 show the existing projects causing combined construction emissions, amortized over the life of each project, plus operational and maintenance emissions at a rate ranging from about 1 to 39 MTCO_2e per year for each megawatt of built capacity, at an average of less than 10 MTCO_2e per year. Based on these estimates, the construction, operation and maintenance, and decommissioning activities for the 50 existing renewable energy projects in the DRECP area, with a combined generation capacity of 6,250 megawatts, may emit about 62,500 $MTCO_2e$ per year. Projected carbon sequestration losses from the loss of vegetation and land use conversion from the individual projects were shown to be either minimal or were not quantified in the analyses. Losses in the capacity of carbon sequestration on the part of soil microbes affected by the land use conversion were not taken into account.

III.3.3.2 Net GHG Emissions From Existing Renewable Energy Projects in the DRECP Area

Existing renewable energy projects that are operational produce electricity that offsets or displaces GHG emissions that would otherwise be emitted by fossil fuel-fired power plants. The successful operation of the 50 existing projects having a combined generation capacity of 6,250 megawatts, as listed in Appendix O, would indirectly offset or displace the operation of other electricity generators and their associated GHG emissions. The estimated electric power production for these existing renewable energy projects in the DRECP area would be 15.8 million megawatt-hours per year, based on data in Appendix O. At this level of power production, and an offset factor of 830 pounds of CO_2e per megawatt-hour (CARB 2010), the electricity provided by the existing operational projects in the DRECP area displaces about 5.9 million $MTCO_2e$ each year that would otherwise be emitted by fossil fuel-fired power plants, thereby providing net reductions in GHG emissions for the electricity-generating sector.

III.3.4 Meteorology and Climate—Greenhouse Gas Baseline for Outside the DRECP Area

The environmental setting presented in Section III.3.2, Climate Change Trends for the LUPA Decision Area, encompasses all the corridors for transmission outside of the DRECP area as well, due to the scale of meteorological and climate change phenomena.

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