Chapter 14
Energy Resources and Climate Change

14.1 Introduction

This chapter describes the environmental setting and overall regulatory framework for energy resources and climate change. It also evaluates environmental impacts on energy and climate change that could result from the Lower San Joaquin River (LSJR) and southern Delta water quality (SDWQ) alternatives and, if applicable, offers mitigation measures that would reduce significant impacts.

The LSJR alternatives would alter the February–June flow on the Stanislaus, Tuolumne, and Merced Rivers (three eastside tributaries), which could affect reservoir operations and surface water diversions and the associated timing and amount of hydropower generated by dams on the three eastside tributaries. This chapter evaluates the effects on hydropower production, electric grid reliability, and the resulting increase in energy consumption in the plan area, which includes the LSJR, the three eastside tributaries of the LSJR (the Merced, Tuolumne, and Stanislaus Rivers), and the southern Delta, that would result from the LSJR alternatives. This chapter also evaluates the effects on climate change[1] and greenhouse gas (GHG) emissions on the LSJR alternatives and SDWQ alternatives. A summary of impacts on energy and climate change is provided in Table 14-1. The detailed discussion regarding the hydropower production on the LSJR's three eastside tributaries, the electric grid reliability, and the surface water diversions are presented in Chapter 5, *Water Supply, Surface Hydrology, and Water Quality,* Appendix F.1, *Hydrologic and Water Quality Modeling,* and Appendix J, *Hydropower and Electric Grid Analysis of LSJR Flow Alternatives*.

Impacts related to LSJR Alternative 1 and SDWQ Alternative 1 (No Project) are presented in Chapter 15, *LSJR Alternative 1 and SDWQ Alternative 1 (No Project Alternative)*, and the supporting technical analysis is presented in Appendix D, *Evaluation of LSJR Alternative 1 and SDWQ Alternative 1 (No Project Alternative)*. Impacts related to methods of compliance are discussed in Appendix H, *Evaluation of Methods of Compliance*.

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[1] Climate change is a global problem, and GHGs are global pollutants, unlike criteria air pollutants (such as ozone precursors), which are primarily pollutants of regional and local concern. Given their long atmospheric lifetimes (Table 14-3), GHGs emitted by countless sources worldwide accumulate in the atmosphere. No single emitter of GHGs is large enough to trigger global climate change on its own. Rather, climate change is the result of the individual contributions of countless sources past, present, and future. Therefore, GHG impacts are inherently cumulative and are evaluated as such in this analysis.

Table 14-1. Summary of Energy and Climate Change Impacts

Alternative	Summary of Impact(s)	Significance Determination
ECC-1: Adversely affect the reliability of California's electric grid		
LSJR Alternative 1	See note. [1]	
LSJR Alternatives 2 and 3	Transmission line loadings would not exceed the limits under contingency outage conditions because hydropower generation and reservoir elevation would not be substantially modified. Therefore, adverse effects on the reliability of California's electric grid would not occur.	Less than significant
LSJR Alternative 4	Transmission line loadings would not exceed the limits under contingency outage conditions after re-dispatch of generator facilities to correct a minor violation between Borden and Gregg substations and Gregg and Storey substations. Re-dispatches are regular occurrences in the California energy grid, and they provide a solution to redistribute power based on the re-dispatch. Therefore, adverse effects on the reliability of California's electric grid would not occur.	Less than significant
ECC-2: Result in inefficient, wasteful, and unnecessary energy consumption		
LSJR Alternative 1	See note. [1]	
LSJR Alternative 2	Very little additional energy would be consumed under this alternative when compared to baseline conditions. Therefore, there would be no inefficient, wasteful or unnecessary energy consumption.	Less than significant
LSJR Alternatives 3 and 4	Additional groundwater pumping would not result in inefficient, wasteful, and unnecessary consumption of energy because the groundwater pumping is necessary to maintain water supply irrigation demand. Additional energy generation at other facilities to compensate for a potential loss of hydropower would not be considered inefficient, wasteful, and unnecessary as it is energy that would be generated to maintain the energy supply level that is currently supplied by hydropower. Therefore, there would be no inefficient, wasteful or unnecessary energy consumption.	Less than significant
ECC-3: Generate GHG emissions, either directly or indirectly, that have a significant impact on the environment		
LSJR Alternative 1	See note. [1]	
LSJR Alternative 2	Emissions would not exceed 10,000 MT CO_2e threshold. Therefore, GHG emissions would not have a significant impact on the environment.	Less than significant

Alternative	Summary of Impact(s)	Significance Determination
LSJR Alternatives 3 and 4	Emissions exceed 10,000 MT CO_2e threshold. Therefore, GHG emissions would have a significant impact on the environment.	Significant and unavoidable
ECC-4: Conflict with an applicable plan, policy, or regulation adopted for the purposes of reducing GHG emissions		
LSJR Alternative 1	See note. [1]	
LSJR Alternative 2	Since GHG emissions would not exceed the 10,000 MT CO_2e threshold it is expected there would be no conflict with applicable plans, policies or regulations adopted for the purpose of reducing GHGs.	Less than significant
LSJR Alternatives 3 and 4	Since GHG emissions would exceed the 10,000 MT CO_2e threshold it is expected there would be a conflict with applicable plans, policies or regulations adopted for the purpose of reducing GHGs.	Significant and unavoidable
ECC-5: Effect of global climate change on the LSJR and SDWQ alternatives		
LSJR Alternative 1	See note. [1]	
LSJR Alternatives 2–4	Climate change would not affect the impacts of the LSJR alternatives because of the adaptive management framework required to respond to changing circumstances with respect to flow and water quality that might arise due to climate change. Furthermore, the State Water Board is required to regularly review the WQCPs. The planning process continually accounts for changing conditions related to water quality, and water planning such as climate change.	Less than significant
SDWQ Alternative 1	See note. [1]	
SDWQ Alternatives 2 and 3	Climate change would not affect the impacts of the SDWQ alternatives since the State Water Board is required to regularly review the WQCPs. The planning process continually accounts for changing conditions related to water quality and water planning, such as climate change.	Less than significant

MT CO_2e = metric ton carbon dioxide equivalent

[1] The No Project Alternative would result in implementation of flow objectives and salinity objectives identified in the 2006 Bay-Delta Plan. See Chapter 15, *LSJR Alternative 1 and SDWQ Alternative 1 (No Project Alternative)*, for the No Project impact discussion and Appendix D, *Evaluation of LSJR Alternative 1 and SDWQ Alternative 1 (No Project Alternative)*, for the No Project Alternative technical analysis.

14.2 Environmental Setting

14.2.1 Lower San Joaquin River and Eastside Tributaries Hydropower Production

There are numerous hydropower generation plants on the three eastside tributaries. The major power plants are those associated with the New Melones Reservoir (New Melones Dam) on the Stanislaus River, New Don Pedro Reservoir (New Don Pedro Dam) on the Tuolumne River, and Lake McClure (New Exchequer Dam) on the Merced River. The total hydropower generation capacity of the three eastside tributaries combined is about 803 megawatts (MW), and the three facilities considered here represent 87 percent of the total capacity (Appendix J, *Hydropower and Electric Grid Analysis of LSJR Flow Alternatives*). Table 14-2 shows the head for each reservoir, which is the difference between the maximum elevation and tail-water elevation, and the corresponding maximum capacity for the New Melones, New Don Pedro, and New Exchequer power plants.

Table 14-2. Existing Maximum Capacity at Major Hydropower Plants on LSJR Eastside Tributaries

Power Plant	Maximum Elevation (feet)	Tail-water Elevation (feet)	Headwater (feet)	Maximum Capacity (MW)
New Melones	1,088	503	585	300
New Don Pedro	830	310	520	203
New Exchequer	867	400	467	95

Source: Appendix J, *Hydropower and Electric Grid Analysis of LSJR Flow Alternatives*.
MW = megawatts

The existing hydropower production was estimated for the various power plants on the three eastside tributaries. While actual hydropower generation in any given period is variable and depends on the amount of surface water captured and stored in the reservoir during wet and dry years, Table 14-3 summarizes the average annual hydropower generation on each of the three eastside tributaries to provide an overall sense of hydropower generation at the three plants.

Table 14-3. Annual Baseline Hydropower Generation (GWh) on LSJR Eastside Tributaries

LSJR Tributary	Average Annual Hydropower Generation
Stanislaus River	577
Tuolumne River	628
Merced River	403
Project-wide Total	1,607

Source: Appendix J, *Hydropower and Electric Grid Analysis of LSJR Flow Alternatives*. Baseline conditions are those from the "Current (2009) Conditions" CALSIM II model run from the DWR *State Water Project Delivery Reliability Report 2009 (2010)*.
GWh = gigawatt hours

14.2.2 Transmission System in Central California

This section provides a brief overview of the transmission systems and the balancing authorities in which the three hydropower plants, New Melones, New Don Pedro, and New Exchequer are located. According to the North American Electric Reliability Corporation (NERC), a balancing authority is defined as the responsible entity that integrates resource plans ahead of time, maintains load-interchange-generation balance and supports interconnection frequency in real time. The balancing authorities are listed in Table 14-4 and discussed in the sections below. This information is discussed to provide context for the capacity reduction calculation and power flow analysis discussed below in Section 14.4.2.

Table 14-4. Balancing Authority of Major Hydropower Plants on LSJR Eastside Tributaries

Power Plant	Balancing Authority
New Exchequer	California Independent System Operator (CAISO)
New Melones	Sacramento Municipal Utility District (SMUD)
New Don Pedro	Turlock Irrigation District (TID—68%) and SMUD—32%

Source: Appendix J, *Hydropower and Electric Grid Analysis of LSJR Flow Alternatives*.

Note: Don Pedro Hydro Power Plant is jointly owned by TID and Modesto Irrigation District (MID). SMUD performs the balancing authority function for MID's portion of the plant while TID is the balancing authority for its portion.

California Independent System Operator

The New Exchequer hydropower plant lies in the Greater Fresno local capacity areas. These are areas that are transmission constrained and require a certain minimum amount of local generation for meeting the local load requirements. California Independent System Operator (CAISO) operates the high-voltage, long-distance power lines that make up 80 percent of California's wholesale power grid. It is responsible for system reliability in the local capacity areas and other areas throughout California by scheduling available transmission capacity. The California Public Utilities Commission (CPUC) adopted the Resource Adequacy (RA) program in 2004 with the twin objectives of (1) providing sufficient resources to CAISO to ensure the safe and reliable operation of the grid in real time, and (2) providing appropriate incentives for the siting and construction of new resources needed for reliability in the future (CPUC 2011). Each year CAISO performs the Local Capacity Technical (LCT) Study to identify local capacity requirements within its territory. The results of this study are provided to CPUC for consideration in its RA program. These results are also be used by CAISO for identifying the minimum quantity of local capacity necessary to meet the North American Electric Reliability Corporation (NERC) reliability criteria used in the LCT Study (CAISO 2010).

Table 14-5 shows the historical local capacity area peak load, and total dependable local area generation for the Greater Fresno area. The table also shows the local capacity area as a percentage of the total dependable local generation. For example, in 2011, the local capacity area in Greater Fresno was 2,448 megawatts (MW) while the peak load stood at 3,306 MW: the local capacity area was 74 percent of the peak load. At the same time, the total dependable generation stood at 2,919 MW which meant that the local capacity area was 84 percent of the total dependable generation. In other words, in 2011 Greater Fresno had sufficient local resources available to meet its local capacity requirements. As previously mentioned, these are minimum generation requirements imposed on transmission constrained regions within the state.

Table 14-5. Local Capacity Needs vs. Peak Load and Local Area Generation for Greater Fresno Area

Year	Local Capacity Area (MW)	Peak Load (MW)	Local Capacity Area as % of Peak Load	Dependable Local Area Generation (MW)	Local Capacity Area as % of Total Area Generation
2006	2,837	3,117	91	2,651	107
2007	2,219	3,154	70	2,912	76
2008	2,382	3,260	73	2,991	80
2009	2,680	3,381	79	2,829	95
2010	2,640	3,377	78	2,941	90
2011	2,448	3,306	74	2,919	84

Source: Appendix J, *Hydropower and Electric Grid Analysis of LSJR Flow Alternatives*.
MW = megawatts

In the California ISO board of governors approved 2010/2011 transmission plan, CAISO identified a number of transmission upgrades that are needed in the Greater Fresno Area to maintain system reliability between 2011 and 2020. Pacific Gas & Electric Company (PG&E) proposed a number of projects to maintain system reliability in the Greater Fresno Area (CAISO 2011). A number of generators are also seeking interconnection in the Greater Fresno Area between now and 2014. These transmission and generation projects are likely to improve the system reliability in the Greater Fresno Area.

Sacramento Municipal Utility District

SMUD, established in 1946, is the nation's sixth largest community-owned electric utility in terms of customers served (approximately 590,000) and covers a 900-square-mile area that includes Sacramento County and a small portion of Placer County. While the New Melones Power Plant physically resides in the CAISO balancing authority area, Sierra Nevada Region (SNR), Sacramento Municipal Utility District (SMUD), and CAISO operate New Melones as a pseudo-tie generation export from CAISO into the SMUD balancing authority area (Western Area Power Administration 2010). The pseudo-tie generation export arrangement implies that New Melones is electrically and operationally included as part of the SMUD balancing authority area. For purposes of Qualifying Capacity, SNR has designated the New Melones Power Plant as part of the Central Valley Project (CVP) resource in the SMUD balancing authority area.

As part of the biennial resource adequacy and resource plan assessments for publically owned utilities, the California Energy Commission (CEC) published its biennial report in November 2009 detailing the need and availability of generation resources to meet the future load and planning reserve margin requirements within the territory of publically owned utilities (CEC 2009a). The report indicates that SMUD will be able to meet its resource adequacy requirements in the near term; however, in 2018, SMUD's generation resources may not be sufficient to meet its load and planning reserve margin obligations. The expected deficiency in 2018 is estimated to be 347 megawatts (MW), but the CEC does not expect this to be an issue due to the lead time available to resolve the expected deficiency.

SMUD also carries out an annual 10-year transmission planning process to ensure that NERC and Western Electricity Coordinating Council (WECC) Reliability Standards are met each year of the 10-year planning horizon. Major projects that have been proposed in the 2010 transmission plan for the 2016–2020 time period are expected to improve the reliability of SMUD's electric system as well as increase its load-serving capability.

Turlock Irrigation District

The Turlock Irrigation District (TID) operates as a balancing authority located between Sacramento and Fresno in California's Central Valley (California Transmission Planning Group). Westley 230 kilovolt (kV) and Oakdale 115 kV lines provide import access for TID. The TID balancing authority incorporates all 662 square miles of TID's electric service territory as well as a 115 kV loop with three 115 kV substations owned by the Merced Irrigation District (Merced ID). The Merced ID facilities are interconnected to TID's August and Tuolumne 115 kV substations and are located just south of TID's service territory and north of the city of Merced. TID is the majority owner and operating partner of the New Don Pedro Power Plant with 68.46 percent ownership and MID has a 31.54 percent ownership.

14.2.3 Climate Change

The phenomenon known as the *greenhouse effect* keeps Earth's atmosphere near the surface warm enough for successful habitation by humans and other forms of life. GHGs present in the earth's lower atmosphere play a critical role in maintaining Earth's temperature as they trap some of the long-wave infrared radiation emitted from Earth's surface that otherwise would have escaped to space.

The accelerated increase of fossil fuel combustion and deforestation since the Industrial Revolution of the nineteenth century has exponentially increased concentrations of GHGs in the atmosphere. Increases in the atmospheric concentrations of GHGs in excess of natural ambient concentrations increase the natural greenhouse effect.

This increased greenhouse effect has contributed to global warming, which is an increased rate of warming of Earth's surface temperature. Specifically, increases in GHGs lead to increased absorption of long-wave infrared radiation by the earth's atmosphere and further warm the lower atmosphere, thereby increasing evaporation rates and temperatures near the surface. Warming of Earth's lower atmosphere induces large-scale changes in ocean circulation patterns, precipitation patterns, global ice cover, biological distributions, and other changes to Earth's systems that are collectively referred to as *climate change*.

The Intergovernmental Panel on Climate Change (IPCC) has been established by the World Meteorological Organization and United Nations Environment Programme to assess scientific, technical, and socioeconomic information relevant to the understanding of climate change, its potential impacts, and options for adaptation and mitigation. The IPCC estimates that the average global temperature rise between the years 2000 and 2100 could range from 1.1°C, with no increase in GHG emissions above year 2000 levels, to 6.4°C, with substantial increase in GHG emissions (IPCC 2007). Large increases in global temperatures could have massive deleterious impacts on the natural and human environments.

Principal Greenhouse Gases

GHGs are gases that trap heat in the atmosphere. GHGs are both naturally occurring and artificial. Examples of GHGs that are produced both by natural processes and industry are carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). Examples of GHGs created and emitted primarily through human activities are hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). The primary GHGs generated by the alternatives—CO_2, CH_4, and N_2O—are discussed below.

The IPCC estimates that CO_2 accounts for more than 75 percent of all anthropogenic (human-made) GHG emissions. Three quarters of anthropogenic CO_2 emissions are the result of fossil fuel burning, and approximately one quarter result from land use change (IPCC 2007). CH_4 is the second largest contributor of anthropogenic GHG emissions and is the result of growing rice, raising cattle, combustion, and mining coal . N_2O, while not as abundant as CO_2 or CH_4, is a powerful GHG. Sources of N_2O include agricultural processes, nylon production, fuel-fired power plants, nitric acid production, and vehicle emissions.

In order to simplify reporting and analysis, methods have been set forth to describe emissions of GHGs in terms of a single gas. The most commonly accepted method to compare GHG emissions is the global warming potential (GWP) methodology defined in the IPCC reference documents (IPCC 1996, 2001). The IPCC defines the GWP of various GHGs on a normalized scale that recasts all GHG emissions in terms of CO_2e. GWP is a measure of a gas's heat-absorbing capacity and lifespan relative to a reference gas, CO_2 (CO_2 has a GWP of 1, by definition).

Table 14-6 lists the global warming potential of CO_2, CH_4, and N_2O; their lifetimes; and abundances in the atmosphere in parts per million (ppm) and parts per trillion (ppt).

Table 14-6. Lifetimes and Global Warming Potentials

GHG	Global Warming Potential (100 years)	Lifetime (years)	2005 Atmospheric Abundance
CO_2 (ppm)	1	50–200	379
CH_4 (ppt)	21	9–15	1.7
N_2O (ppt)	310	120	0.32

Sources: IPCC 1996, 2001:388–390, 2007.
GHG = greenhouse gas
ppm = parts per million
ppt = parts per trillion

Greenhouse Gas Emissions Inventories

A GHG inventory is a quantification of GHG emissions and sinks within a selected physical and/or economic boundary over a specified time. GHG inventories can be performed on a large scale (i.e., for global and national entities) or on a small scale (i.e., for a particular building or person). GHG sinks typically refer to removals of GHGs from the atmosphere as a result of carbon sequestration. Carbon sequestration is the process by which plants absorb and store atmospheric CO_2.

Table 14-7 outlines the most recent global, national, and statewide GHG inventories to help contextualize the magnitude of potential alternative-related emissions.

Table 14-7. Global, National, and State Greenhouse Gas Emissions Inventories

Emissions Inventory	Total GHG Emissions and Sinks in CO_2e (metric tons)
2004 IPCC Global GHG Emissions Inventory	49,000,000,000
2010 USEPA National GHG Emissions Inventory	5,747,100,000
2009 ARB State GHG Emissions Inventory	452,970,000

Sources: IPCC 2007; USEPA 2012a; ARB 2011.
IPCC = Intergovernmental Panel on Climate Change
GHG = greenhouse gas
USEPA = U.S. Environmental Protection Agency
ARB = Air Resources Board

Climate Change Effects on State Climate Trends

Climate change is a complex phenomenon that has the potential to alter local climatic patterns and meteorology. Although modeling indicates that climate change will result in such things as sea level rise and changes in regional climate and rainfall, a high degree of scientific uncertainty still exists with regard to characterizing future climate characteristics and predicting how various ecological and social systems will react to any changes in the existing climate at the local level. Regardless of this uncertainty, it is widely understood that some form of climate change is expected to occur in the future.

Several recent studies have attempted to characterize future climatic scenarios for California. While specific estimates and statistics on the severity of changes vary, sources agree that the San Joaquin Valley and the Delta will witness warmer temperatures, increased heat waves, and changes in rainfall patterns. In addition, reduced snow pack and stream flow in the Sierra Nevada mountains, could lead to changes in water supply into the Delta region. Specifically, the CEC estimates that average annual temperatures in the state will increase by approximately 1°C–3°C between 2010 and mid-century, according the model for the Sacramento region. Climatic models also predict that between 2035 and 2064, the number of heat wave days modeled for the Sacramento region will increase by more than 100 days, relative to the previous 30-year period between 2005 and 2034. Annual precipitation may experience a declining trend, but remain highly variable, suggesting that the Sacramento Valley will be vulnerable to increased drought. Warmer temperatures and increased precipitation in the form of rain are expected to result in decreased snowpack in the Sierra Nevada. Such effects will translate into earlier snowmelt and increased potential for flooding as a result of insufficient reservoir capacity to retain earlier snowmelt. (IPCC 2007; California Natural Resources Agency 2009; CEC 2009b)

Sea level rise during the next 50 years is expected to increase dramatically over historical rates. The CEC predicts that by 2050, sea level rise, relative to the 2000 measurements, will range from 30 centimeters (cm) to 45 cm. Coastal sea level rise could result in saltwater intrusion to the Delta and associated biological impacts in the San Joaquin Valley. Changes in soil moisture and increased risk of wildfires also may dominate future climatic conditions in the area. (IPCC 2007; California Natural Resources Agency 2009; CEC 2009b).

The changes in temperature, precipitation and sea level may have substantial effects on other resources areas. The primary effects of climate change anticipated in California are listed below (California Natural Resources Agency 2009).

- Increased average temperatures (air, water, and soil).
- Reduced or slightly increased annual precipitation amounts.
- Change from snowfall (and spring snowmelt) to rainfall.
- Decreased Sierra snowpack (earlier runoff, reduced maximum storage).
- Increased evapotranspiration.
- Increased frequency and intensity of Pacific storms (flood events).
- Increased severity of droughts.
- Increased frequency and severity of extreme heat events.
- Increased frequency and severity of wildfire events.
- Sea level rise (with increased salt water intrusion in the Delta).
- Changes in species distribution and ranges.
- Decreased number of species.
- Increased number of vector-borne diseases and pests (including impacts on agriculture).
- Altered timing of animal and plant lifecycles (phenology).
- Disruption of biotic interactions (e.g., predator-prey relationships amongst species and increased invasive species abundance).
- Changes in physiological performance, including reproductive success and survival of plants and animals.
- Increase in invasive species.
- Altered migration patterns of fishes, aquatic-breeding amphibians, birds, and mammals.
- Changes in food (forage) base.
- Changes in habitat, vegetation structure, and plant and animal communities.

These changes have significant implications for water quality, water supply, flooding, aquatic ecosystems, energy generation, and recreation throughout the state. Guidance documents have been drafted and published to discuss strategies to protect resources from climate change in California (e.g., the State Of California Sea-Level Rise Interim Guidance Document) (Coastal and Ocean Working Group of the California Climate Action Team 2010).

14.3 Regulatory Setting

The climate change regulatory setting is complex and evolving. The following section identifies key legislation, executive orders, and seminal court cases relevant to the environmental assessment of GHG emissions.

14.3.1 Federal

Relevant federal programs, policies, plans, or regulations related to GHG emissions are described below.

Mandatory Greenhouse Gas Reporting Rule

On September 22, 2009, the U.S. Environmental Protection Agency (USEPA) released its final Greenhouse Gas Reporting Rule (Reporting Rule). The Reporting Rule is a response to the fiscal year (FY) 2008 Consolidated Appropriations Act (H.R. 2764; Public Law 110-161), which required USEPA to develop "… mandatory reporting of greenhouse gasses above appropriate thresholds in all sectors of the economy…." The Reporting Rule would apply to most entities that emit 25,000 metric tons (MT) of CO_2e or more per year. Starting in 2010, facility owners are required to submit an annual GHG emissions report with detailed calculations of facility GHG emissions. The Reporting Rule also would mandate recordkeeping and administrative requirements in order for USEPA to verify annual GHG emissions reports.

14.3.2 State

Relevant state programs, policies, plans, or regulations related to GHG emissions are described below.

Executive Order S-3-05

Signed by Governor Arnold Schwarzenegger on June 1, 2005, Executive Order S-3-05 asserts that California is vulnerable to the effects of climate change. To combat this concern, Executive Order S-3-05 established the following GHG emissions reduction targets for state agencies.

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

Assembly Bill 32, California Global Warming Solutions Act of 2006

In September 2006, the California State Legislature adopted Assembly Bill 32, the California Global Warming Solutions Act of 2006 (AB 32). AB 32 establishes a cap on statewide GHG emissions and sets forth the regulatory framework to achieve the corresponding reduction in statewide emission levels. Under AB 32, the California Air Resources Board (ARB) is required to take the following actions.

- Adopt early action measures to reduce GHGs.
- Establish a statewide GHG emissions cap for 2020 based on 1990 emissions.
- Adopt mandatory report rules for significant GHG sources.
- Adopt a scoping plan indicating how emission reductions would be achieved through regulations, market mechanisms, and other actions.
- Adopt regulations needed to achieve the maximum technologically feasible and cost-effective reductions in GHGs.

Climate Change Scoping Plan

On December 11, 2008, pursuant to AB 32, ARB adopted the Climate Change Scoping Plan. This plan outlines how emissions reductions from significant sources of GHGs will be achieved via regulations, market mechanisms, and other actions. Six key elements are identified and outlined in the plan to achieve emissions reduction targets.

- Expanding and strengthening existing energy efficiency programs as well as building and appliance standards.
- Achieving a statewide renewable energy mix of 33 percent.
- Developing a California cap-and-trade program that links with other Western Climate Initiative partner programs to create a regional market system.
- Establishing targets for transportation-related GHG emissions for regions throughout California, and pursuing policies and incentives to achieve those targets.
- Adopting and implementing measures pursuant to existing state laws and policies, including California's clean car standards, goods movement measures, and the low carbon fuel standard (LCFS).
- Creating targeted fees, including a public goods charge on water use, fees on high global warming potential gases, and a fee to fund the administrative costs of the state's long-term commitment to AB 32 implementation.

The Climate Change Scoping Plan also describes recommended measures that were developed to reduce GHG emissions from key sources and activities while improving public health, promoting a cleaner environment, preserving our natural resources, and ensuring that the impacts of the reductions are equitable and do not disproportionately affect low-income and minority communities. These measures put the state on a path to meet the long-term 2050 goal of reducing California's GHG emissions to 80 percent below 1990 levels. The measures in the approved Climate Change Scoping Plan will be developed and in place in 2012.

California 2010 Mandatory Greenhouse Gas Reporting Regulation

The ARB first approved the Regulation for the Mandatory Reporting of Greenhouse Gas Emissions, in 2007. In 2010, ARB initiated a rulemaking to amend the 2007 version. These amendments became effective on January 1, 2012. The mandatory reporting regulations require reporting for major facilities, which are those that generate more than 25,000 MT of CO_2e per year.

California Air Resources Board Climate Change Scoping Plan

The Global Warming Solutions Act of 2006 (AB 32) required the California Air Resources Board (ARB) to prepare and adopt a plan that identified measures that would achieve reductions in greenhouse gas emissions in the State. The Climate Change Scoping Plan (Scoping Plan) was approved by the ARB Board in December 2008. In particular, the Scoping Plan contains six strategies for the Water Sector to implement that are expected to reduce greenhouse gas emissions due to the fact that water use requires significant amounts of energy. The six strategies for the Water Sector to implement include Water Use Efficiency (Measure W-1), Water Recycling (Measure W-2), Water System Energy Efficiency (Measure W-3), Reuse Urban Runoff (Measure W-4), Increase Renewable Energy Production from Water (Measure W-5), and a Public Goods Charge (Measure W-6). Efficient water conveyance, treatment and use can result in reductions in greenhouse gas emissions for those activities. The implementation of Measures W-1 through W-5 is expected to result in a total reduction of 4.8 MMTCO2E by 2020.

CEQA Statutes and Guidelines

Senate Bill (SB) 97 of 2007 requires that the State's Office of Planning and Research (OPR) prepare guidelines to submit to the California Resources Agency (now Natural Resources Agency) regarding feasible mitigation of GHG emissions or the effects of GHG emissions as required by the California Environmental Quality Act (CEQA). The Natural Resources Agency adopted amendments to the State CEQA Guidelines for GHG emissions on December 30, 2009. The amendments became effective March 18, 2010.

The 2011 State CEQA Guidelines included a new section (§ 15064.4) that specifically addresses the significance of GHG emissions. Section 15064.4 calls for a good-faith effort to describe, calculate, or estimate GHG emissions. Section 15064.4 further states that the significance of GHG impacts should include consideration of the extent to which the project would increase or reduce GHG emissions, exceed a locally applicable threshold of significance, and comply with regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction or mitigation of GHG emissions. The revisions also state that a project may be found to have a less-than-significant impact if it complies with an adopted plan that includes specific measures to sufficiently reduce GHG emissions (§ 15064(h)(3)). However, the revised guidelines do not require or recommend a specific analysis methodology or provide quantitative criteria for determining the significance of GHG emissions.

In order to assure that wise and efficient use of energy is considered in project decisions, CEQA requires that environmental impact reports (EIRs) include a discussion of the potential energy impacts of proposed projects, with particular emphasis on avoiding or reducing inefficient, wasteful, and unnecessary consumption of energy. Appendix F of the State CEQA Guidelines also includes guidelines for evaluating impacts on energy conservation.

State Water Board Water Quality Control Plans and Strategic Plan

The State Water Resources Control Board (State Water Board) is required to prepare WQCPs and regularly review the plans to update water quality standards. Thus the planning process continually accounts for changing conditions related to water quality and water planning, such as climate change. As the State Water Board updates the WQCPs, information regarding climate change will be incorporated. The 2006 Bay-Delta Plan identifies climate change as an emerging issue to be addressed in future objective setting in the WQCP process. The 2008–2012 State Water Board Strategic Plan also calls for consideration of climate change in several areas, including the planning process for WQCPs. Under climate change scenarios, it is likely that increased flow variability and shifts in timing of high flows would occur. Therefore, the planning process for WQCPs continually incorporates new information with respect to climate change as it becomes available based on the frequency of which the plans must be revised (tri-annual). In addition, the LSJR alternatives include an adaptive management process that can integrate real-time data generated from the rivers and adjust flows based on increased flow variability and shifts in flow timing that may be attributable to climate change.

14.3.3 Regional or Local

Relevant regional or local programs, policies, or regulations related to GHG emissions are described below. Although local policies, plans, and regulations are not binding on the State of California, below is a description of relevant ones.

San Joaquin Valley Air Pollution Control District

In December 2009, the San Joaquin Valley Air Pollution Control District (SJVAPCD) formally adopted the region's first GHG thresholds for determining significant climate change impacts in the SJVAPCD. The guidance is intended to streamline CEQA review by quantifying emissions reductions that would be achieved through the implementation of Best Performance Standards (BPS). While the thresholds adopted by the SJVAPCD were developed for internal use for projects in which the SJVAPCD is the lead agency, they can serve as the basis for guidance issued by the SJVAPCD for other agencies that are establishing their own processes for determining significance related to climate change (SJVAPCD 2009b).

14.4 Impact Analysis

This section lists the thresholds used to define impacts on energy resources and climate change. It describes the methods of analysis and the approach to determine the significance of impacts on energy resources and climate change. The impact discussion describes the changes to baseline resulting from the alternatives and incorporates the thresholds for determining whether those changes are significant. Measures to mitigate (i.e., avoid, minimize, rectify, reduce, eliminate, or compensate for) significant impacts accompany the impact discussion where appropriate.

14.4.1 Thresholds of Significance

The thresholds for determining the significance of impacts for this analysis are based on the State Water Board's Environmental Checklist in Appendix A of the board's CEQA regulations (Cal. Code Regs., tit. 23, §§ 3720–3781), the Environmental Checklist in Appendix G of the State CEQA Guidelines, and Appendix F of the State CEQA Guidelines. The thresholds derived from the checklist(s) have been modified, as appropriate, to meet the circumstances of the alternatives. (Cal. Code Regs., tit. 23, § 3777, subd. (a)(2).) Energy resources and climate change impacts were determined to be potentially significant (see Appendix B, *State Water Board's Environmental Checklist* in this SED) and therefore are discussed in the analysis.

Energy Resources

Energy impacts would be significant the LSJR alternatives result in any of the following conditions.

- Adversely impact the reliability of California's electric grid.
- Result in inefficient, wasteful, and unnecessary energy consumption.

According to CEQA Appendix F, the goal of conserving energy implies the wise and efficient use of energy. In order to assure that energy implications are considered in project decisions, CEQA requires a discussion of the potential energy impacts of proposed projects and mitigation or avoidance of inefficient, wasteful, and unnecessary consumption of energy.

Climate Change

Climate change impacts would be significant if the LSJR alternatives result in any of the following conditions.

- Generate GHG emissions, either directly or indirectly, that have a significant impact on the environment.
- Conflict with an applicable plan, policy, or regulation adopted for the purposes of reducing GHG emissions.
- LSJR and SDWQ alternatives effected by global climate change.

Potential changes in electricity generation and distribution could occur; however, several local air pollution control districts have not adopted GHG thresholds to evaluate climate change impacts. Therefore, a threshold of 10,000 MT of CO_2e per year is used for evaluating the GHG emission impact of the project under CEQA. The threshold of 10,000 MT of CO_2e per year was adopted by the South Coast Air Quality Management District (SCAQMD) and the Bay Area Air Quality Management District (BAAQMD) for industrial projects that would capture 90 percent of all GHG emissions from stationary sources in each air basin. Because the alternatives would affect facilities in several air pollution control districts, the GHG threshold, although conservative, would be and appropriate measure to evaluate climate change impacts.

14.4.2 Methods and Approach

The methods and approach focuses on evaluating the energy and climate change resulting from the alternatives.

LSJR Alternatives

Reduction in Hydropower Production

This section summarizes the method to estimate the potential reduction in hydropower generated by power plants on the three eastside tributaries as a result of the LSJR alternatives. Detailed information related to this methodology is in Appendix J, *Hydropower and Electric Grid Analysis of LSJR Flow Alternatives*. The method relies on the State Water Board Water Supply Effects (WSE) model to estimate the effects of the LSJR alternatives on reservoir releases and storage (elevations head) and allowable diversions to off-stream generation facilities, and then calculate the associated change in monthly and annual amounts of energy produced in comparison to the baseline CALSIM model run.

For a particular alternative, each of the three eastside tributaries must meet the specified percentage of its own unimpaired flow at its mouth with the LSJR during the months of February–June. The percentage unimpaired flow requirements are 20 percent, 40 percent, and 60 percent, respectively, for LSJR Alternatives 2, 3, and 4, but only apply when flows are otherwise below a specified trigger level. Also, flows must not drop below specified levels on each of the three eastside tributaries and together must maintain a minimum flow on the SJR at Vernalis. Specific trigger and minimum flow levels and other details of the LSJR alternatives are provided in Chapter 3, *Alternatives Description*, and are the basis for how the alternatives are modeled in this analysis.

Hydropower facilities on the three eastside tributaries were grouped into four categories (in-stream, rim dam, off-stream, and upstream), based on where they are located relative to the three eastside tributary dams and whether they are in-stream facilities or off-stream facilities. Detailed discussions on calculating hydropower from each of the categories are provided in Appendix J. Table 14-8 contains a summary of the average annual hydropower generation change on each of the three eastside tributaries due to LSJR Alternatives 2, 3, and 4. These changes are also represented as a percent of baseline generation. Generally, as the percent unimpaired flow increases, the amount of power generated annually is reduced.

Table 14-8. Change of Existing Annual Hydropower Generation

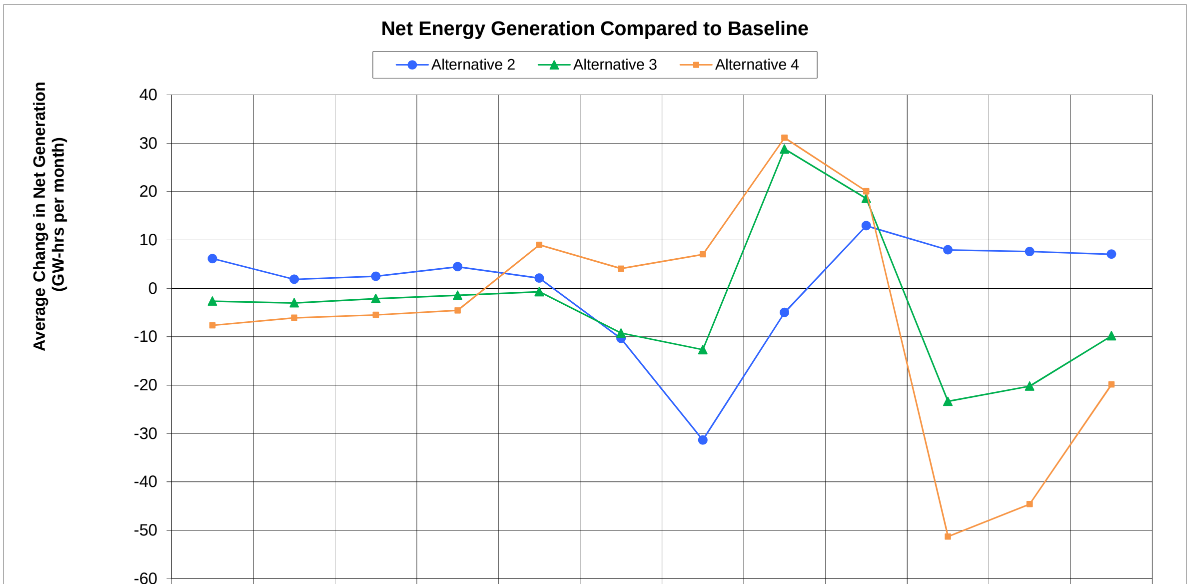
Alternative	Stanislaus River (GWh)/(% dif)	Tuolumne River (GWh)/(% dif)	Merced River (GWh)/(% dif)	Plan-wide Total (GWh)/(% dif)
Baseline Conditions Power Generation	577 (0)	628 (0)	403 (0)	1,607 (0)
Change of Hydropower Generation (Alternative minus Baseline)				
LSJR Alternative 2	7 (1)[1]	-1 (0)	0 (0)	6 (0)
LSJR Alternative 3	-20 (-4)	-11 (-2)	-7 (-2)	-38 (-2)
LSJR Alternative 4	-33 (-6)	-19 (-3)	-16 (-4)	-68 (-4)

Source: Appendix J, *Hydropower and Electric Grid Analysis of LSJR Flow Alternatives*

GWh = gigawatt hours

[1] Modeled results indicate that LSJR Alternative 2 would result in an increase in hydropower production.

The monthly pattern of the average change (over 82 years of simulation) in hydropower generation from the plan area when compared to the baseline condition is presented in Figure 14-1. This shows a general increase in energy production in the months of February (month 2) through June (month 6) as more flow would be released from the reservoirs to meet the unimpaired flow objectives. A decrease in hydropower generation during the summer months of July–September is due to less water being released from the major reservoirs as a result of reduced diversions downstream. These effects are more pronounced as the percentage of unimpaired flow requirement of the LSJR alternatives increases.



	10	11	12	1	2	3	4	5	6	7	8	9
Alternative 2	6.2	1.9	2.5	4.5	2.1	-10.3	-31.3	-5.0	12.9	7.9	7.6	7.1
Alternative 3	-2.6	-3.0	-2.1	-1.4	-0.7	-9.2	-12.7	28.8	18.6	-23.4	-20.2	-9.8
Alternative 4	-7.7	-6.1	-5.5	-4.6	9.0	4.1	7.0	31.1	20.1	-51.3	-44.6	-19.9

Figure 14-1. Change in Average Monthly Hydropower Generation Across 82 Years of Simulation Associated with the LSJR Flow Alternatives when Compared to Baseline

Power Flow Assessment

The LSJR alternatives could reduce the hydropower generation in the summer months of July–September because less water would be stored during those months in the reservoirs as a result of being released earlier in the year (e.g., February–June), thereby reducing the amount of water available for hydropower generation. Since California's electric grid is most stressed during the summer months of June–August, with peak demand typically occurring in the month of July, a reduction in hydropower capacity during this time has the potential of stressing the grid even further.

The results of a steady-state power flow assessment of the California grid are used to determine if reduction in hydropower capacities at New Melones, New Don Pedro, and New Exchequer power plants would adversely impact the grid reliability as defined by NERC (Appendix J, *Hydropower and Electric Grid Analysis of LSJR Flow Alternatives*, for discussion of NERC reliability). The reduction in hydropower capacity at the three power plants was calculated using the WSE model for the month of July during the 82-year period (water years 1922–2003) for LSJR Alternatives 2, 3, and 4. Detailed discussions on the capacity reduction calculation are presented in Appendix J. LSJR Alternative 2 would lead to negligible power capacity reduction from the baseline condition, while the total output of the three plants would reduce by 5 percent and 8 percent under LSJR Alternatives 3 and 4, respectively. Therefore, power flow assessment was conducted for LSJR Alternatives 3 and 4 only.

Detailed discussions of the power assessment are presented in Appendix J. In general, the study examined the operation of the electric grid under peak summer demand conditions, using the following steps.

- Develop a baseline case and separate change cases for LSJR Alternatives 3 and 4. All cases are developed for both normal and contingency conditions. Under normal conditions, all transmission and generator facilities are assumed to be in service. Contingency conditions refer to the unplanned outage of power system equipment.
- Select analysis contingency conditions for transmission and generator facilities.
- Select the analysis areas based on the transmission line/transformer loadings and substation voltages.
- Model the transmission line/transformer loadings and substation voltages for baseline and LSJR Alternatives 3 and 4 under both normal and contingency conditions.
- Determine the impact of LSJR Alternatives 3 and 4 on the reliability of California's electric grid by comparing the analysis results to baseline.

If the comparison showed that transmission line/transformer loadings or substation voltages are within violation limits in baseline, but outside the limits in LSJR Alternatives 3 and 4, the alternatives could be considered to have an adverse impact on the reliability of California's electric grid.

Generally, a well operated transmission system should have line flows that are within the ratings of the transmission lines and substation voltages that are close to the nominal voltages. Typically, transmission lines have normal and emergency ratings. The analysis uses the normal and short-term emergency ratings for the normal and contingency analyses, respectively.

Voltage limits were established relative to the nominal voltages. Under normal conditions, system operators regulate nodal voltages within ±5 percent of their nominal values. Under contingency conditions, this limit is relaxed to ±10 percent of the nominal value. These limits are typically set by the transmission owning utilities and the grid operator. When voltages or line loadings deviate from these limits it is referred to as a reliability violation. The limits used in the study for transmission line/transformer loading were the normal and long-term emergency (LTE) ratings. Under the normal conditions, transmission line/transformer flows should remain within the normal ratings. Under contingency conditions, transmission line/transformer flows should remain within the LTE ratings. Under normal conditions, substation voltages should remain within ±5 percent limit of the voltages of their nominal values. Under contingency conditions, the substation voltages should remain within ±10 percent limit of the nominal values.

The results of the power flow analysis for LSJR Alternatives 3 and 4 are presented in detail in Appendix J and are summarized below. These results are used to determine significant impacts on California's power grid.

- Under normal operating conditions, neither LSJR Alternatives 3 or 4 triggered any transmission line or transformer to violate the ratings.
- Under contingency conditions, no line/transformer limit violation was found for LSJR Alternative 3. However, under LSJR Alternative 4, the 230 kV line between "Borden" and "Gregg" substations showed a minor violation under the outage of the 230 kV line between "Gregg" and "Storey" substations. A re-dispatch of the three "Helms" generator units (Helms Unit 1, 2, and 3) reduced the minor violation. The new loading of the analysis element after this re-dispatch was 99.81 percent.

- No line/transformer limit violations were found that could be exclusively attributed to LSJR Alternatives 3 or 4, under generator contingencies.
- No voltage violations were found that could be exclusively attributed to the reduced hydropower capacity in LSJR Alternatives 3 or 4.

Increase in Energy Consumption

As described in Chapter 5, *Water Supply, Surface Hydrology, and Water Quality*, the LSJR alternatives are expected to change annual water supply for on the Stanislaus, Tuolumne and Merced Rivers. The water supply analysis was compared to the modeled existing water supply. Table 14-9 summarizes the reduction of average annual water supply from each of the three eastside tributaries for LSJR Alternatives 2, 3, and 4.

Table 14-9. Change of Existing Annual Water Supply (TAF)

Alternative	Stanislaus River	Tuolumne River	Merced River	Total
Existing Water Supply	577	885	527	1,989
Change of Water Supply (Alternative minus Existing)				
LSJR Alternative 2	+73	-6	-10	-16[1]
LSJR Alternative 3	-8	-173	-87	-268
LSJR Alternative 4	-120	-329	-164	-613

Source: Chapter 5, *Water Supply, Surface Hydrology, and Water Quality*, Table 5-21

TAF = thousand acre-feet

[1] The model predicts an increase in the water supply on the Stanislaus River. It is assumed the increased water supply would only be used for the plan area downstream of Stanislaus River and would not be used to balance the water supply deficits from Merced River and Tuolumne River watersheds.

To satisfy the existing water demand for the purpose of identifying energy and climate change impacts, it is assumed that the reduced water supply would be compensated by pumping groundwater from the end users. This assumption creates a worst-case scenario for energy impacts, as water-supply losses may be compensated for in other manners as well, such as changing crop choice, improving irrigation efficiency, or fallowing. It is assumed that the model-predicted increased water supply from the Stanislaus River for LSJR Alternative 2 would only be used for the plan area downstream of Stanislaus River and would not be used to balance the water supply deficits between Merced River and Stanislaus River. Therefore, as shown in Table 14-9, the total amount of groundwater needed for LSJR Alternative 2 does not account for the increased water supply from the Stanislaus River.

To further maximize estimates of energy impacts, it is assumed that the compensated pumping would be electric, and the electricity consumption for groundwater pumping is calculated using the rate of 478 kilowatt hours (KWh) per acre-feet (AF). The rate is based on a conservative assumption that the groundwater is at a uniform 189 feet depth. Table 14-10 summarizes the increased annual electricity consumption for groundwater pumping, while Table 14-11 summarizes annual energy consumption in the service area of the LSJR and three eastside tributaries. It is anticipated that most deep wells are and would be powered by electric pumps, while a smaller portion will be powered by diesel generators. It is currently unknown what proportion of ground water pumping at deep wells would use electric- or diesel-powered pumps because it is unknown exactly which existing wells would pump more under the LSJR alternatives and the type and number of new groundwater wells that maybe developed under the LSJR alternatives. Electric pumps are more efficient than diesel pumps, and due to economies of scale, produce less emission per unit of power. It is anticipated that, given the same horsepower rating, an electric pump would generate less than 3 percent of the GHG emissions than a diesel pump would (Leib 2012).

Table 14-10. Increase in Electricity Consumption for Groundwater Pumping

Alternative	Stanislaus River (GWh)	Tuolumne River (GWh)	Merced River (GWh)	Project-wide Total (GWh)
LSJR Alternative 2	0	2.9	4.8	8
LSJR Alternative 3	3.8	82.7	41.6	128
LSJR Alternative 4	57.4	157.3	78.4	293
GWh = gigawatt hours				

Table 14-11. 2010 Annual Electricity Consumption in San Joaquin, Stanislaus, and Merced Counties

	2010 Annual Electricity Consumption by County (GWh)		
Sector	San Joaquin	Stanislaus	Merced
Non-Residential	3,879	2,971	2,962
Residential	1,682	1,634	660
County-Wide Total	5,561	4,505	3,622
Plan Area Total		13,688	
Source: CEC 2012			
GWh = gigawatt hours			

Greenhouse Gas Emissions

The majority of the GHGs generated under the LSJR alternatives would result from the increase in power generation and energy consumption, which are described below.

Power Generation for Reduced Hydropower Production

The LSJR alternatives, overall, would cause a reduction in annual hydropower production. Table 14-8 summarized the reduction of average annual hydropower produced by each of the three eastside tributaries for LSJR Alternatives 2, 3, and 4 in comparison to the baseline hydropower production. To maintain the power supply for the end users, the lost hydropower would need to be compensated by ramping up other generation facilities by the following providers: PG&E, MID, TID, and Merced ID. The analysis of climate change impacts includes an analysis of GHG emissions associated with other generation facilities to offset the lost hydropower generation associated with the alternatives. The direct GHG emissions generated from the electricity produced by the other offsetting facilities are calculated using the CO_2 emission factor published in the 2008 TID Annual

Emissions Report[2] (CCAR 2009) and the CH_4 and N_2O emission factors published by USEPA (2012b). Table 14-12 lists the emission factors for CO_2, CH_4, and N_2O used to estimate GHG emissions associated with offset power generation.

Table 14-12. Greenhouse Gas Emission Factors (lb/MWh)

Area	CO_2	CH_4	N_2O
Turlock Irrigation District Service Areas	790.00[1]	0.02894[2]	0.00617[2]
California Region[3]	658.68	0.02894	0.00617

Sources: [1] CCAR 2009; [2] No CH_4 or N_2O emission factors were reported by CCAR 2009. The emission factors published by USEPA are used (USEPA 2012b); [3] USEPA 2012b.

CO_2 = carbon dioxide
CH_4 = methane
N_2O = nitrous oxide
lb/MWh = pounds per megawatt hour

Energy Consumption from Increased Groundwater Pumping

As shown in Table 14-9, some of the LSJR alternatives would result in a decrease in annual surface water supply available for agriculture and other uses, which could cause an increase in electricity consumption for groundwater pumping to satisfy the existing water demand. Because it is unknown what specific energy providers supply affected end users, the GHG emissions generated from the electricity consumption for the groundwater pumping were calculated using the GHG factors published by USEPA (2012b) for the California region to represent an average or composite rate of emissions (Table 14-12). While it is likely that existing groundwater wells would be used to pump water, new groundwater wells could be developed to satisfy demand; however, it is unknown the number, location, or extent of any new groundwater wells and therefore, quantification of GHG emissions with respect to construction equipment and vehicles is not included in this analysis. For a qualitative discussion of the potential environmental impacts related to methods of compliance, including the possible construction and operation of new groundwater wells, see Appendix H, *Evaluation of Methods of Compliance*.

The analysis assumed that the total water used for irrigation and other purposes (surface water supply plus groundwater supply) in the system would generally remain the same. Under this assumption, any additional municipal water needed to support population growth would result in decreased agricultural diversions. This is because municipalities typically purchase or contract with irrigators to pay for water supply that might otherwise be used for irrigation and because generally municipal development must demonstrate adequate water supplies prior to approval. The decrease in water available for cropland irrigation could also result in a decrease in the acreage of cropland that would be farmed if groundwater pumping did not occur. It is anticipated that some croplands would be removed from active agricultural production; however, this would have the potential to

[2] The California Climate Action Registry (CCAR) does not have published emission factors for MID or Merced ID. While PG&E represents a larger service area than Turlock ID, the emission factor associated with Turlock ID was used in the emissions calculations, as it is larger than the PG&E emission factor and represent a worst-case estimate of the maximum amount of emissions that could be anticipated to result from the project.

reduce GHG emissions as these lands would no longer require the use of fertilizers, which are a major source of GHG emissions. In addition, fallowed agricultural lands would not require the use of agricultural machinery, which would also reduce emissions of GHGs. Fallow lands would be expected to retain crop stubble cover and would ultimately experience vegetative regrowth, which could potentially result in a net carbon sequestration. Furthermore, since fallowed agricultural land would be expected to result in fewer GHG emissions, using additional groundwater pumping to maintain fallowed land and municipalities provides a conservative land use assumption to analyze the production of GHGs under the LSJR alternatives.

Other changes to land use as a result of a decrease in water available for cropland irrigation are considered speculative. The population growth rate, the available water supply, the timing, and alternatives to replace the cropland are uncertain. Consequently, the GHG emission reduction resulting from land use changes were not included in the analysis.

Energy Consumption from Change in Exports

As discussed in Chapter 5, *Water Supply, Surface Hydrology, and Water Quality*, and Appendix F.1, *Hydrologic and Water Quality Modeling*, the expected inflow from the LSJR could modify the CVP and SWP exports such that exports are expected to either remain the same or increase. The analysis related to exports and outflow assumes the State Water Board does not change export constraints to protect any increased flows downstream of Vernalis. The State Water Board is currently in the process of reviewing the export restrictions included in the 2006 Bay-Delta Plan as part of its periodic review of the plan (i.e., Phase II). Through that process, the State Water Board will determine what changes should be made to the export restrictions in light of the new flow objectives and other changes to the 2006 Bay-Delta Plan. The State Water Board will then determine as part of Phase III what actions are needed to implement changes to the flow and export objectives.

Modeling results presented in Chapter 5 (Table 5-23) and F.1 (Table F.1-22b) indicate annual average exports would increase by 1 percent for LSJR Alternative 3 and 3 percent for LSJR Alternative 4. It is appropriate to use the annual average when considering GHG emissions because GHG emissions are calculated and reported on an annual basis per standard inventorying procedures (i.e., IPCC, USEPA, etc.). The extent to which a net increase in GHG emissions would occur cannot be quantified. This is because it is currently unknown how increased exports would specifically affect other GHG emission-producing activities in the CVP and SWP export service areas (e.g., groundwater pumping) or other energy-intensive water supply activities, such as drinking water treatment or transport. Because change in groundwater pumping due to increased exportation cannot be estimated, GHG emissions associated with reduced groundwater pumping and increased exports, consequently, the net change in GHG emissions associated with water exports (i.e., emissions associated with exports and other activities that could be influenced by changes in exports) cannot be fully quantified as the specific effects that increased water exports would have on other activities are currently unknown. Therefore, impacts associated with a change in exports are discussed qualitatively for each of the LSJR alternatives.

SDWQ Alternatives

As described in Chapter 5, *Water Supply, Surface Hydrology, and Water Quality*, the historical range of salinity in the southern Delta would likely remain the same under the SDWQ alternatives. Because they relate to water quality, it is unlikely the SDWQ alternatives would reduce the hydropower production and electric grid reliability or reduce the municipal and agriculture water supply. The

SDWQ alternatives are not expected to reduce energy production or increase energy demand or consumption; therefore, they are not discussed further. The SDWQ alternatives would not result in a significant impact related to energy resources. Secondary, indirect impacts associated with potential future energy consumption associated with potential changes to existing wastewater treatment plants or drinking water facilities as a result of the SDWQ alternatives are described in Appendix H, *Evaluation of Methods of Compliance* and Chapter 13, *Service Providers*. Climate change could affect water quality in the southern Delta; this impact is qualitatively addressed in ECC-5.

14.4.3 Impacts and Mitigation Measures

Energy Resources

This section provides the evaluation of energy resources from the LSJR alternatives. The LSJR alternatives would affect energy by potentially reducing the power production at hydropower facilities along the three eastside tributaries.

ECC-1: Adversely affect the reliability of California's electric grid

Based on the analysis approach described in Section 14.4.2, LSJR Alternative 2 would lead to negligible power capacity reduction for the three hydropower plants, while the total output of the three plants would reduce by 5 percent and 8 percent under LSJR Alternatives 3 and 4, respectively.

The LSJR alternative substation voltages and line/transformer loadings were modeled and then compared with those of the baseline. If the comparison showed that substation voltages or transmission line/transformer loadings are within limits (defined in Section 14.4.2) under baseline, but outside the limits in the LSJR alternatives, the alternatives could be considered to have an adverse impact on the reliability of California's electric grid.

LSJR Alternative 1: No Project

The No Project Alternative would result in implementation of flow objectives identified in the 2006 Bay-Delta Plan. See Chapter 15, *LSJR Alternative 1 and SDWQ Alternative 1 (No Project Alternative)*, for the No Project impact discussion and Appendix D, *Evaluation of LSJR Alternative 1 and SDWQ Alternative 1 (No Project Alternative)*, for the No Project Alternative technical analysis.

LSJR Alternative 2: 20% Unimpaired Flow (Less than significant)

Based on the analysis approach described in Section 14.4.2, LSJR Alternative 2 would lead to negligible power capacity reduction from baseline. Therefore, this alternative is not expected to impact the reliability of California's electric grid. The impact would be less than significant.

LSJR Alternative 3: 40% Unimpaired Flow (Less than significant)

As described above, by comparing the results of LSJR Alternative 3 to baseline, LSJR Alternative 3 would not result in any violations of line/transformer limits and substation voltage limits under normal and contingency conditions. Therefore, this alternative would not adversely impact the reliability of California's electric grid. The impact would be less than significant.

LSJR Alternative 4: 60% Unimpaired Flow (Less than significant)

As described above, LSJR Alternative 4 could adversely impact the reliability of California's electric grid because of minor violations between "Borden" and "Gregg" substations and "Gregg" and "Storey" substations. However, the results indicate that a simple re-dispatch of generator facilities would correct the minor violation. This violation of transmission line limit under the contingency outage condition can be easily eliminated through a re-dispatch of the three "Helms" generator units (Helms Units 1, 2, and 3). The new loading of the analysis element after this re-dispatch was 99.81 percent of the LTE rating. Therefore, there would be no violation after the re-dispatch. Re-dispatches are regular occurrences in the California energy grid and they provide a solution to re-distribute power based on the re-dispatch. Therefore, impacts would be less than significant.

ECC-2: Result in inefficient, wasteful, and unnecessary energy consumption

LSJR Alternative 1: No Project

The No Project Alternative would result in implementation of flow objectives identified in the 2006 Bay-Delta Plan. See Chapter 15, *LSJR Alternative 1 and SDWQ Alternative 1 (No Project Alternative)*, for the No Project impact discussion and Appendix D, *Evaluation of LSJR Alternative 1 and SDWQ Alternative 1 (No Project Alternative)*, for the No Project Alternative technical analysis.

LSJR Alternatives 2, 3, and 4: 20% Unimpaired Flow, 40% Unimpaired Flow, and 60% Unimpaired Flow (Less than significant)

Although LSJR alternatives could result in additional energy consumption by groundwater pumping as shown in Table 14-10, they would not result in inefficient, wasteful, and unnecessary consumption of energy because the groundwater pumping is necessary to maintain the water supply irrigation demand.

Even under the conservative estimates used to project energy consumption associated with increased groundwater pumping, the alternatives would only increase the consumption by 0.06 percent (8 GWh), 0.94 percent (128 GWh), and 2.14 percent (293 GWh) under the LSJR Alternatives 2, 3 and 4, respectively.

In addition to increased energy consumption associated with increased groundwater pumping, the LSJR alternatives could result in additional energy generation at other facilities to compensate the loss of hydropower predicted by the model results, as shown in Table 14-8. However, this increased electricity generation is not considered inefficient, wasteful, and unnecessary, as it is energy that would be generated to maintain the energy supply level that is currently supplied by hydropower. The LSJR alternatives would only increase the consumption by 2 percent (38 GWh) and 4 percent (68 GWh) under the LSJR Alternatives 3 and 4, respectively. Modeled results indicate that LSJR Alternative 2 would result in an increase in hydropower production by 0.04 percent (6 GWh).

None of the alternatives result in an inefficient, wasteful, or unnecessary consumption of energy, and none are anticipated to have a significant impact on the energy resources or supplies of the plan area. The impact would be less than significant.

Climate Change

This section provides the evaluation of the effects of GHG emissions from the LSJR alternatives. The LSJR alternatives would affect GHG emissions by potentially reducing the power production at hydropower facilities along the three eastside tributaries and by potentially reducing surface water supply.

ECC-3: Generate GHG emissions, either directly or indirectly, that have a significant impact on the environment

Table 14-13 summarizes the annual GHG emissions generated from (1) the increased power generation at other generation facilities to balance the loss of hydropower production, and (2) the increased energy consumption for groundwater pumping to balance the reduction of surface water supply. The total GHG emissions generated by LSJR Alternatives 2, 3, and 4 are compared against the significance threshold of 10,000 MT CO_2e per year to determine the LSJR alternatives' impacts on climate change.

Table 14-13. Estimated Annual Greenhouse Gas Emissions (MT CO_2e/year)

Alternative	GHGs from Power Generation	GHGs from Energy Consumption	Total GHG Emissions
Baseline Conditions	0	0	0
LSJR Alternative 2	-2,157[1]	2,294	137
LSJR Alternative 3	13,660	38,420	52,081
LSJR Alternative 4	24,445	87,879	112,324

[1] Modeled results indicate that LSJR Alternative 2 would result in an increase in hydropower production.

MT CO_2e/year = metric ton carbon dioxide equivalent per year

LSJR Alternative 1: No Project

The No Project Alternative would result in implementation of flow objectives identified in the 2006 Bay-Delta Plan. See Chapter 15, *LSJR Alternative 1 and SDWQ Alternative 1 (No Project Alternative)*, for the No Project impact discussion and Appendix D, *Evaluation of LSJR Alternative 1 and SDWQ Alternative 1 (No Project Alternative)*, for the No Project Alternative technical analysis.

LSJR Alternative 2: 20% Unimpaired Flow (Less than significant)

As shown in Table 14-13, GHG emissions (137 MT CO_2e/year) would be well below the GHG threshold of 10,000 MT CO_2e/year. Furthermore, as identified in Table F.1-22b, the average annual exports are not expected to change from baseline under LSJR Alternative 2. Therefore, impacts would be less than significant.

LSJR Alternative 3: 40% Unimpaired Flow (Significant and unavoidable)

As shown in Table 14-13, GHG emissions (52,081 MT CO_2e/year) would exceed the GHG threshold of 10,000 MT CO_2e/year and impacts would be significant. Although it is likely some agricultural lands would be fallowed under LSJR Alternative 3 and thus potentially result in GHG reductions, these reductions are unlikely to offset all of the increased emissions expected if all surface water supply reductions are replaced by pumping groundwater and the reductions cannot be fully quantified.

As discussed in Section 14.4.2, the annual average of water exports is expected to increase approximately 1 percent under LSJR Alternative 3. While it is anticipated that this slight increase in water exports would result in a slight increase in the electricity consumption and associated GHG emissions, it is also expected that other water supply activities that may currently generate GHG emissions would be reduced as a result of the slight increase in exports. For example, an increase in water exports would be expected to lead to decreases in groundwater pumping, although the amount by which groundwater pumping would decrease cannot be quantified. In addition, other more energy-intensive means of water transport associated with water supply may decrease if water purveyors use slightly more exported water, depending on economic conditions, because it is less energy intensive. For example, if energy resources currently used to treat a local water supply rise such that treatment and distribution of the local supply is less cost effective than relying on imported water and the treatment is more energy intensive than relying on exported water, then using exported water could reduce cost and reduce energy use. Therefore, it is anticipated the modeled increase in exports would not contribute to a significant increase in GHG emissions.

An SED must identify feasible mitigation measures for each significant environmental impact identified in the SED. (Cal. Code Regs., tit. 23, § 3777(b)(3)). In order to reduce significant impacts identified above, less flow would be needed in the three eastside tributaries. Evaluating the effects of less flow is part of other alternatives (i.e., LSJR Alternative 1 and 2) and is separately considered in this document. Requiring less flow cannot be independently applied under LSJR Alternative 3 as a mitigation measure because requiring less flow would be inconsistent with the terms of LSJR Alternative 3 (i.e., requiring 40 percent of unimpaired flow). A review of GHG mitigation measure guidance documents was conducted to determine if additional actions could be taken by the State Water Board to reduce GHGs. These documents include: California Air Resources Board *Climate Change Scoping Plan* (ARB 2008), which was incorporated into the State Boards GHG guidance (State Water Board 2009); California Department of Water Resources Draft *Climate Action Plan* (DWR 2012), and the Office of the Attorney General (OAG) list of proposed project-level GHG Mitigation Measures (OAG 2010). Example measures from these documents are listed below.

- Increase water system energy efficiency to reduce energy consumption related to irrigation deliveries (State Water Board 2009).
- Increase water use efficiency to reduce water demand related to agricultural uses (State Water Board 2009.
- Create water-efficient landscapes (OAG 2010).
- Install water-efficient irrigation systems and devices, such as soil moisture-based irrigation controls (OAG 2010).
- Design buildings to be water-efficient. Install water-efficient fixtures and appliances (OAG 2010).
- Devise a comprehensive water conservation strategy appropriate for the project and location. The strategy may include many of the specific items listed above, plus other innovative measures that are appropriate to the specific project (OAG 2010).
- Provide education about water conservation (OAG 2010).

- Implement low-impact development practices that maintain the existing hydrologic character of the site to manage storm water and protect the environment. (Retaining storm water runoff on-site can drastically reduce the need for energy-intensive imported water at the site.) (DWR 2012 and OAG 2010).
- Restrict watering methods (e.g., prohibit systems that apply water to non-vegetated surfaces) and control runoff (DWR 2012).
- Restrict the use of water for cleaning outdoor surfaces and vehicles (DWR 2012).
- Increase energy efficiency of pumps and turbines throughout the SWP system through design, construction, and refurbishment methods (OP-2 Energy Efficiency Improvements) (DWR 2012).
- Increase the proportion of energy used to run the SWP with energy supplies from renewable sources (OP 3 Renewable Energy Procurement Plan) (DWR 2012).
- Explore ways to develop renewable energy on land the California Department of Water Resources (DWR) owns (OP 4 On Site Renewable Generation) (DWR 2012).
- Establish of contracts for or ownership of high efficient energy resources (OP 5 Lower Emissions Energy Resources) (DWR 2012).
- Implement environmental restoration activities that have the potential to improve sequestration of carbon by natural processes (OP-6 Carbon Sequestration Actions) (DWR 2012).

Irrigation efficiency could also be applied as a mitigation measure because the surface water diversions primarily support agriculture in the plan area. Irrigation efficiency reduces the amount of water required for application without impacting the beneficial use. Increasing the irrigation efficiency would be expected to reduce the amount of supplemental groundwater pumping that may be required to replace reduced surface water diversions and thus less groundwater pumping would be expected to consume less energy and produce fewer GHGs. Local water suppliers, regional groundwater management agencies, and/or irrigation districts could require modifications to existing agricultural practices such that an increase in irrigation efficiency would reduce the amount of water supply needed to maintain existing crops and agricultural lands in production. Increasing the irrigation efficiency could be done using the following methods.

- Increase the use of irrigation management services to better determine how much water is needed by crop and when to apply it.
- Convert current inefficient irrigation systems (e.g., surface irrigation) to more efficient ones (e.g., use of microirrigation).
- Increase the capability of irrigation water suppliers to provide delivery flexibility, such as the use of irrigation district regulating reservoirs to allow flexible delivery durations.

Any quantification of the effects of applying irrigation efficiency measures would be speculative; however, even a reduction to zero, would not reduce the GHG impacts to less than significant levels, because of the estimated GHG emissions of replacement for lost hydropower generation.

Many of the measures identified in the guidance documents are project level measures appropriate for project-specific development, such as the construction and operation of a building. Others would require undertaking new projects as or almost as complex as the regulations being considered here. Furthermore, many require multiple actions from other individuals or entities besides the State Water Board under CEQA. Therefore, they are not feasible, enforceable mitigation measures for the potential GHG impacts of LSJR Alternative 3. Any authority the State Water Board has to impose irrigation efficiency requirements would be outside the scope of this standard-setting, and would have to occur in individual water right hearings based on findings of waste or unreasonable use. Whether water use by any water right holder in these watersheds constitutes waste or unreasonable use is speculative. Furthermore, any broader regulatory action to implement the irrigation efficiencies would be under the jurisdiction of local water suppliers, or local and regional groundwater management agencies. While it is possible that some of the water-diversion and use measures, including irrigation efficiency, may have some applicability to reducing impacts, or may have the ability to be implemented, as part of the individualized water right proceedings that are expected to occur to implement the flow objectives; any application of these measures at this point would be speculative. Therefore, impacts under LSJR Alternative 3 would remain significant and unavoidable.

LSJR Alternative 4: 60% Unimpaired Flow (Significant and unavoidable)

As shown in Table 14-13, GHG emissions (112,324 MT CO_2e/year) would exceed the GHG threshold of 10,000 MT CO_2e/year and impacts would be significant. Although it is likely some agricultural lands would be fallowed under LSJR Alternative 4 and thus potentially result in GHG reduction, these reductions are unlikely to offset all of the increased emissions and cannot be fully quantified. As discussed in Section 14.4.2, the annual average of water exports is expected to increase approximately 3 percent under LSJR Alternative 4. While it is anticipated that this slight increase in water exports would result in a slight increase in electricity consumption and associated GHG emissions, it is also expected that other water supply activities that may currently generate GHG emissions would be reduced as a result of the slight increase in exports as discussed under LSJR Alternative 3. Therefore, it is anticipated the modeled increase in exports would not contribute to a significant increase in GHG emissions.

As discussed above, guidance documents (listed under LSJR Alternative 3) for possible GHG mitigation measures and possible methods to result in better irrigation efficiency were reviewed. It is possible that some of the water-diversion and use measures, including irrigation efficiency, may be applicable to reducing impacts or could potentially be implemented as part of the expected individualized water right proceedings to implement the flow objectives; however, any application of these measures at this point would be speculative. Therefore, impacts under LSJR Alternative 4 would remain significant and unavoidable.

ECC-4: Conflict with an applicable plan, policy, or regulation adopted for the purposes of reducing GHG emissions

CAA requirements for GHGs are the GHG emissions standards for vehicles and do not apply to projects that do not generate GHG emissions from vehicles. GHG emissions from the largest stationary sources (such as electricity utilities, refineries, etc.) are typically covered by CAA Prevention of Significant Deterioration (PSD) and Title V Operating Permit Programs. This requires permitting for facilities in excess of 100,000 MT CO_2e/year. The electric utilities that could be affected by the LSJR alternatives as a result of reduced hydropower or increased groundwater pumping would be subject to these permitting requirements regardless of LSJR alternatives, and the LSJR alternatives would not alter or modify these permit requirements. Therefore, the LSJR alternatives would not conflict with the requirements or CAA.

The GHG threshold of 10,000 MT CO_2e per year adopted by SCAQMD and BAAQMD and used for the analysis was developed by considering consistency with a GHG reduction plan, the predicted emissions reductions from statewide regulatory measures and resulting emissions inventories, and the efficacies of GHG mitigation measures. It addresses a broad range of combustion sources and thus provides for a greater amount of GHG reductions to be analyzed and mitigated through the CEQA process. (BAAQMD 2010) Therefore, the LSJR alternatives would be considered to conflict with the state goals listed in AB 32 or in any preceding state policies and plans adopted to reduce GHG emissions if the GHG emissions generated by the alternatives are greater than the GHG threshold of 10,000 MT CO_2e per year.

LSJR Alternative 1: No Project

The No Project Alternative would result in implementation of flow objectives identified in the 2006 Bay-Delta Plan. See Chapter 15, *LSJR Alternative 1 and SDWQ Alternative 1 (No Project Alternative)*, for the No Project impact discussion and Appendix D, *Evaluation of LSJR Alternative 1 and SDWQ Alternative 1 (No Project Alternative)*, for the No Project Alternative technical analysis.

LSJR Alternative 2: 20% Unimpaired Flow (Less than significant)

As discussed for ECC-3, the LSJR Alternative 2 would generate GHG emissions well below 10,000 MT of CO_2e per year. Therefore, the alternative is not expected to conflict or be inconsistent with the state goals listed in AB 32 or in any preceding state policies and plans adopted to reduce GHG emissions. This impact would be less than significant.

LSJR Alternative 3: 40% Unimpaired Flow (Significant and unavoidable)

As discussed for ECC-3, LSJR Alternative 3 would generate GHG emissions in excess of 10,000 MT of CO_2e per year, which is considered to be inconsistent with the state goals listed in AB 32 or in any preceding state policies and plans adopted to reduce GHG emissions. This impact would be significant. Implementation of the measures discussed in ECC-3 would likely reduce GHG emissions, but cannot be fully quantified. Furthermore, while it is possible that some of the water-diversion and use measures, including irrigation efficiency, may have some applicability to reducing impacts, or may have the ability to be implemented, as part of the individualized water right proceedings that are expected to occur to implement the flow objectives; any application of these measures at this point would be speculative. Consequently, this impact would be significant and unavoidable.

LSJR Alternative 4: 60% Unimpaired Flow (Significant and unavoidable)

As discussed for ECC-3, LSJR Alternative 4 would generate GHG emissions in excess of 10,000 MT of CO_2e per year, which is considered to be inconsistent with the state goals listed in AB 32 or in any preceding state policies and plans adopted to reduce GHG emissions. This impact would be significant. Implementation of the measures discussed for ECC-3 would likely reduce GHG emissions, but cannot be fully quantified. Furthermore, while it is possible that some of the water-diversion and use measures, including irrigation efficiency, may have some applicability to reducing impacts, or may have the ability to be implemented, as part of the individualized water right proceedings that are expected to occur to implement the flow objectives; any application of these measures at this point would be speculative. Consequently, this impact would be significant and unavoidable.

ECC-5: Effect of global climate change on the LSJR and SDWQ alternatives

LSJR Alternative 1 No Project

The No Project Alternative would result in implementation of flow objectives identified in the 2006 Bay-Delta Plan. See Chapter 15, *LSJR Alternative 1 and SDWQ Alternative 1 (No Project Alternative)*, for the No Project impact discussion and Appendix D, *Evaluation of LSJR Alternative 1 and SDWQ Alternative 1 (No Project Alternative)*, for the No Project Alternative technical analysis.

SDWQ Alternative 1 No Project

The No Project Alternative would result in implementation of flow objectives identified in the 2006 Bay-Delta Plan. See Appendix D, *Evaluation of LSJR Alternative 1 and SDWQ Alternative 1 (No Project Alternative)*, for a No Project Alternative technical analysis and impact discussion.

LSJR Alternatives 2, 3, and 4 and SDWQ Alternatives 2 and 3: (Less than significant)

The LSJR alternatives would be subject to climate change impacts resulting from past, present, and future GHG emissions regardless of the success of local, state, national, or international efforts in reducing future GHG emissions due to the existing concentrations of GHG emissions in the atmosphere and the inevitable additional emissions before GHG reductions plans provide reductions. As mentioned earlier, potential climate change impacts in California and the San Joaquin Valley might include sea level rise and saltwater intrusion, reduced snowpack and water supplies, and increased water consumption. Increased saltwater intrusion, changes in rainfall, and snowpack and water supplies have the potential to impede the flow and salinity objectives of the LSJR and southern Delta.

The adaptive management framework of the LSJR alternatives would provide the State Water Board and Council of Governments the ability to respond to changing circumstances with respect to flow and water quality that may arise due to climate change (e.g., more precipitation and less snow pack) as it relates to protecting beneficial uses such as fish and wildlife on the three eastside tributaries and agricultural uses in the southern Delta. In addition, the State Water Board is required to prepare WQCPs and regularly review the plans to update water quality standards. As a result, the planning process continually accounts for changing conditions related to water quality and water planning, such as climate change. Therefore, because the State Water Board is actively preparing for the effects of climate change on their programs and the adaptive management framework would incorporate circumstances that arise from climate change, this impact would be less than significant.

14.5 Cumulative Impacts

14.5.1 Definition

Cumulative impacts are defined in the State CEQA Guidelines (14 California Code of Regulations [Cal. Code Regs.], § 15355) as “two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts.” A cumulative impact occurs from “the change in the environment which results from the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable future projects. Cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time” (14 Cal. Code Regs., § 15355(b)).

Consistent with the State CEQA Guidelines (14 Cal. Code Regs., § 15130(a)), the discussion of cumulative impacts in this chapter focuses on significant and potentially significant cumulative impacts. The State CEQA Guidelines (14 Cal. Code Regs., § 15130(b)) state the following:

> The discussion of cumulative impacts shall reflect the severity of the impacts and their likelihood of occurrence, but the discussion need not provide as great detail as is provided for the effects attributable to the project alone. The discussion should be guided by the standards of practicality and reasonableness, and should focus on the cumulative impact to which the identified other projects contribute rather than the attributes of other projects which do not contribute to the cumulative impact.

14.5.2 Cumulative Impact Analysis

Climate change is a global problem, and GHGs are global pollutants, unlike criteria air pollutants (such as ozone precursors), which are primarily pollutants of regional and local concern. Given their long atmospheric lifetimes, GHGs emitted by countless sources worldwide accumulate in the atmosphere. No single project could generate enough GHG emissions large enough to trigger global climate change on its own. Rather, climate change is the result of the individual GHG contributions of countless past, present, and future sources. Therefore, the evaluation of GHG emissions is always cumulatively considerable. If a project would generate GHG emissions above the threshold of 10,000 MT CO_2e per year, it would be considered significant because it contributes substantially to a cumulative impact. As discussed in Section 14.4.3, LSJR Alternatives 3 or 4 would result in GHGs increase in exceedance of significance threshold and would be considered to be inconsistent with the state goals listed in AB 32 or in any preceding state policies and plans adopted to reduce GHG emissions. Therefore, LSJR Alternatives 3 or 4 would have significant and unavoidable cumulative impacts on climate change.

California has instituted requirements for all electricity producers to add at least 33 percent renewable to their energy portfolio per the Renewable Energy Standard/Renewable Portfolio Standard. Senate Bill (SB) 1078 (2002) and SB 107 (2006) created the Renewable Energy Standard (RES) program, which required electric corporations to increase procurement from eligible renewable energy resources by at least 1 percent of their retail sales annually, until they reach 20 percent by 2010. SB 2X 1 (2011) requires an Renewable Portfolio Standard (RPS), functionally the same thing as the RES) of 33 percent by 2020. Energy production and consumption in the SJR Basin and California is anticipated to result in the use of more renewable energy sources over the next few decades. This is already evident, as the SJR Basin and surrounding areas have seen an increase in renewable energy projects, which will help the State to meet the RPS requirements. The renewable sources developed over the next decade are expected to support and replace existing non-renewable sources. While the LSJR alternatives would have an effect on hydropower (i.e., more water may need to be released from reservoirs in the spring making less available in the summer), and thus result in a loss of hydropower it is anticipated that electricity derived from existing carbon-free hydropower would need to be compensated by ramping up other generation facilities. Although other sources to compensate for electricity would include renewable energy sources, not all renewable energy is carbon-free. For example, biomass- and biofuel-derived energy does emit GHGs[3]. However, overall

[3] Biomass and biofuels are considered biogenic, which means they are produced by natural sources and processes. Consistent with national and international reporting protocols (i.e., EPA and IPCC), emissions generated from the combustion of biomass and biofuelsto generate electricity are not included in GHG inventories, as these biogenic sources are considered net-neutral with respect to carbon emissions.

the RPS requirements would serve to further reduce the carbon intensity of generated electricity, ensuring that GHGs associated with electricity generation, including any generation needed to compensate for the slight reduction under the LSJR alternatives, is reduced in California to meet the RES/RPS. Therefore, the LSJR alternatives would not make a cumulatively considerable incremental contribution, and impacts on energy production and consumption would not be cumulatively considerable.

14.6 References

14.6.1 Printed References

Bay Area Air Quality Management District (BAAQMD). 2010. California Environmental Quality Act: Air Quality Guidelines, Updated May 2010

California Air Resources Board (ARB). 2008. Climate Change Scoping Plan. December 2008.

California Air Resources Board (ARB). 2011. California Greenhouse Gas Inventory Data for 2000 to 2009—by Category as Defined in the Scoping Plan. Last revised: October 26, 2012. Available: <http://www.arb.ca.gov/cc/inventory/data/data.htm>. Accessed: June 2012.

California Climate Action Registry (CCAR). 2009. PG&E Public/Utility Reporting Protocol Spreadsheet for the 2008 Turlock Irrigation District Annual Emissions Report. Published: October 29, 2009. Available: <http://www.climateregistry.org/CARROT/public/reports.aspx>. Accessed: April 12, 2012.

California Department of Water Resources (DWR). 2010. State Water Project Delivery Reliability Report 2009. Available at: <http://baydeltaoffice.water.ca.gov/swpreliability/Reliability2010final101210.pdf>. Accessed on: December 2012.

California Department of Water Resources (DWR). 2012. Climate Action Plan—Phase I: Greenhouse Gas Emissions Reduction Plan. Published: May 2012. Available: <http://www.water.ca.gov/climatechange/docs/Final-DWR-ClimateActionPlan.pdf>. Accessed on: June 6, 2012.

California Energy Commission (CEC). 2009a. An Assessment of Resource Adequacy and Resource Plans of Publicly Owned Utilities in California, California Energy Commission. Published: November 2009. Available: <http://www.energy.ca.gov/2009publications/CEC-200-2009-019/CEC-200-2009-019.PDF>. Accessed: November 2011.

California Energy Commission (CEC). 2009b. Climate Change Scenarios and Sea Level Rise Estimates for California 2008 Climate Change Scenario Assessment. Published: March 2009. Available: <http://www.energy.ca.gov/2009publications/CEC-500-2009-014/CEC-500-2009-014-D.PDF>. Accessed: January 2012.

California Energy Commission (CEC). 2012. California Energy Consumption Database, Electricity Consumption by County. Available: <http://www.ecdms.energy.ca.gov/>. Accessed: March 2012.

California Independent System Operator (CAISO). 2010. 2011 Local Capacity Technical Analysis: Final Report and Study Results. Published: April 30, 2010. Available: <http://www.caiso.com/planning/Pages/ReliabilityRequirements/LocalCapacityRequirements.aspx>. Accessed: November 2011.

California Independent System Operator (CAISO). 2011. 2010–2011 Transmission Plan. Published: May 18, 2011. Available: <http://www.caiso.com/2b88/2b8872c95ce10.pdf>. Accessed: November 2011.

California Natural Resources Agency. 2009. 2009 California Climate Adaptation Strategy: A Report to the Governor of the State of California in Response to Executive Order S-13-2008. Available: <http://www.energy.ca.gov/2009publications/CNRA-1000-2009-027/CNRA-1000-2009-027-F.PDF>. Accessed: January 2012.

California Public Utilities Commission (CPUC). 2011. Resource Adequacy – What it does. Last revised: April 22, 2011. Available: <http://www.cpuc.ca.gov>. Accessed: November 2011.

Coastal and Ocean Working Group of the California Climate Action Team. 2010. State of California Sea-level Rise Interim Guidance Document. October. Published: October 2010. Available: <http://opc.ca.gov/webmaster/ftp/pdf/agenda_items/20110311/12.SLR_Resolution/SLR-Guidance-Document.pdf. Accessed: June 2012.

Intergovernmental Panel on Climate Change (IPCC). 1996. Climate Change 1995. (IPCC Second Assessment). Cambridge, U.K.: Cambridge University Press.

Intergovernmental Panel on Climate Change (IPCC). 2001. Atmospheric Chemistry and Greenhouse Gases. Pages 241–280 in Climate Change 2001: Working Group I: The Scientific Basis. Available: <http://www.ipcc.ch/ipccreports/tar/wg1/pdf/TAR-04.PDF>. Accessed: September 22, 2009.

Intergovernmental Panel on Climate Change (IPCC). 2007. Introduction. Pages 97–115 B. Metz, O.R. Davidson, P.R. Bosch, R. Dave, L.A. Meyer, eds., in Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, 2007. Cambridge, U.K. and New York, NY, USA: Cambridge University Press. Available: <http://www.ipcc.ch/pdf/assessment-report/ar4/wg3/ar4-wg3-chapter1.pdf>. Accessed: August 11, 2009.

Leib, Brian. 2012. Comparison of Diesel vs. Electric Pumping Costs. Available: <http://news.utcrops.com/wp-content/uploads/2012/05/Diesel-Electric-Pump-Payback-Table-simplified.pdf>. Accessed: June 8, 2012.

Office of the Attorney General (OAG). 2010. Addressing Climate Change at the Project Level, California Attorney General's Office. Revised: January 6, 2010. Available: <http://ag.ca.gov/globalwarming/pdf/GW_mitigation_measures.pdf>. Accessed: June 6, 2012.

San Joaquin Valley Air Pollution Control District (SJVAPCD). 2009a. District Policy: Addressing GHG Emission Impacts for Stationary Source Projects Under CEQA When Serving as the Lead Agency. December 17, 2009.

San Joaquin Valley Air Pollution Control District (SJVAPCD). 2009b. Guidance for Valley Land-use Agencies in Addressing GHG Emission Impacts for New Projects under CEQA. December 17, 2009.

State Water Resources Control Board (State Water Board). 2009. Draft Water Boards Staff Guidance on Climate Change. November 30.

U.S. Environmental Protection Agency (USEPA). 2012a. Executive Summary of Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2010. EPA 430-R-12-001. April. Available: <http://www.epa.gov/climatechange/Downloads/ghgemissions/US-GHG-Inventory-2012-ES.pdf>. Accessed: June 2012.

U.S. Environmental Protection Agency (USEPA). 2012b. eGRID2012 Version 1.0–Year 2009 Summary Tables. Last revised: April 2012. Available: <http://www.epa.gov/cleanenergy/documents/egridzips/eGRID2012V1_0_year09_SummaryTables.pdf>. Accessed: June 2012.

Western Area Power Administration. 2010. Final Resource Adequacy (RA) Plan, Federal Register 72 FR 41317; SMUD Comments to CAISO March 10, 2010 Dynamic Transfer Straw Proposal. Available: <http://www.caiso.com/276c/276cbecb37360.pdf>. Accessed: November 2011.