IV.3 METEOROLOGY AND CLIMATE CHANGE

IV.3.1 Approach to Impact Analysis

This chapter addresses the potential for the proposed Desert Renewable Energy Conservation Plan (DRECP) Land Use Plan Amendment (LUPA) alternatives to increase or decrease cumulative levels of greenhouse gas (GHG) emissions after renewable energy facilities and associated transmission facilities are built out to be on line by 2040. This analysis also addresses how the alternatives relate to the emissions reduction targets identified in the California Global Warming Solutions Act and in California's Climate Change Scoping Plan.

This impact analysis considers broad activities, not site-specific issues associated with particular projects. Project- or location-specific factors that vary considerably from site to site cannot feasibly be analyzed in a programmatic document on this scale. No single activity or source of GHG emissions is large enough to trigger global climate change on its own. Because climate change is the result of the individual contributions of countless past, present, and future sources, GHG impacts are inherently cumulative. The cumulative impact analyses for the alternatives include GHG impacts from construction, operations, and decommissioning activities, as well as GHG reductions from the operation of the planned renewable energy projects. Project-specific impacts will be assessed both during the permitting process and in supplemental National Environmental Policy Act (NEPA) documents.

The following metrics are used to assess impact in this analysis:

- The number of megawatt-hours (MWh) likely to be produced under each alternative built out by 2040.
- The loss of carbon uptake from vegetation removed as a result of ground disturbance under each alternative.

These metrics provide a basis for comparison for the benefits and impacts under each alternative. The MWh metric indicates the effectiveness of the Proposed LUPA in producing electricity from renewable resources, and the ground disturbance metric indicates how Proposed LUPA activities influence development of the resources.

Climate change adaptation strategies and vegetation restoration are addressed in Chapter IV.7, Biological Resources. Appendix P illustrates the climate setting and how climate change science pertains to the DRECP landscape and the adaptive management framework.

The impact analysis considers whether the proposed DRECP would conflict with any applicable plans, policies, or regulations adopted for the purpose of reducing GHG

emissions. The California Global Warming Solutions Act and the Climate Change Scoping Plan make up the basis for the most relevant and applicable GHG reduction programs. These are described in Volume III, Chapter III.3, Regulatory Setting. The California Global Warming Solutions Act established GHG emissions reduction targets for the state and required developing a plan that would outline the strategies to achieve these targets. Expanding the use of renewable energy in California is an important part of California's approach to GHG reduction.

The state Climate Change Scoping Plan includes several measures to reduce GHG emissions from the energy sector (electricity production), including mandates for utility providers to increase their renewable energy mix to 33% by 2020. This means that 33% of the electricity provided by a utility must be produced from renewable energy sources. The intent of this measure, called the Renewable Portfolio Standard (RPS), is to transition away from dependence on fossil fuels and out-of-state fossil-fuel fired energy sources.

IV.3.2 Typical Impacts Common to All Action Alternatives

Development of solar, distributed generation, wind, and geothermal renewable energy sources generates relatively low levels of GHG emissions from construction, operations, and decommissioning activities (see Appendix R1.3-1 for examples of GHG emission rates for existing projects in the LUPA Decision Area).

The typical impacts from the various renewable energy and transmission technologies on Bureau of Land Management (BLM) lands would be the same as those described in Section IV.3.2.1. However, the specific locations where energy and transmission development will be allowed will be driven by LUPA decisions, which may encourage or restrict development in some areas.

The GHG emissions from construction and operations activities result from fossil-fuel combustion in the engines of construction equipment, vehicles carrying construction materials and workers, and vehicles necessary to provide maintenance, site security, and other operating functions. Carbon dioxide (CO_2) emissions account for the majority of GHG emissions from motor vehicles and equipment used during construction and operation and are directly related to the quantity of fuel combusted.

For complete development of a renewable energy site, typical levels of GHG emissions from construction, operation, and maintenance can be estimated based on the documented levels of emissions associated with existing renewable energy projects in the DRECP area (See Volume III, Section III.3.3.1, and Appendix R1.3-1). Environmental documents for the existing renewable energy projects in the DRECP area forecast levels of total GHG emission rates for project construction activities plus typical year-to-year operations activities.

These project-specific GHG emissions occur at greater levels at sites where greater electrical generating capacity is installed. As described in Volume III, Section III.3.3.1, GHG emissions typically occur at a rate ranging from about 1 to 39 metric ton CO_2 equivalent ($MTCO_2E$) per year for each megawatt (MW) of generation capacity installed. Typically, the complete development of a site causes an average rate of less than 10 $MTCO_2E$ per year for each MW of capacity installed. These factors indicate that complete development of up to 2,500 MW of capacity installed would be likely to create GHG emissions below the 25,000 MTCO2e annual level warranting quantitative disclosure, according to December 2014 CEQ Revised Draft NEPA Guidance for GHG Emissions and Climate Change Impacts.

As described in the Draft DRECP and EIR/EIS, the Renewable Energy Action Team (REAT) agencies anticipate that renewable generation projects of approximately 20,000 MW could be located within the DRECP area under all alternatives. The level of generation that would be located on BLM-managed land varies among alternatives, as follows:

- 9,792 MW on BLM land in the No Action Alternative.
- 8,175 MW in the Preferred Alternative.
- 3,042 MW in Alternative 1.
- 10,726 MW in Alternative 2.
- 6,376 MW in Alternative 3.
- 7,094 MW in Alternative 4.

The amount of electricity produced annually from renewable resources installed on BLM-managed land would also vary among alternatives, as follows:

- 22.1 million MWh produced on BLM land in the No Action Alternative.
- 22.8 million MWh in the Preferred Alternative.
- 9.3 million MWh in Alternative 1.
- 30.0 million MWh in Alternative 2.
- 18.1 million MWh in Alternative 3.
- 19.4 million MWh in Alternative 4.

Along with the GHG emissions caused by project construction activities and operations activities such as maintenance and inspection, development of renewable energy affects the natural carbon uptake of vegetation lost through land use conversion. Other one-time (life-cycle) events such as manufacturing, transport, and ultimately disposal of project components also cause GHG emissions.

Indirect GHG emissions reductions would occur because of the electricity provided by each renewable energy project. As discussed here, because developing new renewable energy sources would reduce, displace, or eliminate the emissions that otherwise result from fossil fuel-fired power plants, the avoided GHG emissions typically greatly exceed the levels of emissions directly caused from developing the project.

IV.3.2.1 Impacts of Renewable Energy and Transmission Development

The GHG emissions impacts from solar, wind, geothermal, and transmission differ depending on the individual technology deployed. All of the renewable energy technologies would generate GHG emissions from activities necessary for site characterization and testing, employee commuting, construction, operations, and decommissioning. Development of the land also results in lost capacity of soil and vegetation to sequester carbon at the sites. However, this impact is offset by reducing emissions associated with producing electricity through the use of carbon-based fuels.

Electricity production by fossil fuel-fired California and western U.S. power plants under baseline conditions causes approximately 20% of California's overall GHG inventory. Producing electricity through renewable energy technologies avoids conventional power plant emissions that occur when serving the California load. These substantial GHG emissions reductions would be indirect, because while each renewable energy project would enable a reduction, the renewable energy project is not in control of those reductions. To serve any given load, these GHG reductions are attributable to using the renewable resources.

IV.3.2.1.1 Impacts of Site Characterization

Typical site characterization activities include construction of temporary access roads, site reconnaissance, geotechnical borings, and the construction of meteorological towers. These impacts are similar for each renewable energy technology. The emissions from site characterization would come from fossil-fuel combustion in the engines of the equipment and vehicles used during construction or decommissioning. In-depth lists of activities are located in Volume II, Section II.3.3.1.

IV.3.2.1.2 Impacts of Construction and Decommissioning

The typical GHG emissions impacts from construction and decommissioning activities result from fossil-fuel combustion in the engines of construction equipment and the vehicles carrying construction materials and workers to each development site. Diesel fuel or gasoline is used in mobilizing the heavy-duty construction equipment, site development and preparation, facility removal, building construction, and roadway construction; the nature of the GHG emissions from these types of activities would be

similar regardless of the renewable energy technology. The GHG emissions from decommissioning are similar to those that occur during construction. Because CO_2 has an atmospheric lifetime of from 50 to 200 years, assessing the impacts of limited-duration construction-phase GHG emissions usually involves averaging or amortizing the total emissions created by the construction effort over each project's expected operating life. In-depth lists of activities are located in Volume II, Section II.3.3.1.

Land use conversion brought about by the development of renewable energy and the vegetation removal that occurs with ground disturbance may reduce the rate of natural carbon uptake into soils and vegetation (carbon sequestration). Soils and plants on each development site currently provide a natural carbon sink (storage capacity). By developing the land, some but not all of the natural carbon sequestration provided by the existing soils and vegetation would be eliminated. Vegetation management and restoration practices during project operation can partially restore the natural removal of CO_2 from the atmosphere that would otherwise be lost through construction-related ground disturbance.

IV.3.2.1.3 Impacts of Operations and Maintenance

The GHG emissions occurring during operation and maintenance of each renewable energy project result from the fossil-fuel combustion used for routine upkeep of the project site, security, emergency generators, employee commuting trips, and vegetation removal. Sources of GHG emissions occur with access and spur road maintenance, combustion of natural gas for solar thermal technologies, facilities maintenance, geothermal well drilling, well venting, and steam turbine operations, among other activities. Sulfur hexafluoride (SF_6) is used as an insulating gas in electric power transmission and distribution equipment.

Solar thermal projects could additionally involve combustion of natural gas and therefore are expected to result in GHG emissions impacts during operations. Geothermal technologies would result in additional emissions of CO_2 and methane (CH_4) naturally present in geothermal steam emitted during well venting and steam turbine operations.

In-depth lists of operations and maintenance activities are presented in Volume II, Section II.3.3.1.

IV.3.2.2 Impacts of the Ecological and Cultural Conservation and Recreation Designations

In general, the conservation designations would define large areas where development would be very limited or prohibited. Construction activities would be limited, and new vehicle emissions would be at very low levels. In areas with no development, there would be no removal of vegetation, so the natural carbon uptake of existing plants would continue

or be enhanced through restoration design, which has optimization of carbon sequestration as one goal. Restoration of plants is discussed in Chapter IV.7, Biological Resources.

The BLM LUPA land designations define management approaches that protect ecological, historic, cultural, scenic, scientific, and recreation resources and values. They would not have an effect on GHG emissions, except for controls on emissions-generating projects**.**

Details on allowable uses and management within National Conservation Lands are presented in the Proposed LUPA description in Volume II. Details on the goals, objectives, allowable uses, and management actions for each Area of Critical Environmental Concern (ACEC) and Special Recreation Management Area (SRMA) unit are presented in the LUPA worksheets in Appendix H.

IV.3.3 Impact Analysis by Alternative

The following sections present impact analysis on GHG emissions for the No Action Alternative, the Preferred Alternative, and Alternatives 1 through 4.

IV.3.3.1 No Action Alternative

IV.3.3.1.1 Impacts of Renewable Energy and Transmission Development

The No Action Alternative assumes the state's renewable energy goals would be achieved absent the DRECP and that renewable energy, transmission development, and mitigation for such projects in the DRECP area would occur on a project-by-project basis consistent with past and ongoing renewable energy and transmission projects.

Under the No Action Alternative, the existing land management plans within the DRECP area (California Desert Conservation Area [CDCA) Plan as amended, Caliente Resource Management Plan [RMP], and Bishop RMP) would continue to be implemented on BLM lands. As GHGs are not confined to specific boundaries, they would not interact any differently with ACECs and within Solar Energy Zones (SEZs) and Variance Process Lands.

As described in the Draft DRECP and EIR/EIS, the REAT agencies anticipate that renewable generation projects of approximately 20,000 MW could be located within the DRECP area under all alternatives. This level of generation includes 9,800 MW that would be located on BLM-managed lands in the No Action Alternative. The No Action Alternative assumes a mix of technologies on BLM land producing 22.1 million MWh annually and on line by 2040.

Impact MC-1: Construction or operation of Plan components would generate GHG emissions.

All development of renewable energy technologies and transmission would result in GHG emissions from activities listed previously (see Section IV.3.2), including construction, operations and maintenance, and decommissioning. Emissions for the 2040 horizon are considered here, although year-to-year rates would vary as renewable energy facilities and associated transmission capacities are built out to be on line by 2040. Separate discussions appear for the GHG emissions caused by construction activities, operations activities such as maintenance and inspection, the effects of land use conversion, and indirect GHG emissions reductions from the energy output provided by the renewable energy technologies.

Emissions From Development Activities: Construction, Operations, and Decommissioning. Examples of the typical levels of GHG emissions produced from developing individual renewable energy projects are listed in Appendix R1.3-1 These levels of emissions are indicative of those that would result from development of projects expected under the No Action Alternative.

Projects developed under the No Action Alternative are anticipated to achieve a combined capacity of approximately 20,000 MW by the time they are built out by 2040 with 9,800 MW on BLM land. Based on the existing projects in the DRECP area, construction emissions plus operations emissions during the life of each project would occur at an average rate of less than 10 $MTCO_2E$ per year for each MW of capacity (see Section III.3.3.1 and Appendix R1.3-1). Development activities to install approximately 20,000 MW through a variety of individual projects across the entire DRECP area would therefore result in GHG emissions at the rate of approximately 200,000 $MTCO_2E$ per year or approximately 98,000 $MTCO_2E$ per year on BLM-managed lands.

Emissions Related to Land Use Conversion. There are 9,781,700 acres of land within the DRECP area that would be available for development under the No Action Alternative. As defined in Volume II, the No Action Alternative would result in 122,000 acres of long-term disturbance due to construction and operation of renewable generation facilities across the entire DRECP area and 61,500 acres on BLM land. Development of transmission would disturb additional areas. This ground disturbance is assumed to remove vegetation that naturally provides carbon uptake. Converting the existing lands would eliminate the natural sequestration of carbon because the existing vegetation acts as a sink by removing CO_2 from the atmosphere. As described under typical impacts, ground disturbance and vegetation removal during construction of renewable energy facilities would add to the GHG impact because vegetation would no longer be present to sequester CO_2. The loss of carbon uptake depends on what fraction

of natural vegetation on each site would be cleared for permanent installation of foundations or other structures, and on efforts to minimize soil erosion or protect existing habitat to minimize the loss of carbon uptake.

The loss of vegetation due to ground disturbance in the No Action Alternative would reduce the rate of carbon uptake. The actual amount of this loss is uncertain because it would depend on each particular development site, and data on rates of sequestration by vegetation and soils are approximations. This loss of carbon uptake could range from 178,000 $MTCO_2E$ to 630,000 $MTCO_2E$ per year across the entire DRECP area and from 74,400 $MTCO_2E$ to 217,100 $MTCO_2E$ per year on BLM-managed lands (see Table IV.3-1).

Table IV.3-1
Estimated Loss of Annual Carbon Uptake – No Action Alternative

Alternative	Permanent Disturbance (acres)	Carbon Sequestered ($MTCO_2E$), Low Est.[1]	Carbon Sequestered ($MTCO_2E$), High Est.[2]
No Action Alternative (Total BLM Portion)	61,500	-74,400	-217,100

[1] Estimate for "average U.S. forests," including desert scrub environments. Desert scrub sequesters less carbon than other U.S. forest categories. http://www.epa.gov/cleanenergy/energy-resources/refs.html#pineforests.

[2] Estimate for "grasslands," as reported by the California Climate Action Registry and the California Emissions Estimator Model, which is a category that includes shrub communities that fall below the threshold values used in the forest land category (http://www.caleemod.com, Appendix A).

Note: The following general rounding rules were applied to calculated values: values greater than 1,000 were rounded to the nearest 1,000; values less than 1,000 and greater than 100 were rounded to the nearest 100; values of 100 or less were rounded to the nearest 10, and therefore totals may not sum due to rounding. In cases where subtotals are provided, the subtotals and the totals are individually rounded. The totals are not a sum of the rounded subtotals; therefore the subtotals may not sum to the total within the table.

Emissions Avoided by Producing Electricity. The use of renewable power would displace power produced by carbon-based fuels that would otherwise be used to meet electricity demand. The power displaced is incremental power provided by generators, typically from natural gas power plants. The California Public Utilities Commission (CPUC) has stated that, by 2020, the marginal power plant will be a new combined-cycle combustion turbine 95% of the time or a new combustion turbine 5% of the time. Based on this ratio, the GHG emissions associated with marginal power production are 830 pounds CO_2E per MWh (Air Resources Board [ARB] 2010). The Environmental Protection Agency (EPA) estimates the baseline GHG emissions of marginal power to be more than 990 pounds CO_2E per MWh for California (see Table III.3-3).

Absent the emissions directly caused by construction, operations, and decommissioning, the GHG emissions that would be avoided or displaced as a result of new solar and wind renewable electricity production are expected to be approximately 830 pounds CO_2E per

MWh (see Section III.3.3.2). GHG emissions displaced by geothermal energy would be approximately 520 pounds CO_2E per MWh, which accounts for the CO_2 that occurs naturally in geothermal steam released by operations at a geothermal plant, which averages 310 pounds CO_2E per MWh (ARB 2010). Methane may also be naturally present in the steam. As seen for the existing renewable energy projects in the DRECP area (see Volume III, Section III.3.3.1, and Appendix R1.3-1), the displaced annual GHG emissions exceed the total emissions calculated for construction, operations, and decommissioning, resulting in a GHG reduction.

These GHG emissions reductions for the No Action Alternative would be approximately 18,200,000 $MTCO_2E$ per year for the combined renewable energy technologies across the entire DRECP area and 8,265,000 $MTCO_2E$ for projects on BLM land (See Table IV.3-2). Because the GHG avoided from fossil fuel-fired power plants would greatly exceed GHG emissions generated by renewable energy development and land use conversion, the electricity produced under the No Action Alternative would reduce California's net GHG emissions.

Table IV.3-2
Annual GHG Emissions Reductions – No Action Alternative

Technology	Annual Production (MWh)	Avoided Emissions ($MTCO_2E$)
Solar[1]	18,623,300	7,011,000
Wind[1]	3,072,300	1,157,000
Geothermal[2]	412,720	97,000
Total	**22,108,320**	**8,265,000**

[1] Emissions avoided/displaced for solar and wind energy are 830 pounds per MWh (ARB 2010).
[2] Emissions avoided/displaced for geothermal energy are 520 pounds per MWh (ARB 2010).

Impact MC-2: Construction or operation of Plan components would conflict with an applicable plan, policy, or regulation intended to address climate change.

Projects developed under the No Action Alternative would support the state's GHG emissions reductions goals and plans by generating electricity from renewable energy resources instead of fossil-fuel resources. This displacement of GHGs would lower the GHG baseline emissions attributable to electricity use in California and would be consistent with the GHG reduction goals established by Executive Orders, the California Global Warming Solutions Act, and the Climate Change Scoping Plan (see Volume III, Section III.3.1.2).

Executive Order S-14-08 established the RPS goal of 33% by 2020 and directed the Renewable Energy Action Team to achieve certain goals related to the DRECP, including processes to facilitate RPS desert project approval. Development of renewable energy

facilities under the No Action Alternative would provide energy to retail sellers of electricity and partially enable California's utilities to comply with RPS requirements. However, the No Action Alternative would not include any long-term natural resource conservation strategies. The No Action Alternative would therefore conflict with Executive Order S-14-08, which addresses the need for renewable energy while conserving the natural resources of the desert. Aside from the conflict with Executive Order S-14-08, individual renewable energy projects under the No Action Alternative would not be expected to conflict with any other applicable plan, policy, or regulation adopted for purposes of reducing GHG emissions.

Laws and Regulations

Existing laws and regulations provide a framework to reduce statewide GHG emissions and baseline conditions (including projected conditions) for the DRECP area and subsequent renewable energy projects. Additionally, some of the following regulations provide direction for project-level measures designed to reduce GHG emissions and impacts:

- Executive Order S-3-05, signed by Governor Arnold Schwarzenegger on June 1, 2005, and Executive Order B-30-15 signed by Governor Edmund G. Brown Jr. on April 29, 2015, established GHG emissions reduction targets for the state of California and directed the California Environmental Protection Agency to oversee efforts to reach these targets.
- AB 32 (Nunez), the California Global Warming Solutions Act of 2006, requires that the California Air Resources Board (CARB) adopt rules and regulations to reduce GHG emissions to 1990 levels by 2020. The CARB is required to publish a list of discrete GHG emissions reduction measures.
- The RPS promotes diversification of the state's electricity supply, and Executive Orders S-14-08 and S-21-09 established the goal that, by 2020, 33% of the electricity provided by a utility must be produced from renewable energy sources in a manner that considers conservation of California's desert natural resources.
- The Greenhouse Gases Emission Performance Standard (SB 1368) requires California utilities to satisfy a per-MWh performance threshold when making new investments in power plants. Baseload generation owned by, or under long-term contract to, California utilities must not exceed 1,100 pounds CO_2 per MWh (0.5 MT per MWh).
- CARB adopted SF_6 regulations (17 California Code of Regulations [CCR] 95350) to reduce SF_6 emissions from electric power system gas-insulated switchgear. The regulations require owners of such switchgear to (1) annually report their SF_6 emissions, (2) determine the emission rate relative to the SF_6 capacity of the switchgear, (3) provide a complete inventory of all gas-insulated switchgear and

their SF_6 capacities, (4) produce a SF_6 gas container inventory, and (5) keep all information current for CARB enforcement staff inspection and verification. Transmission projects and switchgear associated with the renewable energy development projects would be subject to this regulation.

Design Features of the Solar PEIS

The Solar Programmatic EIS (PEIS) does not include any design features for the specific purposes of reducing GHG or avoiding potential impacts due to climate change.

Typical Mitigation Measures

The types of mitigation available to reduce GHG focus on either avoiding or offsetting emissions from fossil fuels used during construction and controlling SF_6 emissions from electrical switchgear. Following are the typical mitigation measures that would likely be implemented under the No Action Alternative. These strategies could be used, where necessary, to reduce GHG (as defined in Impact MC-1) under the No Action Alternative.

- Use electric vehicles, biodiesel, or alternative fuels during construction and operations phases to reduce the project's emissions of criteria pollutants and GHG.
- Reduce SF_6 emissions and losses through a comprehensive strategy that includes the following actions: Develop and maintain a record of SF_6 purchases, an SF_6 leak detection and repair program using laser imaging leak detection and monitoring no less frequently than quarterly, an SF_6 recycling program, and an employee education and training program for avoiding or eliminating SF_6 emissions caused by gas-insulated switchgear.
- Offset construction-phase emissions by surrendering carbon credits backed by voluntary GHG emissions reductions to fully offset construction-phase GHG emissions.

IV.3.3.1.2 Impacts of Ecological and Cultural Conservation and Recreation Designations

The No Action Alternative has no new conservation designations, but without approval of an action alternative, there would be continued protection of existing approximately 2.4 million acres of conservation lands such as wilderness areas. In addition, under the No Action Alternative, renewable energy projects would continue to be evaluated and approved with project-specific mitigation requirements.

IV.3.3.1.3 Impacts of Transmission Outside the DRECP Area

New transmission lines would be required to deliver electricity from renewable energy projects in the DRECP area to high-demand urban areas. The corridors for

transmission lines would be existing transmission corridors located outside the DRECP area in San Diego, Los Angeles, North Palm Springs–Riverside, and the Central Valley. Renewable energy projects produce electricity that avoids or displaces use of GHG-emitting power plants. These transmission lines would be part of that overall GHG displacement or avoidance.

Impact MC-1: Construction or operation of Plan components would generate GHG emissions.

Except for emissions involved in the use of vehicles and equipment during the construction and maintenance of the transmission lines and emissions of SF_6 that escape during its use as an insulating gas in switchgear, transmission facilities would not create GHG emissions. The GHG emissions during routine operation and maintenance of the transmission lines would occur at much lower levels than during construction, and the GHG emissions avoided as a result of avoiding operation of fossil fuel-fired power plants would greatly exceed the levels of emissions from transmission line construction and operations activities.

Impact MC-2: Construction or operation of Plan components would conflict with an applicable plan, policy, or regulation intended to address climate change.

While GHG emissions would result from transmission line construction and operation, the overall effect of developing renewable energy resources and the transmission facilities to deliver the electricity to customers would reduce GHG emissions. The transmission lines would be essential to achieving the RPS and the overall GHG reduction strategy for the state, as transmission lines are necessary to deliver renewable energy to load centers. Developing the transmission facilities would occur in a manner consistent with and would not conflict with the California Global Warming Solutions Act, GHG reduction goals, and the Climate Change Scoping Plan (see Volume III, Section III.3.1.2).

IV.3.3.2 Preferred Alternative

IV.3.3.2.1 Impacts of Renewable Energy and Transmission Development

The Preferred Alternative assumes that a mix of technologies on BLM land will produce 22.8 million MWh of electricity annually. The mix includes 8,175 MW of generation capacity on BLM land installed, built out, and on line by 2040.

Streamlining renewable energy development on BLM lands within the DFAs would not change the numeric calculations for Impacts MC-1 and MC-2, which are presented below. The range of loss of natural carbon uptake would remain the same, as would the MWh produced under the Preferred Alternative and the GHG emissions reductions. Streamlining

development may result in faster delivery of electricity to the grid, thereby achieving the GHG emissions reductions more quickly and maintaining consistency with the California Global Warming Solutions Act and the Climate Change Scoping Plan.

Impact MC-1: Construction or operation of Plan components would generate GHG emissions.

The activities associated with renewable energy technologies and transmission would result in construction, operations and maintenance, and decommissioning activities that create GHG emissions, as described for the No Action Alternative in Section IV.3.3.1.1. Emissions for the 2040 horizon appear here, although the year-to-year rates would vary as the renewable energy facilities and associated transmission capacity are to be on line by 2040. Separate discussions appear for the GHG emissions caused by construction and operations and maintenance activities, the effects of land use conversion, and the indirect GHG emissions reductions that would occur because of the energy output provided by the renewable energy facilities.

Emissions From Development Activities: Construction, Operations, and Decommissioning. Projects developed under the Preferred Alternative within the DRECP area would have a combined capacity of approximately 20,000 MW when built out by 2040. Based on the emissions caused by existing projects, construction emissions plus operations, emissions to develop this capacity across the entire DRECP area would cause GHG emissions at a rate of approximately 200,000 $MTCO_2E$ per year or approximately 81,750 $MTCO_2E$ per year on BLM-managed lands during the life of the Plan.

Emissions Related to Land Use Conversion. There would be 48,000 acres of ground disturbance and vegetation removal due to renewable energy generation under the Preferred Alternative on BLM land. Development of transmission would disturb additional areas. Vegetation removal results in a loss of natural carbon uptake. Based on this loss of vegetation, the Preferred Alternative would reduce the rate of carbon uptake. The actual amount of this loss is uncertain because it would depend on each particular development site, and data on rates of sequestration by vegetation and soils are approximations (see Table IV.3-3).

Table IV.3-3
Estimated Loss of Annual Carbon Uptake – Preferred Alternative

Alternative	Permanent Disturbance (acres)	Carbon Sequestered ($MTCO_2E$) Low Est.[1]	Carbon Sequestered ($MTCO_2E$) High Est.[2]
Preferred Alternative (Total BLM Portion)	48,419	-58,600	-170,900

[1] Estimate for "average U.S. forests," including desert scrub environments. Desert scrub sequesters less carbon than other U.S. forest categories. http://www.epa.gov/cleanenergy/energy-resources/refs.html#pineforests.

[2] Estimate for "grasslands," as reported by the California Climate Action Registry and the California Emissions Estimator Model, which is a category that includes shrub communities that fall below the threshold values used in the forest land category (http://www.caleemod.com, Appendix A).

Note: The following general rounding rules were applied to calculated values: values greater than 1,000 were rounded to the nearest 1,000; values less than 1,000 and greater than 100 were rounded to the nearest 100; values of 100 or less were rounded to the nearest 10, and therefore totals may not sum due to rounding. In cases where subtotals are provided, the subtotals and the totals are individually rounded. The totals are not a sum of the rounded subtotals; therefore, the subtotals may not sum to the total within the table.

Emissions Avoided by Producing Electricity. The GHG emissions reductions for the Preferred Alternative would occur at the same displacement rates as described for the No Action Alternative in Section IV.3.3.1.1. The GHG emissions reductions for the Preferred Alternative would be approximately 7.6 million $MTCO_2E$ per year for the combined renewable energy technologies on BLM land (see Table IV.3-4). Because the GHG avoided from fossil fuel-fired power plants would greatly exceed the GHG emissions caused by renewable energy development activities and land use conversion, the electricity produced under the Preferred Alternative would reduce California's GHG emissions.

Table IV.3-4
Annual GHG Emissions Reductions – Preferred Alternative

Technology	Annual Production (MWh)	Avoided Emissions ($MTCO_2E$)
Solar[1]	11,617,783	4,374,000
Wind[1]	4,120,729	1,551,000
Geothermal[2]	7,030,984	1,658,000
Total	**22,769,497**	**7,583,000**

[1] Emissions avoided/displaced for solar and wind energy are 830 pounds per MWh (ARB 2010).
[2] Emissions avoided/displaced for geothermal energy are 520 pounds per MWh (ARB 2010).

Impact MC-2: Construction or operation of Plan components would conflict with an applicable plan, policy, or regulation intended to address climate change.

Projects developed under the Preferred Alternative would support the state's GHG emissions reductions goals and plans by generating electricity from renewable energy resources instead of fossil-fuel resources. This displacement of GHGs would be consistent with the California Global Warming Solutions Act, GHG reduction goals, and the Climate Change Scoping Plan (see Volume III, Section III.3.1.2). Additionally, the Preferred Alternative would address the need for renewable energy while establishing strategies for conservation of California's desert natural resources in a manner consistent with Executive Order S-14-08. Individual renewable energy projects would cause no other potential conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions.

Impacts on Variance Process Lands

Variance Process Lands are neither conservation designations nor DFAs. They are a subset of the variance lands identified in the Solar PEIS ROD and additional lands that, based on current information, have moderate to low ecological value and ambiguous value for renewable energy. If renewable energy development occurs on Variance Process Lands, a LUPA would not be required, so the environmental review process would be somewhat simpler than if the location were left undesignated.

Variance Process Lands for each alternative are as shown in Chapter IV.1, Table IV.1-2 and in Volume II, Chapter II.3, Figure II.3-1 for the Preferred Alternative. Development of the Variance Process Lands would have similar air quality effects as described under Impacts MC-1 and MC-2.

Impact Reduction Strategies

The implementation of the Proposed LUPA would result in conservation of some desert lands as well as the development of renewable energy generation and transmission facilities on other lands. The impacts of the renewable energy development covered by the Proposed LUPA would be lessened in two ways. First, it incorporates Conservation and Management Actions (CMAs) for each alternative, including specific biological conservation designation components and LUPA components. Second, the implementation of existing laws, orders, regulations, and standards would reduce the impacts of project development.

Design Features of the Solar PEIS

The Solar Programmatic EIS (PEIS) does not include any design features for the specific purposes of reducing GHG or avoiding potential impacts due to climate change.

Conservation and Management Actions

The conservation strategy for the Preferred Alternative (presented in Volume II, Section II.3.4) defines specific actions that would reduce the impacts of this alternative. The conservation strategy defines the conservation designations and specific CMAs for the Preferred Alternative. One CMA for air resources (LUPA-AIR-3) specifically addresses GHG emissions as a necessary part of the impact analysis.

Laws and Regulations

Similar to the No Action Alternative, existing laws and regulations will reduce certain impacts of DRECP implementation. Relevant regulations are presented in the Regulatory

Setting in Chapter III.3. The requirements of relevant laws and regulations are summarized for the No Action Alternative in Section IV.3.3.1.1.

IV.3.3.2.2 Impacts of Ecological and Cultural Conservation and Recreation Designations

The Preferred Alternative would provide about 5 million acres within the DRECP area with protective land designations. Establishing lands with protective designations provides GHG benefits because limiting development on the lands restricts the potential removal of vegetation, which would allow the natural carbon uptake of existing soils and vegetation to continue in these areas. Restoration of plants is discussed in Chapter IV.7, Biological Resources.

The BLM LUPA land designations protect ecological, historical, cultural, scenic, scientific, and recreational resources and values. While other land uses within these areas are allowed, they must be compatible with the resources and values that the land designation is intended to protect. GHG impacts are not likely from changes to BLM land designations.

IV.3.3.2.3 Impacts of Transmission Outside the DRECP Area

The impacts of transmission outside of the DRECP area on meteorology and climate change would be the same under all alternatives. These impacts are as described for the No Action Alternative in Section IV.3.3.1.3.

IV.3.3.2.4 Comparison of the Preferred Alternative With No Action Alternative

The Preferred Alternative would produce greater levels of electricity from renewable resources installed on BLM land compared with the No Action Alternative. Implementing the DRECP under the Preferred Alternative would develop the resources in a manner that would satisfy Executive Order S-14-08 to address the need for renewable energy. The Preferred Alternative would therefore avoid the potential conflict with Executive Order S-14-08 that would occur with the No Action Alternative.

The mix of technologies in the Preferred Alternative would result in more wind and geothermal generation capacity being installed on BLM land compared with the No Action Alternative (see Tables IV.3-2 and IV.3-4). When the avoided or displaced GHG emissions are calculated (see Section IV.3.3.1.1 for the rationale), the generation mix of the Preferred Alternative would provide fewer $MTCO_2E$ GHG emissions reductions per year. This means a lower level of GHG emissions would be reduced (i.e., displaced) under the Preferred Alternative than under the No Action Alternative.

Unlike the No Action Alternative, the Preferred Alternative would cause no potential conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions.

The BLM land designations and management actions would not change the calculations for Impacts MC-1 and MC-2 analyzed under the No Action Alternative and the Preferred Alternative. The range of loss of natural carbon uptake would remain the same, as would the MWh produced under both alternatives and the GHG emissions reduced.

The streamlined development under the Preferred Alternative may result in faster delivery of electricity to the grid than under the No Action Alternative, thereby achieving the GHG emissions reductions more quickly and maintaining consistency with the California Global Warming Solutions Act and the Climate Change Scoping Plan.

IV.3.3.3 Alternative 1

IV.3.3.3.1 Impacts of Renewable Energy and Transmission Development

Alternative 1 assumes that a mix of technologies on BLM land will produce 9.3 million MWh annually. The mix includes 3,042 MW of generation capacity on BLM land installed, built out, and on line by 2040.

Streamlining renewable energy development on BLM lands within the DFAs would not change the numeric calculations for Impacts MC-1 and MC-2. The range of loss of natural carbon uptake would remain the same, as would the MWh produced under Alternative 1 and the GHG emissions reductions. Streamlining development may result in faster delivery of electricity to the grid, thereby achieving the GHG emissions reductions more quickly and maintaining consistency with the California Global Warming Solutions Act and the Climate Change Scoping Plan.

Impact MC-1: Construction or operation of Plan components would generate GHG emissions.

The activities associated with renewable energy and transmission facilities would result in construction, operations and maintenance, and decommissioning activities, in turn resulting in GHG emissions as described for the No Action Alternative in Section IV.3.3.1.1. Emissions for the 2040 horizon appear here, although the year-to-year rates would vary as renewable energy and transmission facilities are to be on line by 2040. Separate discussions appear for the GHG emissions caused by construction and operations and maintenance activities, the effects of land use conversion, and the indirect GHG emissions reductions that would occur because of the energy output provided by the renewable energy technologies.

Emissions From Development Activities: Construction, Operations, and Decommissioning. Projects developed under Alternative 1 within the DRECP area are anticipated to have a combined capacity of approximately 20,000 MW when built out by 2040. Construction emissions plus operations emissions to develop this capacity across the entire DRECP area would cause GHG emissions at a rate of approximately 200,000 $MTCO_2E$ per year or approximately 30,420 $MTCO_2E$ per year on BLM-managed lands during the life of the DRECP.

Emissions Related to Land Use Conversion. There would be much less ground disturbance and vegetation removal on BLM land from renewable energy development under Alternative 1 than with the Preferred Alternative. Development of transmission would also disturb additional areas. Vegetation removal results in a loss of natural carbon uptake, although the actual amount of this loss is uncertain because it would depend on each particular development site, and data on rates of sequestration by vegetation and soils are approximations (see Table IV.3-5).

Table IV.3-5
Estimated Loss of Annual Carbon Uptake – Alternative 1

Alternative	Permanent Disturbance (acres)	Carbon Sequestered ($MTCO_2E$), Low Est.[1]	Carbon Sequestered ($MTCO_2E$), High Est.[2]
Alternative 1 (Total BLM Portion)	18,436	-22,300	-65,100

[1] Estimate for "average U.S. forests," including desert scrub environments. Desert scrub sequesters less carbon than other U.S. forest categories. http://www.epa.gov/cleanenergy/energy-resources/refs.html#pineforests.

[2] Estimate for "grasslands," as reported by the California Climate Action Registry and the California Emissions Estimator Model, which is a category that includes shrub communities that fall below the threshold values used in the forest land category (http://www.caleemod.com, Appendix A).

Note: The following general rounding rules were applied to calculated values: values greater than 1,000 were rounded to the nearest 1,000; values less than 1,000 and greater than 100 were rounded to the nearest 100; values of 100 or less were rounded to the nearest 10, and therefore totals may not sum due to rounding. In cases where subtotals are provided, the subtotals and the totals are individually rounded. The totals are not a sum of the rounded subtotals; therefore the subtotals may not sum to the total within the table.

Emissions Avoided by Producing Electricity. The GHG emissions reductions for Alternative 1 would occur at the same displacement rates described for the No Action Alternative in Section IV.3.3.1.1. These GHG emissions reductions for Alternative 1 would be approximately 2.8 million $MTCO_2E$ per year for the combined renewable energy technologies on BLM land (see Table IV.3-6). Because the GHG avoided from fossil fuel-fired power plants would greatly exceed the GHG emissions caused by renewable energy development activities and land use conversion, the electricity produced under Alternative 1 would reduce California's GHG emissions.

Table IV.3-6
Annual GHG Emissions Reductions – Alternative 1

Technology	Annual Production (MWh)	Avoided Emissions ($MTCO_2E$)
Solar[1]	4,481,090	1,687,000
Wind[1]	158,427	60,000
Geothermal[2]	4,662,817	1,100,000
Total	**9,302,335**	**2,847,000**

[1] Emissions avoided/displaced for solar and wind energy are 830 pounds per MWh (ARB 2010).
[2] Emissions avoided/displaced for geothermal energy are 520 pounds per MWh (ARB 2010).

Impact MC-2: Construction or operation of Plan components would conflict with an applicable plan, policy, or regulation intended to address climate change.

Projects developed under Alternative 1 would support the state's GHG emissions reductions goals and plans by generating electricity from renewable energy resources instead of fossil-fuel resources. This displacement of GHGs would be consistent with the California Global Warming Solutions Act, GHG reduction goals, and the Climate Change Scoping Plan (see Volume III, Section III.3.1.2). Individual renewable energy projects would cause no potential conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions.

Impacts on Variance Process Lands

Variance Process Lands are neither conservation lands nor DFAs. They are a subset of the variance lands identified in the Solar PEIS ROD and additional lands that, based on current information, have moderate to low ecological value and ambiguous value for renewable energy. If renewable energy development occurs on Variance Process Lands, a LUPA would not be required, so the environmental review process would be somewhat simpler than if the location were left undesignated.

Variance Process Lands for each alternative are as shown in Chapter IV.1, Table IV.1-2 and in Volume II, Chapter II.4, Figure II.4-1 for Alternative 1. Development of the Variance Process Lands would have similar air quality effects as described under Impacts MC-1 and MC-2.

Impact Reduction Strategies

The implementation of the Proposed LUPA would result in conservation of some desert lands as well as the development of renewable energy generation and transmission facilities on other lands. The impacts of the renewable energy development covered by the

Proposed LUPA would be lessened in two ways. First, it would incorporate CMAs for each alternative, including specific biological conservation designation components and LUPA components. Second, the implementation of existing laws, orders, regulations, and standards would reduce the impacts of project development.

Design Features of the Solar PEIS

The Solar Programmatic EIS (PEIS) does not include any design features for the specific purposes of reducing GHG or avoiding potential impacts due to climate change.

Conservation and Management Actions

The conservation strategy for Alternative 1 (presented in Volume II, Section II.4.4) defines specific actions that would reduce the impacts of this alternative. The conservation strategy defines the conservation designations and specific CMAs for the Preferred Alternative.

Laws and Regulations

Similar to the No Action Alternative, existing laws and regulations will reduce certain impacts of Plan implementation. Relevant regulations are presented in the Regulatory Setting in Chapter III.3. The requirements of relevant laws and regulations are summarized for the No Action Alternative in Section IV.3.3.1.1.

IV.3.3.3.2 Impacts of Ecological and Cultural Conservation and Recreation Designations

Alternative 1 would result in about 4.9 million acres within the DRECP area with protective land designations. Establishing lands with protective designations provides GHG benefits because limiting development on the lands restricts the potential removal of vegetation, which would allow the natural carbon uptake of existing soils and vegetation to continue in these areas.

The BLM LUPA land designations protect ecological, historical, cultural, scenic, scientific, and recreational resources and values. While other land uses within these areas are allowed, they must be compatible with the resources and values that the land designation is intended to protect. Establishing lands with protective designations provides GHG benefits.

IV.3.3.3.3 Impacts of Transmission Outside the DRECP Area

The impacts of transmission outside of the DRECP area on meteorology and climate change would be the same under all alternatives. These impacts are as described for the No Action Alternative in Section IV.3.3.1.3.

IV.3.3.3.4 Comparison of Alternative 1 With the Preferred Alternative

Alternative 1 would produce lower levels of electricity from renewable resources installed on BLM land compared with the Preferred Alternative.

The mix of technologies in Alternative 1 would result in much less renewable generation capacity being installed on BLM land compared with the Preferred Alternative (see Tables IV.3-4 and IV.3-6). When the avoided or displaced GHG emissions are calculated (see Section IV.3.3.1.1 for the rationale), the generation mix of Alternative 1 would displace fewer (nearly 4.8 million $MTCO_2E$ less) GHG emissions per year, which means a lower level of GHG emissions would be reduced (i.e., displaced) under Alternative 1 than under the Preferred Alternative.

The BLM land designations and management actions would not change the calculations for Impacts MC-1 and MC-2 as analyzed under Alternative 1 and the Preferred Alternative. The range of loss of natural carbon uptake would remain the same, as would the MWh produced under both alternatives and the GHG emissions reduced. The streamlined development is anticipated to occur under both of the alternatives.

IV.3.3.4 Alternative 2

IV.3.3.4.1 Impacts of Renewable Energy and Transmission Development

Alternative 2 assumes that a mix of technologies on BLM land will produce 30 million MWh annually. The mix includes 10,726 MW of generation capacity on BLM land installed, built out, and on line by 2040.

Streamlining renewable energy development on BLM lands within the DFAs would not change the numeric calculations for Impacts MC-1 and MC-2. The range of loss of natural carbon uptake would remain the same, as would the MWh produced under Alternative 2 and the GHG emissions reductions. Streamlining development may result in faster delivery of electricity to the grid, thereby achieving the GHG emissions reductions more quickly and maintaining consistency with the California Global Warming Solutions Act and the Climate Change Scoping Plan.

Impact MC-1: Construction or operation of Plan components would generate GHG emissions.

Activities related to the renewable energy technologies and transmission would result in construction, operations and maintenance, and decommissioning that create GHG emissions as described for the No Action Alternative in Section IV.3.3.1.1. Emissions for the 2040 horizon appear here, although the year-to-year rates would vary as the renewable energy facilities and associated transmission capacity are to be on line by 2040. Separate discussions appear for the

GHG emissions caused by construction and operations and maintenance activities, the effects of land use conversion, and the indirect GHG emissions reductions that would occur because of the energy output provided by the renewable energy facilities.

Emissions From Development Activities: Construction, Operations, and Decommissioning. Projects developed under Alternative 2 within the DRECP area would have a combined capacity of approximately 20,000 MW when built out by 2040. Construction emissions plus operations emissions to develop this capacity across the entire DRECP area would cause GHG emissions at a rate of approximately 200,000 $MTCO_2E$ per year or approximately 107,260 $MTCO_2E$ per year on BLM-managed lands during the life of the Plan.

Emissions Related to Land Use Conversion. There would be more ground disturbance and vegetation removal on BLM land due to renewable energy development under Alternative 2 compared with the Preferred Alternative. Development of transmission would disturb additional areas. Vegetation removal results in a loss of natural carbon uptake, although the actual amount of this loss is uncertain because it would depend on each particular development site, and data on rates of sequestration by vegetation and soils are approximations (see Table IV.3-7).

Table IV.3-7
Estimated Loss of Annual Carbon Uptake – Alternative 2

Alternative	Permanent Disturbance (acres)	Carbon Sequestered ($MTCO_2E$), Low Est.[1]	Carbon Sequestered ($MTCO_2E$), High Est.[2]
Alternative 2 (Total BLM Portion)	53,816	-65,100	-190,000

[1] Estimate for "average U.S. forests," including desert scrub environments. Desert scrub sequesters less carbon than other U.S. forest categories. http://www.epa.gov/cleanenergy/energy-resources/refs.html#pineforests.

[2] Estimate for "grasslands," as reported by the California Climate Action Registry and the California Emissions Estimator Model, which is a category that includes shrub communities that fall below the threshold values used in the forest land category (http://www.caleemod.com, Appendix A).

Note: The following general rounding rules were applied to calculated values: values greater than 1,000 were rounded to the nearest 1,000; values less than 1,000 and greater than 100 were rounded to the nearest 100; values of 100 or less were rounded to the nearest 10, and therefore totals may not sum due to rounding. In cases where subtotals are provided, the subtotals and the totals are individually rounded. The totals are not a sum of the rounded subtotals; therefore the subtotals may not sum to the total within the table.

Emissions Avoided by Producing Electricity. The GHG emissions reductions for Alternative 2 would occur at the same displacement rates described for the No Action Alternative in Section IV.3.3.1.1. The GHG emissions reductions for Alternative 2 would be approximately 10.3 million $MTCO_2E$ per year for the combined renewable energy technologies on BLM land (see Table IV.3-8). Because the GHG avoided from fossil fuel-fired power plants would greatly exceed the GHG emissions caused by renewable

energy development activities and land use conversion, the electricity produced under Alternative 2 would reduce California's GHG emissions.

Table IV.3-8
Annual GHG Emissions Reductions – Alternative 2

Technology	Annual Production (MWh)	Avoided Emissions ($MTCO_2E$)
Solar[1]	12,115,275	4,561,000
Wind[1]	10,959,564	4,126,000
Geothermal[2]	6,940,697	1,637,000
Total	**30,015,536**	**10,324,000**

[1] Emissions avoided/displaced for solar and wind energy are 830 pounds per MWh (ARB 2010).
[2] Emissions avoided/displaced for geothermal energy are 520 pounds per MWh (ARB 2010).

Impact MC-2: Construction or operation of Plan components would conflict with an applicable plan, policy, or regulation intended to address climate change.

Projects developed under Alternative 2 would support the state's GHG emissions reductions goals and plans by generating electricity from renewable energy resources instead of fossil-fuel resources. This displacement of GHGs would be consistent with the California Global Warming Solutions Act, GHG reduction goals, and the Climate Change Scoping Plan (see Volume III, Section III.3.1.2). Individual renewable energy projects would cause no potential conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions.

Impacts on Variance Process Lands

Variance Process Lands are neither conservation lands nor DFAs. They are a subset of the variance lands identified in the Solar PEIS ROD and additional lands that, based on current information, have moderate to low ecological value and ambiguous value for renewable energy. If renewable energy development occurs on Variance Process Lands, a LUPA would not be required, so the environmental review process would be somewhat simpler than if the location were left undesignated.

Variance Process Lands for each alternative are as shown in Chapter IV.1, Table IV.1-2 and in Volume II, Chapter II.5, Figure II.5-1 for Alternative 2. Development of the Variance Process Lands would have similar air quality effects as described under Impacts MC-1 and MC-2.

Impact Reduction Strategies

The implementation of the Proposed LUPA would result in conservation of some desert lands as well as the development of renewable energy generation and transmission facilities on other lands. The impacts of the renewable energy development covered by the

Proposed LUPA would be lessened in two ways. First, it incorporates CMAs for each alternative, including specific biological conservation designation components and LUPA components. Second, the implementation of existing laws, orders, regulations, and standards would reduce the impacts of project development.

Design Features of the Solar PEIS

The Solar Programmatic EIS (PEIS) does not include any design features for the specific purposes of reducing GHG or avoiding potential impacts due to climate change.

Conservation and Management Actions

The conservation strategy for Alternative 2 (presented in Volume II, Section II.5.4) defines specific actions that would reduce the impacts of this alternative. The conservation strategy defines the conservation designations and specific CMAs for the Preferred Alternative.

Laws and Regulations

Similar to the No Action Alternative, existing laws and regulations will reduce certain impacts of DRECP implementation. Relevant regulations are presented in the Regulatory Setting in Chapter III.3. The requirements of relevant laws and regulations are summarized for the No Action Alternative in Section IV.3.3.1.1.

IV.3.3.4.2 Impacts of Ecological and Cultural Conservation and Recreation Designations

Alternative 2 would provide about 5.2 million acres within the DRECP area with protective land designations. Establishing lands with protective designations provides GHG benefits because limiting development on the lands restricts the potential removal of vegetation, which would allow the natural carbon uptake of existing soils and vegetation to continue in these areas.

The BLM LUPA land designations protect ecological, historical, cultural, scenic, scientific, and recreational resources and values. While other land uses within these areas are allowed, they must be compatible with the resources and values that the land designation is intended to protect. Establishing lands with protective designations provides GHG benefits.

IV.3.3.4.3 Impacts of Transmission Outside the DRECP Area

The impacts of transmission outside of the DRECP area on meteorology and climate change would be the same under all alternatives. These impacts are as described for the No Action Alternative in Section IV.3.3.1.3.

IV.3.3.4.4 Comparison of Alternative 2 With Preferred Alternative

Alternative 2 would produce greater levels of electricity from renewable resources installed on BLM land compared with the Preferred Alternative.

The mix of technologies in Alternative 2 would result in much more wind generation capacity being installed on BLM land compared with the Preferred Alternative (see Tables IV.3-4 and IV.3-8). When the avoided or displaced GHG emissions are calculated (see Section IV.3.3.1.1 for the rationale), the generation mix of Alternative 2 would displace more (about 2.7 million $MTCO_2E$ more) GHG emissions per year, which means a greater level of GHG emissions would be reduced (i.e., displaced) under Alternative 2 than under the Preferred Alternative.

The BLM land designations and management actions would not change the calculations for Impacts MC-1 and MC-2 analyzed under Alternative 2 and the Preferred Alternative. The range of loss of natural carbon uptake would remain the same, as would the MWh produced under both alternatives and the GHG emissions reductions. The streamlined development is anticipated to occur under both of the alternatives.

IV.3.3.5 Alternative 3

IV.3.3.5.1 Impacts of Renewable Energy and Transmission Development

Alternative 3 assumes that a mix of technologies on BLM land will produce 18.1 million MWh annually. The mix includes 6,376 MW of generation capacity installed on BLM land, built out, and on line by 2040.

Streamlining renewable energy development on BLM lands within the DFAs would not change the numeric calculations for Impacts MC-1 and MC-2. The range of loss of natural carbon uptake would remain the same, as would the MWh produced under Alternative 3 and the GHG emissions reductions.

Streamlining development may result in faster delivery of electricity to the grid, thereby achieving the GHG emissions reductions more quickly and maintaining consistency with the California Global Warming Solutions Act and the Climate Change Scoping Plan.

Impact MC-1: Construction or operation of Plan components would generate GHG emissions.

All of the activities related to renewable energy and transmission technologies would result in construction, operations and maintenance, and decommissioning activities that would produce GHG emissions, as described for the No Action Alternative in Section IV.3.3.1.1. Emissions for the 2040 horizon appear here, although the year-to-year rates would vary as

the renewable energy facilities and associated transmission capacity are to be on line by 2040. Separate discussions appear for the GHG emissions caused by construction and operations and maintenance activities, the effects of land use conversion, and the indirect GHG emissions reductions that would occur because of the energy output provided by the renewable energy technologies.

Emissions from Development Activities: Construction, Operations, and Decommissioning. Projects developed under Alternative 3 within the DRECP area would have a combined capacity of approximately 20,000 MW upon being built out by 2040. Construction emissions plus operations emissions to develop this capacity across the entire DRECP area would cause GHG emissions at a rate of approximately 200,000 $MTCO_2E$ per year or approximately 63,760 $MTCO_2E$ per year on BLM-managed lands during the life of the DRECP.

Emissions Related to Land Use Conversion. There would be less ground disturbance and vegetation removal on BLM land due to renewable energy development under Alternative 3 compared with the Preferred Alternative. Development of transmission would disturb additional areas. Vegetation removal results in a loss of natural carbon uptake, although the actual amount of this loss is uncertain because it would depend on each particular development site, and data on rates of sequestration by vegetation and soils are approximations (see Table IV.3-9).

Table IV.3-9
Estimated Loss of Annual Carbon Uptake – Alternative 3

Alternative	Permanent Disturbance (acres)	Carbon Sequestered ($MTCO_2E$), Low Est.[1]	Carbon Sequestered ($MTCO_2E$), High Est.[2]
Alternative 3 (Total BLM Portion)	37,089	-44,900	-130,900

[1] Estimate for "average U.S. forests," including desert scrub environments. Desert scrub sequesters less carbon than other U.S. forest categories. http://www.epa.gov/cleanenergy/energy-resources/refs.html#pineforests.

[2] Estimate for "grasslands," as reported by the California Climate Action Registry and the California Emissions Estimator Model, which is a category that includes shrub communities that fall below the threshold values used in the forest land category (http://www.caleemod.com, Appendix A).

Note: The following general rounding rules were applied to calculated values: values greater than 1,000 were rounded to the nearest 1,000; values less than 1,000 and greater than 100 were rounded to the nearest 100; values of 100 or less were rounded to the nearest 10, and therefore totals may not sum due to rounding. In cases where subtotals are provided, the subtotals and the totals are individually rounded. The totals are not a sum of the rounded subtotals; therefore the subtotals may not sum to the total within the table.

Emissions Avoided by Producing Electricity. The GHG emissions reductions for Alternative 3 would occur at the same displacement rates described for the No Action Alternative in Section IV.3.3.1.1. The GHG emissions reductions for Alternative 3 would be approximately 5.8 million $MTCO_2E$ per year for the combined renewable energy technologies on BLM land (see Table IV.3-10). Because the GHG avoided from fossil fuel-

fired power plants would greatly exceed the GHG emissions caused by renewable energy development activities and land use conversion, the electricity produced under Alternative 3 would reduce California's GHG emissions.

Table IV.3-10
Annual GHG Emissions Reductions – Alternative 3

Technology	Annual Production (MWh)	Avoided Emissions ($MTCO_2E$)
Solar[1]	10,038,181	3,779,000
Wind[1]	1,008,261	380,000
Geothermal[2]	7,027,658	1,658,000
Total	**18,074,100**	**5,817,000**

[1] Emissions avoided/displaced for solar and wind energy are 830 pounds per MWh (ARB 2010).
[2] Emissions avoided/displaced for geothermal energy are 520 pounds per MWh (ARB 2010).

Impact MC-2: Construction or operation of Plan components would conflict with an applicable plan, policy, or regulation intended to address climate change.

Projects developed under Alternative 3 would support the state's GHG emissions reductions goals and plans by generating electricity from renewable energy resources instead of fossil-fuel resources. This displacement of GHGs would be consistent with the California Global Warming Solutions Act, GHG reduction goals, and the Climate Change Scoping Plan (see Volume III, Section III.3.1.2). Individual renewable energy projects would cause no potential conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions.

Impacts on Variance Process Lands

Variance Process Lands are neither conservation lands nor DFAs. They are a subset of the variance lands identified in the Solar PEIS ROD and additional lands that, based on current information, have moderate to low ecological value and ambiguous value for renewable energy. If renewable energy development occurs on Variance Process Lands, a LUPA would not be required, so the environmental review process would be somewhat simpler than if the location were left undesignated.

Variance Process Lands for each alternative are as shown in Chapter IV.1, Table IV.1-2 and in Volume II, Chapter II.6, Figure II.6-1 for Alternative 3. Development of the Variance Process Lands would have similar air quality effects as described under Impacts MC-1 and MC-2.

Impact Reduction Strategies

The implementation of the Proposed LUPA would result in conservation of some desert lands as well as the development of renewable energy generation and transmission

facilities on other lands. The impacts of renewable energy development would be lessened in two ways. First, the Proposed LUPA incorporates CMAs for each alternative, including specific biological conservation designation components and LUPA components. Second, the implementation of existing laws, orders, regulations, and standards would reduce the impacts of project development.

Design Features of the Solar PEIS

The Solar Programmatic EIS (PEIS) does not include any design features for the specific purposes of reducing GHG or avoiding potential impacts due to climate change.

Conservation and Management Actions

The conservation strategy for Alternative 3 (presented in Volume II, Section II.6.4) defines specific actions that would reduce the impacts of this alternative. The conservation strategy defines the conservation designations and specific CMAs for the Preferred Alternative.

Laws and Regulations

Similar to the No Action Alternative, existing laws and regulations will reduce certain impacts of DRECP implementation. Relevant regulations are presented in the Regulatory Setting in Volume III. The requirements of relevant laws and regulations are summarized for the No Action Alternative in Section IV.3.3.1.1.

IV.3.3.5.2 Impacts of Ecological and Cultural Conservation and Recreation Designations

Alternative 3 would provide about 5 million acres within the DRECP area with protective land designations. Establishing lands with protective designations provides GHG benefits because limiting development on the lands restricts the potential removal of vegetation, which would allow the natural carbon uptake of existing soils and vegetation to continue in these areas.

The BLM LUPA land designations protect ecological, historical, cultural, scenic, scientific, and recreational resources and values. While other land uses within these areas are allowed, they must be compatible with the resources and values that the land designation is intended to protect. Establishing lands with protective designations provides GHG benefits.

IV.3.3.5.3 Impacts of Transmission Outside the DRECP Area

The impacts of transmission outside of the DRECP area on meteorology and climate change would be the same under all alternatives. These impacts are as described for the No Action Alternative in Section IV.3.3.1.3.

IV.3.3.5.4 Comparison of Alternative 3 With Preferred Alternative

Alternative 3 would produce lower levels of electricity from renewable resources installed on BLM land compared with the Preferred Alternative.

The mix of technologies in Alternative 3 would result in somewhat less solar and much less wind generation capacity being installed on BLM land compared with the Preferred Alternative (see Tables IV.3-4 and IV.3-10). When the avoided or displaced GHG emissions are calculated (see Section IV.3.3.1.1 for the rationale), the generation mix of Alternative 3 would displace fewer (nearly 1.7 million $MTCO_2E$ less) GHG emissions per year, which means a lower level of GHG emissions would be reduced (i.e., displaced) under Alternative 3 than under the Preferred Alternative.

The BLM land designations and management actions would not change the calculations for Impacts MC-1 and MC-2 analyzed under Alternative 3 and the Preferred Alternative. The range of loss of natural carbon uptake would remain the same, as would the MWh produced under both alternatives and the GHG emissions reductions. The streamlined development is anticipated to occur under both of the alternatives.

IV.3.3.6 Alternative 4

IV.3.3.6.1 Impacts of Renewable Energy and Transmission Development

Alternative 4 assumes that a mix of technologies on BLM land will produce 19.4 million MWh annually. The mix includes 7,094 MW of generation capacity on BLM land installed, built out, and on line by 2040.

Streamlining renewable energy development on BLM lands within the DFAs would not change the numeric calculations for Impacts MC-1 and MC-2. The range of loss of natural carbon uptake would remain the same, as would the MWh produced under Alternative 4 and the GHG emissions reductions.

Streamlining development may result in faster delivery of electricity to the grid, thereby achieving the GHG emissions reductions more quickly and maintaining consistency with the California Global Warming Solutions Act and the Climate Change Scoping Plan.

Impact MC-1: Construction or operation of Plan components would generate GHG emissions.

All of the activities related to renewable energy technologies and transmission would result in construction, operations and maintenance, and decommissioning activities that would produce GHG emissions, as described for the No Action Alternative in Section IV.3.3.1.1.

Emissions for the 2040 horizon appear here, although the year-to-year rates would vary as the renewable energy and transmission facilities are to be on line by 2040. Separate discussions appear for the GHG emissions caused by construction and operations and maintenance activities, the effects of land use conversion, and the indirect GHG emissions reductions that would occur because of the energy output provided by the renewable energy facilities.

Emissions From Development Activities: Construction, Operations, and Decommissioning. Projects developed under Alternative 4 within the DRECP area would have a combined capacity of approximately 20,000 MW when built out by 2040. Construction emissions plus operations emissions to develop this capacity across the entire DRECP area would cause GHG emissions at a rate of approximately 200,000 $MTCO_2E$ per year or approximately 70,940 $MTCO_2E$ per year on BLM-managed lands during the life of the Plan.

Emissions Related to Land Use Conversion. There would be less ground disturbance and vegetation removal on BLM land due to renewable energy development under Alternative 4 compared with the Preferred Alternative. Development of transmission would disturb additional areas. Vegetation removal results in a loss of natural carbon uptake, although the actual amount of this loss is uncertain because it would depend on each particular development site, and data on rates of sequestration by vegetation and soils are approximations (see Table IV.3-11).

Table IV.3-11
Estimated Loss of Annual Carbon Uptake – Alternative 4

Alternative	Permanent Disturbance (acres)	Carbon Sequestered ($MTCO_2E$), Low Est.[1]	Carbon Sequestered ($MTCO_2E$), High Est.[2]
Alternative 4 (Total BLM Portion)	41,350	-50,000	-146,000

[1] Estimate for "average U.S. forests," including desert scrub environments. Desert scrub sequesters less carbon than other U.S. forest categories. http://www.epa.gov/cleanenergy/energy-resources/refs.html#pineforests.

[2] Estimate for "grasslands," as reported by the California Climate Action Registry and the California Emissions Estimator Model, which is a category that includes shrub communities that fall below the threshold values used in the forest land category (http://www.caleemod.com, Appendix A).

Note: The following general rounding rules were applied to calculated values: values greater than 1,000 were rounded to the nearest 1,000; values less than 1,000 and greater than 100 were rounded to the nearest 100; values of 100 or less were rounded to the nearest 10, and therefore totals may not sum due to rounding. In cases where subtotals are provided, the subtotals and the totals are individually rounded. The totals are not a sum of the rounded subtotals; therefore the subtotals may not sum to the total within the table.

Emissions Avoided by Producing Electricity. The GHG emissions reductions for Alternative 4 would occur at the same displacement rates described for the No Action

Alternative in Section IV.3.3.1.1. These GHG emissions reductions for Alternative 4 would be approximately 6.5 million $MTCO_2E$ per year for the combined renewable energy technologies on BLM land (see Table IV.3-12). Because the GHG avoided from fossil fuel-fired power plants would greatly exceed the GHG emissions caused by renewable energy development activities and land use conversion, the electricity produced under Alternative 4 would reduce California's GHG emissions.

Table IV.3-12
Annual GHG Emissions Reductions – Alternative 4

Technology	Annual Production (MWh)	Avoided Emissions ($MTCO_2E$)
Solar[1]	10,578,117	3,983,000
Wind[1]	3,191,627	1,202,000
Geothermal[2]	5,590,323	1,319,000
Total	**19,360,067**	**6,504,000**

[1] Emissions avoided/displaced for solar and wind energy are 830 pounds per MWh (ARB 2010).
[2] Emissions avoided/displaced for geothermal energy are 520 pounds per MWh (ARB 2010).

Impact MC-2: Construction or operation of Plan components would conflict with an applicable plan, policy, or regulation intended to address climate change.

Projects developed under Alternative 4 would support the state's GHG emissions reductions goals and plans by generating electricity from renewable energy resources instead of fossil-fuel resources. While GHG emissions would result from projects planned under Alternative 4, as referenced in Impact MC-1, there would be GHG emissions reductions as electricity would be generated by renewable energy technologies rather than fossil-fuel technologies. This displacement of GHGs would be consistent with the California Global Warming Solutions Act, GHG reduction goals, and the Climate Change Scoping Plan (see Volume III, Section III.3.1.2). Individual renewable energy projects would cause no potential conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions.

Impacts on Variance Process Lands

Variance Process Lands are neither conservation lands nor DFAs. They are a subset of the variance lands identified in the Solar PEIS ROD and additional lands that, based on current information, have moderate to low ecological value and ambiguous value for renewable energy. If renewable energy development occurs on Variance Process Lands, a LUPA would not be required, so the environmental review process would be somewhat simpler than if the location were left undesignated.

Variance Process Lands for each alternative are as shown in Chapter IV.1, Table IV.1-2 and in Volume II, Chapter II.7, Figure II.7-1 for Alternative 4. Development of the Variance Process Lands would have similar air quality effects as described under Impacts MC-1 and MC-2.

Impact Reduction Strategies

The implementation of the Proposed LUPA would result in conservation of some desert lands as well as the development of renewable energy generation and transmission facilities on other lands. The impacts of the renewable energy development covered by the Proposed LUPA would be lessened in two ways. First, it incorporates CMAs for each alternative, including specific biological conservation designation components and LUPA components. Second, the implementation of existing laws, orders, regulations, and standards would reduce the impacts of project development.

Design Features of the Solar PEIS

The Solar Programmatic EIS (PEIS) does not include any design features for the specific purposes of reducing GHG or avoiding potential impacts due to climate change.

Conservation and Management Actions

The conservation strategy for Alternative 4 (presented in Volume II, Section II.7.4) defines specific actions that would reduce the impacts of this alternative. The conservation strategy defines the conservation designations and specific CMAs for the Preferred Alternative.

Laws and Regulations

Similar to the No Action Alternative, existing laws and regulations will reduce certain impacts of DRECP implementation. Relevant regulations are presented in the Regulatory Setting in Chapter III.3. The requirements of relevant laws and regulations are summarized for the No Action Alternative in Section IV.3.3.1.1.

IV.3.3.6.2 Impacts of Ecological and Cultural Conservation and Recreation Designations

Alternative 4 would provide about 4.4 million acres within the DRECP area with protective land designations. Establishing lands with protective designations provides GHG benefits because limiting development on the lands restricts the potential removal of vegetation, which would allow the natural carbon uptake of existing soils and vegetation to continue in these areas.

The BLM LUPA land designations protect ecological, historical, cultural, scenic, scientific, and recreational resources and values. While other land uses within these areas are allowed, they must be compatible with the resources and values that the land designation is intended to protect. Establishing lands with protective designations provides GHG benefits.

IV.3.3.6.3 Impacts of Transmission Outside the DRECP Area

The impacts of transmission outside of the DRECP area on meteorology and climate change would be the same under all alternatives. These impacts are as described for the No Action Alternative in Section IV.3.3.1.3.

IV.3.3.6.4 Comparison of Alternative 4 With Preferred Alternative

Alternative 4 would produce lower levels of electricity from renewable resources installed on BLM land compared with the Preferred Alternative.

The mix of technologies in Alternative 4 would result in somewhat less renewable generation capacity being installed on BLM land compared with the Preferred Alternative (see Tables IV.3-4 and IV.3-12). When the avoided or displaced GHG emissions are calculated (see Section IV.3.3.1.1 for the rationale), the generation mix of Alternative 4 would displace fewer (nearly 1.1 million $MTCO_2E$ less) GHG emissions per year, which means a lower level of GHG emissions would be reduced (i.e., displaced) under Alternative 4 than under the Preferred Alternative.

The BLM land designations and management actions would not change the calculations for Impacts MC-1 and MC-2 analyzed under Alternative 4 and the Preferred Alternative. The range of loss of natural carbon uptake would remain the same, as would the MWh produced under both alternatives and the GHG emissions reductions. The streamlined development is anticipated to occur under both of the alternatives.

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