ENERGY AWARE
FACILITY SITING AND PERMITTING
GUIDE

CONSULTANT REPORT

Prepared by

ASPEN
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ABSTRACT

The *Energy Aware Facility Siting and Permitting Guide* is an update of an earlier guide developed by the Energy Commission in the 1990s. This most recent guide assists local governments with developing general plan energy and transmission elements and provides guidance on utility-scale electricity generation and transmission planning and permitting. California has ambitious greenhouse gas emission reduction targets and renewable energy development targets that are spurring new energy infrastructure. The guide discusses the increasing role of local governments in energy planning and permitting; describes the energy regulations and policies (both federal and state) and planning processes that define future electricity generation and transmission needs; and identifies opportunities for local government involvement in electricity infrastructure planning and permitting. Examples of local government development of energy planning tools and involvement in generation and transmission planning and permitting are provided. The *Energy Aware Facility Siting and Permitting Guide* also describes the environmental impacts associated with developing new energy generation facilities and transmission lines.

Keywords: Electricity generation, transmission lines, renewables, local government, energy elements, transmission elements, energy planning and permitting, lead agency, environmental impacts, CEQA, NEPA, transmission corridor

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EXECUTIVE SUMMARY

Introduction

The *Energy Aware Facility Siting and Permitting Guide* is a comprehensive resource for local governments seeking to be more engaged in how electricity infrastructure is developed within their own communities and within the state at large. As California responds to climate change science and regulation, new methods of generating electricity are being proposed and built. Electricity infrastructure is being considered in locations where no infrastructure previously existed and can vary in size from quite small to extremely large. This guide provides essential information to local and regional governments describing the regulatory framework, permitting processes, and environmental impacts associated with electricity infrastructure.

Purpose

This guide is intended to help local governments plan for and permit electricity generation facilities and transmission lines that will be needed in the upcoming years. It provides a framework to inform planners, decision makers, and the public about what, how, and why electricity infrastructure may be developed.

Chapter 1 introduces the Guide, identifies its purpose, briefly describes how electricity is generated and transmitted, identifies the key players in future electricity infrastructure planning and development, and illustrates the location of current electricity infrastructure.

Chapter 2 discusses the increasing role of local governments as the state expands its energy goals. It also contains information and recommendations for local energy infrastructure planning and the legal authority for local government involvement in the planning process.

Chapter 3 identifies the kinds of utility-scale generation and transmission projects that are likely to occur within the next 20 years.

Chapter 4 discusses the environmental review process and permitting responsibilities of the various parties who must certify or approve electricity infrastructure. Local government roles are identified for each process.

Appendix A defines common electricity infrastructure terms and contains a glossary of acronyms.

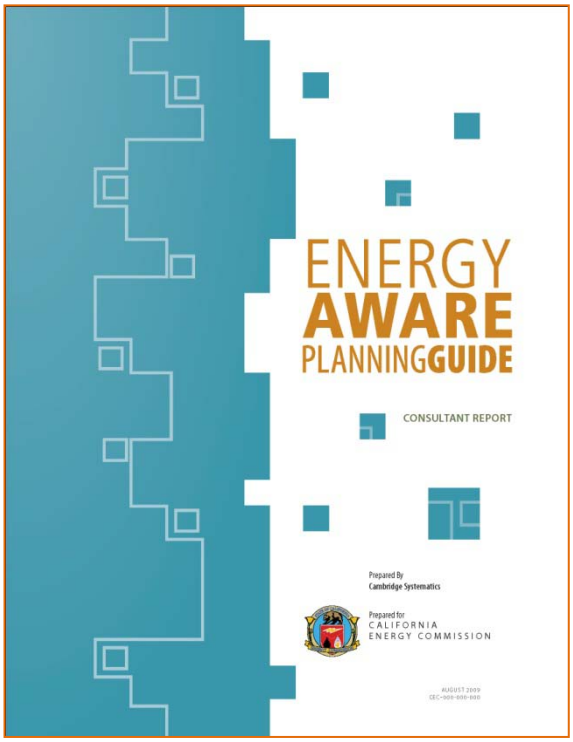
Appendix B identifies the general processes for defining future generation and transmission needs and for permitting of subsequent generation and transmission infrastructure.

Appendix C identifies the major laws and policies that shape what kind of generation and transmission is proposed and permitted.

Appendix D provides details regarding new renewable energy infrastructure developments.

Appendix E considers the environmental issues associated with generation and transmission infrastructure.

Chapter 1: Introduction



The *Energy Aware Facility Siting and Permitting Guide* is a comprehensive resource for local governments seeking to be more engaged in planning and permitting electricity infrastructure[1] within their own communities and within the state at large. As California responds to climate change science and regulation, new methods of generating electricity are being proposed and built. Infrastructure is being considered in locations where no infrastructure previously existed. Renewable energy facilities of all sizes are being built within communities as well as in remote regions of the state. An informed public and proactive local government can advise policy and decision makers on the state's electricity future and ensure appropriate siting and permitting decisions.

The *Energy Aware Facility Siting and Permitting Guide* is a companion guide to the *Energy Aware Planning Guide* which provides technical information to local governments seeking to improve energy efficiency, reduce energy use and greenhouse gas emissions, and enhance renewable sources of energy. The two in tandem provide a comprehensive array of tools and strategies for local, regional, and statewide energy planning. Both guides were first issued in the 1990s, and their current updates reflect many changes that have occurred since then. The nature of electricity infrastructure development in California is changing dramatically; the following factors will affect the ability of local officials to respond effectively to proposed developments.

- Concern over climate change requires reduction in greenhouse gas (GHG) emissions. Approximately 25 percent of California's carbon dioxide emissions are from electric utilities, with 12 percent from in-state electricity and 13 percent from imported electricity. The electricity sector will continue to be a major source of GHG emissions in the near future. Assembly Bill 32 (Núñez, Chapter 488, Statutes of 2006), the California Global Warming Solutions Act of 2006 (AB 32), mandates that California reduce its greenhouse gas emissions to 1990 levels by 2020. By 2050, California's GHG emissions are to be 80 percent lower than 1990 levels.
- California law established the California Renewables Portfolio Standards (RPS) in 2002 under Senate Bill (SB) 1078 (Sher, Chapter 516, Statutes of 2002), and accelerated the standards in 2006 under SB 107 (Simitian, Chapter 464, Statutes of 2006), requiring more renewable energy development. The State has determined that 20 percent of electricity retail sales should be provided by renewable energy facilities by 2010 and 33 percent by 2020. SB X1 2 (Simitian, Chapter 1, Statutes of 2011) codifies the 33 percent RPS requirement. These are ambitious targets.

[1] Electricity infrastructure refers to the physical elements required for electricity generation (natural gas, nuclear, wind, solar, geothermal and biomass facilities) and transmission (transmission lines, substations).

- New transmission lines are needed to access renewable energy facilities in areas remote from urban areas, such as solar power plants in California deserts. The Renewable Energy Transmission Initiative (RETI) stakeholder process has identified the most likely locations for new transmission in the state. Designating corridors in anticipation of future transmission is an important first step.
- Federal stimulus money has helped expedite electricity infrastructure development and local government energy planning.
- The ever-increasing use of the internet allows citizens to engage in decision making at every level.
- Local governments continue to face budget constraints which hamper the ability to plan for and permit electricity infrastructure.

Purpose

This guide is intended to help local governments plan for and permit electricity generation facilities and transmission lines that will be needed in the upcoming years. The size and location of this infrastructure will vary. Local communities have seen an upsurge in roof-top solar facilities resulting from a number of state and federal initiatives. These roof-top systems can be as large as 2 megawatts (MW). New community-based generation on the scale of 2 to 20 MWs will help meet Governor Brown's mandate for 12,000 MW of distributed generation. Utility-scale renewable energy facilities that can range from 20 MW to 1,000 MW are being proposed and built to help the state achieve its 33 percent RPS mandate. The resources available to local governments to help them plan and permit these disparate sized systems vary.

Generation Facilities less than 2 MW

California offers a number of programs in support of very small electricity generation. The Emerging Renewables Program, the Self Generation Incentive Program and the California Solar Initiative have led to the development of roof-top solar installations throughout the state. These systems reduce the amount of electricity consumed by a home or business and therefore reduce electricity needed from the grid. Section C.2.1 of the *Energy Aware Planning Guide* identifies resource links for these programs.

Generation Facilities between 2 and 20 MW

Distributed generation systems between 2 MW and 20 MW are generally located close to where electricity is used and provide an alternative to or an enhancement of the traditional electric power system. These systems increase electricity supply. Section C.2.2 of the Planning Guide describes distributed generation systems and provides resources. The December 2000 Energy Commission report on Distributed Generation: CEQA Review and Permit Streamlining is still pertinent today.

The California Energy Commission's proposed Renewable Planning and Permitting Program (RP3) would provide local governments with planning and permitting assistance to help them evaluate and expedite renewable energy development in their jurisdictions.

The Energy Commission is developing a website (expected to be launched in Fall 2011) to house existing planning and permitting resources to assist local governments in assessing, siting, and regulating renewable energy technologies. The Energy Commission is also working with local jurisdictions, developers, and others to develop additional tools to help local jurisdictions streamline renewable energy permitting processes.

Generation Facilities Greater than 20 MW

The focus of this Siting and Permitting Guide is on land-based utility-scale electricity generation facilities and associated transmission infrastructure.[2] These systems have increased substantially since 2008, spurred by the State's increasing desire for renewable energy and federal stimulus funds available to projects.

The guide identifies opportunities for local governmental involvement and provides information to help local and Tribal governments engage more effectively in the planning and regulatory process for utility-scale infrastructure. The guide is organized into the following sections:

Chapter 1 introduces the Guide, identifies its purpose, briefly describes how electricity is generated and transmitted, identifies the key players in future electricity infrastructure planning and development, and illustrates the location of current electricity infrastructure.

Chapter 2 discusses the increasing role of local governments as the state expands its energy goals. It also contains information and recommendations for local energy infrastructure planning and the legal authority for local government involvement in the planning process.

Chapter 3 identifies the kinds of utility-scale generation and transmission projects that are likely to occur within the next 20 years.

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Appendix A defines common electricity infrastructure terms and contains a glossary of acronyms.

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Appendix D provides details regarding new renewable energy infrastructure developments.

Appendix E considers the environmental issues associated with generation and transmission infrastructure.

Setting the Stage

Electricity Generation and Use

Electricity is an essential commodity for everyday life, but many people have incomplete ideas regarding how electricity is generated and distributed. They simply rely on it to light their homes and offices, operate all their electrical appliances, manufacture goods, pump water, run their cars, and a myriad of other health and safety purposes.

Because currently electricity cannot be easily and inexpensively stored (although new storage possibilities are now under development), a complex system has developed over time to ensure that just enough electricity is produced to meet the demand at a given moment.

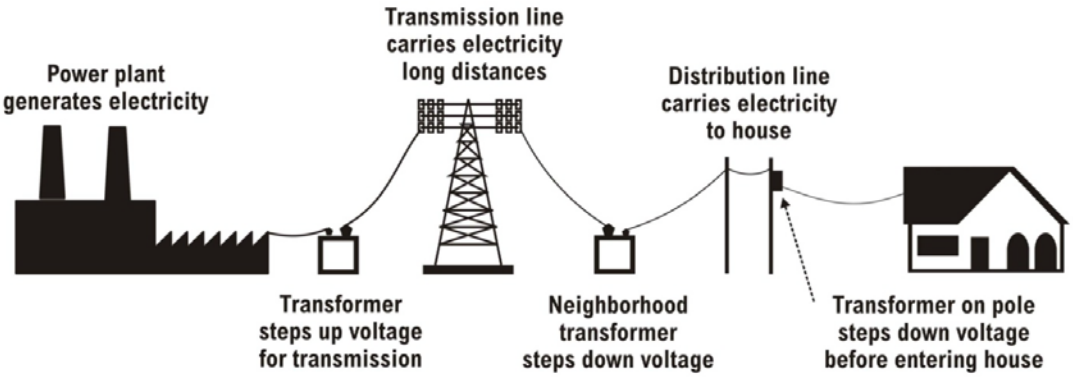
Power plants of various types generate electricity. The electricity is fed to high voltage (for example, 500,000 volts or 500 kV) transmission lines that may run hundreds of miles. The power lines eventually go into substations near

[2] Ocean-based technologies, while promising, are not discussed in this guide. Similarly, small hydro facilities are also not included.

businesses, factories, and homes. Here transformers change the very high-voltage electricity back into lower voltage electricity.

From these substations electricity in different power levels is used to run factories, mass transit, street lights and stop lights, and is sent to neighborhoods. A small transformer mounted on a pole or in a utility box converts the power to even lower levels to be used in the home. The reduced voltages power larger appliances, like stoves and clothes dryers (220 volts), and lights, TVs and other smaller appliances (110 volts). Figure 1.1 shows the electricity transport steps.

Figure 1.1: Transporting Electricity

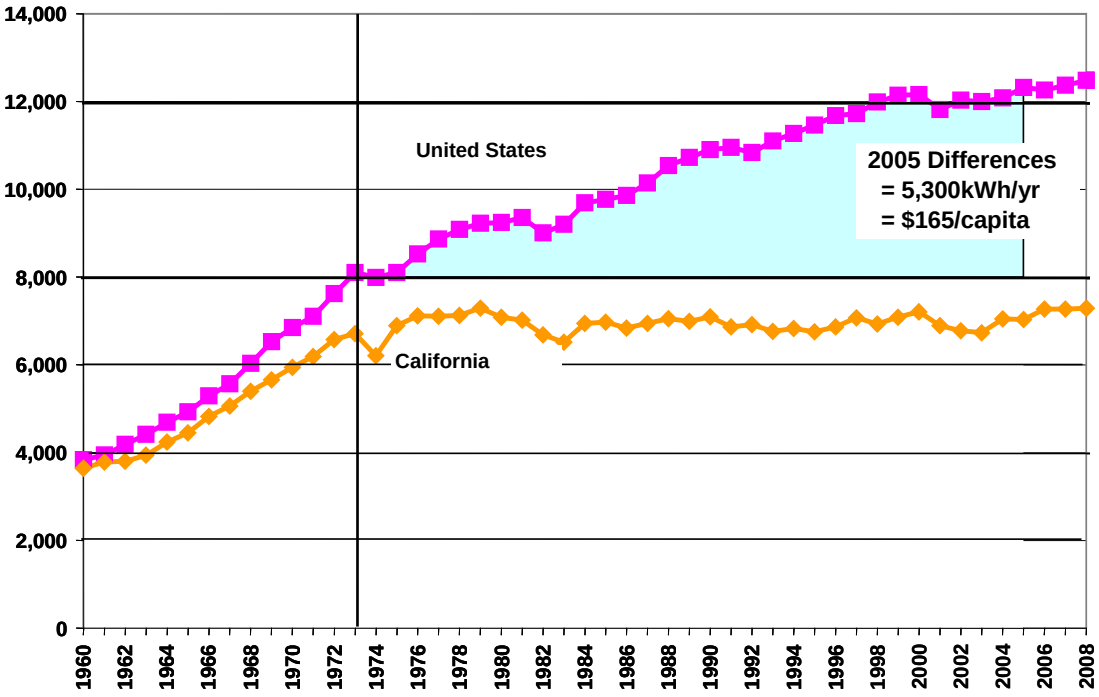


Source: Intermediate Energy Infobook, http://www.need.org/needpdf/infobook_activities/IntInfo/Elec1I.pdf

California leads the nation in the efficient use of electricity. As shown in Figure 1.2, California's per capita electricity use has remained level over the last 20 years despite the fact that the state's population has grown significantly over that time. However, the state's total electricity use has grown to serve the expanded population.

Figure 1.2: Per Capita Electricity Consumption in the United States and California

(Annual use of electricity in kWh per person from 1960 to 2005 with forecasts through 2008 in California and the U.S.)



Source: California Energy Commission

Preferred Sources for Electricity Generation

California has identified preferred sources to meet the demand for electricity. This is referred to as the state's loading order, which calls for meeting new electricity needs first with energy efficiency and demand response; second, with new generation from renewable energy and distributed generation resources; and third, with clean fossil-fueled generation and transmission infrastructure improvements.

Energy efficiency means using less energy/electricity to perform the same functions. **Demand response/reduction** provides economic incentives to customers to voluntarily lower their energy use. **Renewable generation** includes power plants that use the sun, wind, geothermal (i.e., hot underground water or steam), ocean, rivers, and vegetation or animal waste as fuel sources. **Distributed generation** resources are grid—connected or stand—alone electrical generation or storage systems, connected to the distribution level of the transmission and distribution grid, and located at or very near the location where the energy is used. **Clean fossil fuel** includes efficient natural gas power plants. **Transmission infrastructure** improvements include those needed to access cleaner and more competitively priced energy, mitigate grid congestion, increase grid reliability, permit the retirement of aging plants, and bring new renewable and conventional power plants on line.

Electricity Transmission Preferences

Similar to the loading order, the state has identified preferred locations for new transmission lines. In order, these are: use existing rights-of-way by upgrading existing transmission facilities; expand existing rights-of way to include new transmission; and create new rights-of-way when justified by environmental, technical or economic reasons.

Electricity Planning and Permitting

The Federal Government, California Legislature, federal and state agencies, electric utilities, and the California Independent System Operator (California ISO) play the major roles in electricity planning and permitting, although the role of local governments is increasing. (See sidebar) The following discussion highlights the major federal and state actions and players in planning and permitting land-based utility-scale infrastructure.

The federal Energy Policy Act of 2005 requires the **U.S. Department of the Interior** to approve at least 10,000 MW of renewable energy projects on public lands by 2015. It also authorizes the **Federal Energy Regulatory Commission** (FERC) to oversee the reliability of the nation's electricity transmission grid. In 2007, FERC issued Order No. 890 that requires transmission providers to participate in open transmission planning processes at the local and regional level.

The Role of Local Governments

The role of local and Tribal governments in the planning and permitting of generation and transmission infrastructure is expanding. More generation facilities are using non-thermal technology, such as wind and solar photovoltaics (PV), or generate less than 50 MWs of power, which fall under local jurisdiction permitting. Where state or federal agencies are responsible for permitting, local and Tribal governments are increasingly providing input to decisions. Some processes, like the Energy Commission's transmission corridor designation process, specifically identify input needed from local governments.

The **U.S. Bureau of Land Management** (BLM) issues right of way permits for energy projects on BLM lands and issues leases for geothermal wells and facilities.

The **U.S. Fish and Wildlife Service** (USFWS) issues permits for projects or activities that impact federally-listed endangered species and their habitats and consults during the federal environmental documentation process.

The **U.S. Army Corps of Engineers** (USACE) issues permits for impacts related to U.S. navigable waters.

The California Legislature enacts laws that affect electricity infrastructure either directly, such as SB 1 in 2006, the Million Solar Roofs (Murray, Chapter 132, Statutes of 2006, § 4) and Renewables Portfolio Standard (SB 2 in 2011, SB 107 in 2006, SB 1078 in 2002), or indirectly through bills such as the electric industry deregulation of Assembly Bill (AB) 1890 in 1996 (Statues of 1996, Chapter 854, Brulte) and AB 32 in 2006, the Global Warming Solutions Act (Nunez, Chapter 488, Statutes of 2006).

The **California Energy Commission** certifies the construction and operation of thermal power plants, including solar thermal, geothermal, natural gas, and biomass projects with capacities of 50 MW or more. The certifications are in lieu of local and other state permits. The Commission consults with affected local governments and agencies to address their issues and concerns.

The Energy Commission prepares a biennial *Integrated Energy Policy Report* (*IEPR*) which projects future electricity demand and identifies the regulations and policies that affect how that demand will be met. It prepares the biennial *Strategic Transmission Investment Plan* (*STIP*), which identifies and recommends actions to implement infrastructure investments needed to ensure reliability, relieve congestion, and meet future load growth. The Energy Commission is also responsible for designating transmission corridors within California.

The **California Coastal Commission** is involved in the permitting of proposed projects within the state's coastal zone.

The **California Department of Fish and Game** (CDFG) issues permits setting conditions for projects that harm or may cause harm to state-listed endangered species and their habitats. The CDFG also consults during state environmental documentation processes.

The **Regional Water Quality Control Boards** (RWQCB) issue permits controlling storm water and industrial discharges. The **State Water Resources Control Board** (SWRCB) protects water quality by setting statewide policy, coordinating and supporting RWQCB efforts, and reviewing petitions that contest RWQCB actions. The SWRCB has also been active in the phase out of once through cooling (OTC) at the 2 nuclear and 17[3] natural gas power plants along California's coast.

The **California Air Resources Board** (ARB) is responsible for adopting regulations consistent with a 33 percent renewable energy target and GHG emission reduction goals.

The electric utilities, including the **investor-owned utilities** (IOUs) and **publicly owned utilities** (POUs), plan the strategies for meeting the generation and transmission needs within their own service territory.

The **California Public Utilities Commission** (CPUC) regulates the IOUs – Pacific Gas and Electric (PG&E), Southern California Edison (SCE), and San Diego Gas & Electric (SDG&E). The IOUs are publicly traded corporations that provide electrical service for customers and earn profits for shareholders. The CPUC approves the power purchase contracts entered into by the IOUs to meet projected electricity demand and oversees the permitting process for transmission lines built by the IOUs.

The **California Independent System Operator** (California ISO), a nonprofit public benefit corporation, oversees the safe and reliable operation of the transmission grid. The California ISO prepares and publishes an annual transmission plan that identifies upgrades to the transmission system grid that will be needed over a 10-year time horizon. The California ISO is also responsible for approving new generator interconnections to the IOU transmission grid.

The IOUs periodically put forth requests for offers (RFOs) for certain power needs, such as renewable energy. Generators respond with proposals for power from new proposed or existing facilities. The CPUC oversees the process to ensure that the proposed generation would provide the lowest cost to the customer and the best fit to the utility's portfolio.

Municipal electric utilities (also known as POUs) are not overseen by the CPUC nor do they participate in the California ISO planning process. POUs are governed by elected boards and must seek their board's approval for new generation and transmission.

In 2009, the **California Transmission Planning Group** (CTPG) was formed in response to FERC Order No. 890. The CTPG includes the IOUs, POUs, and the California ISO. The CTPG is developing and implementing transmission system expansions to promote transmission reliability, efficiency, and accessibility, and to meet the 33 percent RPS.

Merchant generators (also known as independent power producers or IPPs) develop their own electricity generation facilities or transmission lines and then sell the commodity to utilities. IPPs participate in the CTPG meetings.

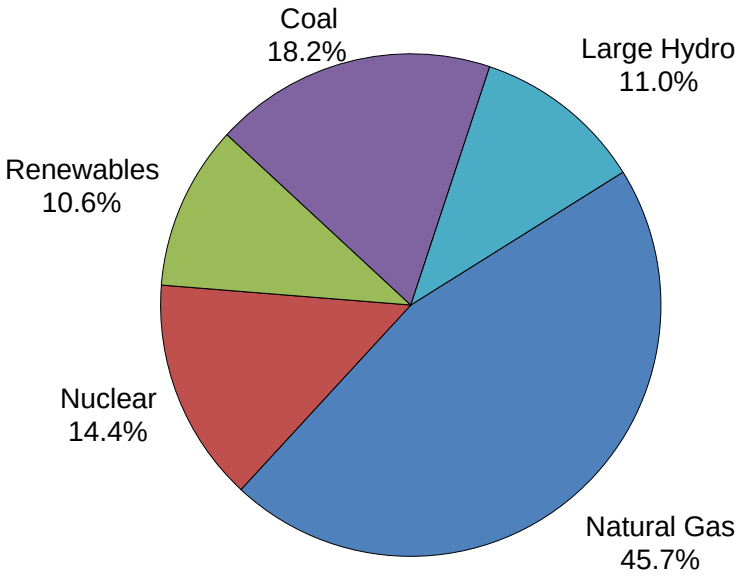
Current Energy Infrastructure

California's electricity system is powered by a large, diverse mix of nearly 1,000 power plants that currently generate about 67,000 MW. In-state generation is supplemented by imports from the Southwest (generated primarily from

[3] Three (Humboldt, Protrero and South Bay) of the 17 natural gas plants were shut down in 2011.

coal, nuclear, and natural gas) and the Northwest (primarily from hydro with some coal and gas) that average about 20 percent of the state's annual total demand to 30 percent in some years. A look at California's electricity generation by sector is shown in Figure 1.3.

Figure 1.3: Electricity Generation by Sector, 2008



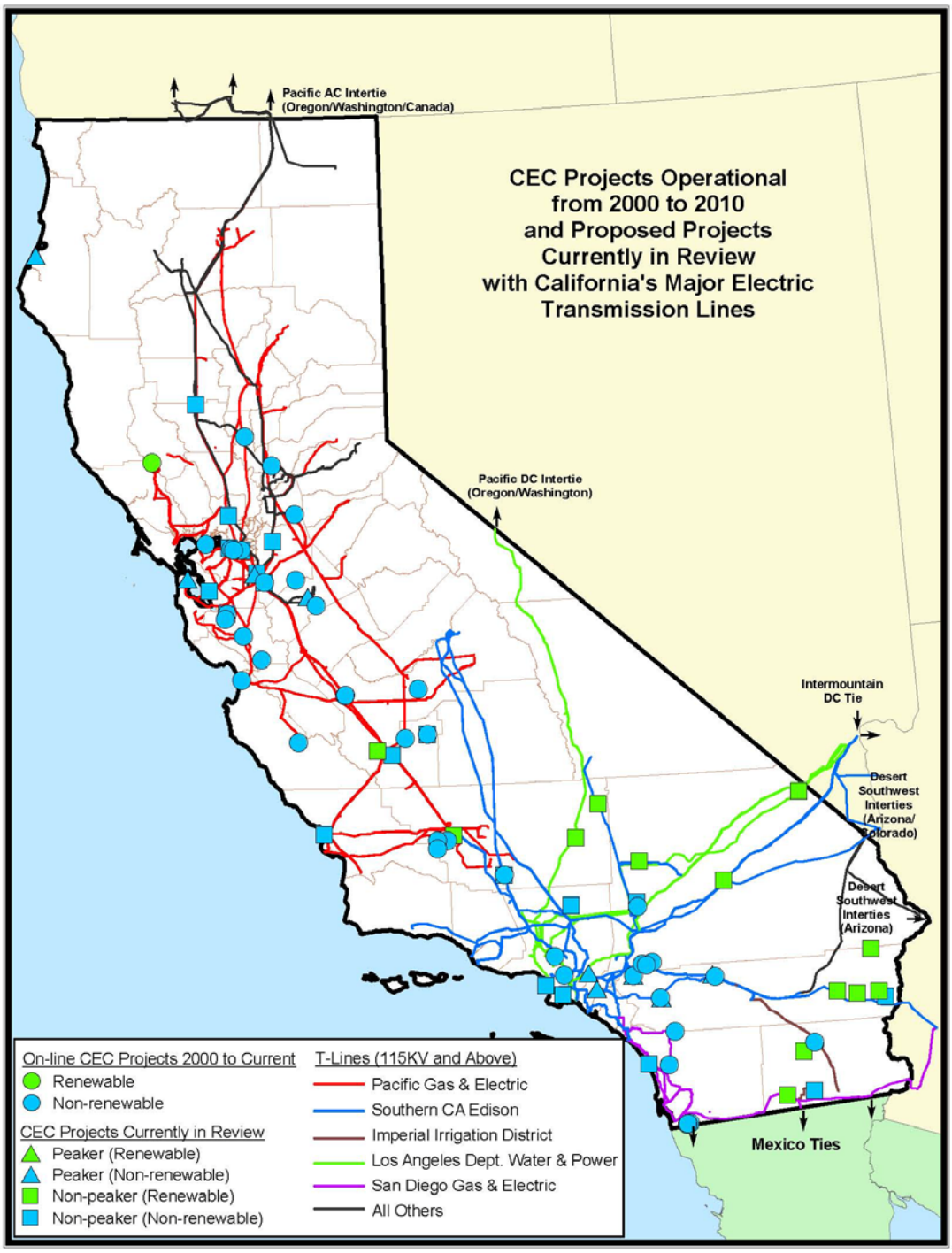
Source: California Energy Commission

California power plants are located throughout the state, as shown in Figure 1.4. Newly approved power plants or proposed plants currently under review by the Energy Commission are concentrated in the San Francisco Bay Area, Central Valley, and the desert areas of Southern California. New, highly efficient, combined cycle natural gas-fired power plants will likely continue to be built in California to meet load growth and replace retiring generation infrastructure. Coastal power plants are retiring due to the SWRCB's policy on the phase-out of OTC. Recent advances in turbine technology have increased thermal efficiency and lowered emissions rates so simple cycle, cost-effective peaker plants are being proposed to meet peak demand and to compensate for the intermittent nature of renewable resources.

Renewable energy generation projects have increased significantly, in part due to incentives available through the American Recovery and Reinvestment Act (ARRA). In 2010, the Energy Commission approved more than 4,000 MW of large solar thermal projects seeking ARRA funding. As of April 2011, more than 26,000 MW of renewable energy (ARRA and non-ARRA, all technologies) are under project review.

Major transmission lines occur throughout the state although they are heavily concentrated in areas of high population (which equates to electricity load/high demand). The location of these lines is shown in Figure 1.4. New transmission lines are being proposed to link remote renewable generation facilities to load centers.

Figure 1.4: California Statewide Projects Operational From 2000 to 2010



Source: California Energy Commission

Chapter 2: Local Government Involvement in Planning for and Permitting of Energy Infrastructure

Introduction

Local government involvement in the energy infrastructure development planning process is essential, even when the local agency is not the permitting authority. This chapter contains information and recommendations for local energy infrastructure planning. It also discusses the increasing role of local governments as the state expands its energy goals and the legal authority for local government involvement in the energy system planning process.

Energy infrastructure planning is important to a community's future and presents both challenges and opportunities for local governments. As awareness of the importance of electricity in society grows, local decision-makers and planners are confronted with public concerns about the potential impacts and benefits of energy generation and transmission facilities.

Community concerns may include the potential for impacts to public health and safety, air quality, water supplies and quality, aesthetics, sensitive species habitat, and the local economy, including property values. Local businesses may focus on positive aspects, such as jobs, a new source of retail sales, and an increased tax base. Educators may see an opportunity to add renewable energy training to their curriculum, and developers and realtors envision the potential for growth.

Planning that links all partners will help communities provide for local growth and development in a sustainable manner. Planning will also facilitate the review and development of infrastructure that is needed statewide. Numerous examples of communities addressing their energy planning challenges are included in this chapter.

The Benefits of Energy-Aware Infrastructure Planning for Local Governments

Energy facilities are indispensable elements of a community's infrastructure. The energy produced and distributed makes homes comfortable, moves people and goods, operates the machinery of industry and powers other infrastructures that underpin communities. The growing importance of electricity in an increasingly technological society becomes especially apparent during power outages, such as those occurring in 2000.

The availability, reliability, and price of energy often affect plans for local development, especially in the commercial and industrial sectors. Just as local planners and economists consider the price and availability of public infrastructure, such as water and roads, energy information is also necessary to accurately project and prepare for future growth.

Encouraging Development of Energy Elements in General Plans

Local and regional planning documents, such as the general plan, specific plans, community plans, mobility plans, and regional transportation plans should consider the need for reliable sources of electrical power to meet future demands and the facilities necessary to ensure that supply. These plans should also weigh the costs of infrastructure development to the local economy and environment.

The general plan is a statement of development policies and is required by law to have seven elements: land use, circulation, housing, conservation, open space, noise, and safety. No specific state mandate requires that a general plan include an energy element, although many general plans now do so and broader incorporation of energy elements in general plans is encouraged. Energy elements are discussed in greater detail later in this chapter.

Government entities that are aware of the land use issues, environmental sensitivities, and infrastructure needs of their communities are better prepared to discuss future development and associated energy needs with those involved in these developments. Informed local governments are also better equipped to work jointly with the state to meet California's aggressive renewable energy and climate change goals and to coordinate the local and regional plans associated with these goals. For example, under AB 32 and SB 375[4] the ARB has set regional targets for the reduction of GHG emissions associated with vehicle travel. The proposed targets are designed to help coordinate land use and transportation planning. Cities within each region will work together with their planning agency to develop a Sustainable Community Strategy. Already cities are preparing GHG inventories and climate action plans, and planning for California's zero net-energy standards for residential and commercial developments in 2020 and 2030, respectively. Energy infrastructure plays a role in all these plans.

The energy choices that a community makes today will have significant effects on tomorrow's economy, environment, and quality of life. Therefore, communities that plan for energy facilities to meet those needs will be in a better position to obtain reliable, affordable, and environmentally sound energy supplies.

When development standards for energy facilities are already integrated into community planning documents and zoning codes, decision-makers will be better informed, permitting applications can be processed more expediently, and there should be fewer costs and less controversy for all stakeholders. This is no different than planning approaches for other key facilities such as schools, parks, roads, and water and wastewater systems. Such upfront planning:

- Provides advance guidance to energy facility developers on desirable and undesirable project types and locations.
- Avoids or minimizes conflicts with environmental and economic resources such as wildlife habitat and scenic qualities that support tourism and recreation.
- Creates jobs from local energy resource and facility development.
- Increases public familiarity with energy facilities and their critical role in community livability, economic competitiveness, and sustainability.
- Builds a relationship among developers, utilities, government agencies, local interest groups, and other stakeholders that can facilitate future siting and permitting of energy facilities.

Regional energy plans should be considered when issues affect more than one city or county. The scale of the energy industry often means that more than one community may be affected by supplier decisions regarding new resources expansion of a service area, or increased demand. Both local and regional energy plans should always be considered even if the immediate issue does not affect more than one city or county. Proactive consideration of adjacent areas will improve future electricity infrastructure project planning. This is especially true for solar projects that involve many thousands of acres, lengthy transmission corridors, and resources that may affect many adjacent communities. An example of regional planning is provided in the sidebar on the San Diego Association of Governments.

[4] SB 375 (Steinberg, Chapter 728, Statutes of 2008) requires Metropolitan Planning Organizations to work with their local government counterparts to develop and implement plans that will achieve regional vehicle travel GHG reduction targets

San Diego Association of Governments (SANDAG)

The San Diego Association of Governments (SANDAG) is composed of mayors, council members, and supervisors from each of the San Diego region's 19 local governments. SANDAG serves as a forum for decision-making on regional issues such as growth, transportation, land use, and housing; the economy; the environment; and criminal justice. SANDAG has prepared a long-term energy plan that serves as the energy policy guideline for the region, similar to California's *Integrated Energy Policy Report*. SANDAG's Regional Energy Planning Program provides input and direction on implementing the SANDAG Regional Energy Strategy 2003 (RES). The RES was adopted in July 2003 by the SANDAG Board and incorporated into the SANDAG Regional Comprehensive Plan (RCP) in 2004. SANDAG also works with federal and state energy planning/regulating agencies to help the region meet energy goals.

SANDAG'S RCP identifies policies and objectives for Planning and Design and Coordination related to this area, as follows:

a) Promote the local production of cost-effective, environmentally sensitive energy to reduce dependence on imported energy.

b) Promote development regulations and design standards to maximize energy efficiency and minimize potential health risks.

c) Create opportunities to coordinate energy supply strategies between governments in the greater border region.

d) Locate energy facilities, such as power plants and/or transmission lines, so that lower income and minority communities are not disproportionately negatively affected.

The Legal Authority for Local Energy Facilities Planning

In contrast to state and federal permitting where local governments often have limited authority, local planning for energy facilities is authorized under California's land-use planning statutes. This can include planning that guides subsequent permitting where local government is the lead siting agency or planning in an advisory manner as input into municipal, state, or federal permitting processes.

City, county, and Tribal governments are the permitting authority for land-based electricity generators under 50 MW and for any non-thermal power generation, except for facilities such as dams, which are under federal jurisdiction. As local electricity generation increases (for example, rooftop solar PV and small-scale facilities near distribution lines), local planning and public works departments, planning commissions, and board of supervisors or city councils (collectively called "planning entities") will be called upon to address the industry's siting needs and permitting requirements. Planning entities should proactively contact their local electrical utility as they should work closely together to plan for infrastructure additions. Advance planning for such eventualities will allow local governments to encourage energy infrastructure development while still protecting the area's resources.

The legal authority to plan locally for energy facilities is found in California's laws, ordinances, regulations, and standards (LORS) and legal precedent relating to police powers and the development of local planning documents, including general plans, area and community plans, and specific plans.

General Plans

Government Code (GC) § 65300 requires that every jurisdiction adopt a "comprehensive, long-term general plan for the physical development of the county or city." A truly comprehensive general plan will cover all locally relevant physical, social, and economic issues. GC §§ 65302 and 65303 provide the flexibility for local governments to include energy infrastructure in local land use and planning statutes. For example,

> "*The general plan shall include a land use element which designates the proposed general distribution and general location and extent of . . . public and private uses of land*."

> "*The general plan may include any other elements or address any other subjects which, in the judgment of the legislative body, relate to the physical development of the county or city.*"

The Governor's Office of Planning and Research (OPR) *General Plan Guidelines (2003)* advises planners that "communities may consolidate energy policies in an optional energy element. An energy element can help integrate the economic and environmental effects of energy costs and benefits into a city's or county's long-term growth planning. An energy element can be a useful component of a sustainable development strategy."

At present, approximately 80 California cities and counties have used this authority to fashion general plan energy elements. The list below shows the jurisdictions where local energy elements are in place.

Kern County's Energy Element is an example of the motivation behind energy elements. It defines critical energy related issues facing the County and sets forth goals, policies, and implementation measures to protect the County's energy resources and encourage orderly energy development while affording the maximum protection for the public's health, safety, and the environment. The Energy Element has three primary objectives: resource management and protection; establishing development standards to provide for the protection of the environment, public health, and safety; and promoting and facilitating energy development. It addresses a wide-range of energy issues, including petroleum resources and development; wind, geothermal, solar and hydroelectric resource development; and transmission lines.

Additional examples of energy elements are discussed in the sidebar on the Humboldt County Energy Element and the Imperial County Transmission Line Element.

Alameda 1979
Alameda County 1994
Alpine County 1999
Alturas 1993
Arcata 2008
Banning 2006
Beaumont 2007
Belvedere2004
Benicia 1999
Big Bear Lake 1999
Calabasas 1995
Calistoga 2003
Cathedral City 2002
Clearlake 1987
Corona 2004
Corte Madera 2009
Davis 2001
Desert Hot Springs 2000
Downey 2005
Emeryville 1993
Escondido 2001
Fort Bragg 2008
Gilroy 2002
Glenn County 1992
Humboldt County 2011
Imperial County 2006
Indian Wells 1996
Irvine 2000
Kern County 2004
La Puente 2004
Lake County 2008
Lassen County 1993
Loma Linda 2006
Los Gatos 1985
Lynwood 2003
Madera County 1995
Marin County 2007
Modoc County 1993
Mono County 1993
Monterey County 1982
Napa County 2008
Ontario 2010
Orland 2003
Palm Desert 2004
Palo Alto 1998
Paradise 1994
Pasadena 1987
Petaluma 2008
Placer County 1994
Pleasanton 2009
Portola 2001
Poway 1991
Rancho Cucamonga 2010
Rancho Mirage 2005
Rosemead 2010
Sacramento County 1979
San Bernardino 2005
San Clemente 1993
San Diego County 1990
San Francisco 1982
San Joaquin County 1992
San Jose 1994
San Luis Obispo 1981
San Luis Obispo County 1995
Santa Ana 1982
Santa Barbara County 1994
Santa Cruz County 1994
Shafter 2005
Shasta County 2004
Sierra County 1996
Siskiyou County 1993
Solano County 2008
Taft 2010
Ukiah 1995
Ventura County 1988
West Hollywood 1988
Wheatland 2006
Yolo County 1982
Yorba Linda 1993
Yucca Valley 1995

Source: The California Planners' Book of Lists, 2011

County of Humboldt Energy Element

Humboldt County, with assistance from the Redwood Coast Energy Authority, has developed a detailed energy element, establishing goals and objectives that lay out, with some specificity, how energy concerns are to be included in the planning process. The element sets out four goals: strategic energy planning; energy efficiency and conservation; renewable energy, distributed generation, and cogeneration; and local management of energy supply. A comprehensive list of objectives supports these goals and speaks to a range of concerns and values motivating the county, including:

- Regional energy authority
- Energy related research and economic development
- Countywide design standards
- Public services, facilities, and operations
- Water, wastewater, and solid waste management
- New energy production and transmission facilities
- Emergency preparedness planning
- Planning of active and healthy communities
- Energy education and policy dissemination
- Building
- Renewable energy distribution, and cogeneration
- Local utility development and management options

Imperial County Transmission Line Element

Imperial County contains one of the largest geothermal energy resource areas in the nation. The region also has more than 350 days of sunshine per year, making it ideal for development of solar facilities.

Given these abundant renewable energy sources, the county recognizes that major transmission facilities are likely to occur in the County over the next decade. In 2006, the county expanded the geothermal/alternative energy and transmission element of its general plan. The expanded element provides guidance for public input into the planning process for future siting of electrical transmission lines in the county. The three guiding principles are:

- Recognize the necessity for transmission corridors within and through Imperial County.
- Plan for the least disruptive corridor routing and encourage the development of joint use corridors.
- Formalize the county's input to the appropriate public and private entities in terms of goals, policies, routing criteria, and specific corridor location plans.

The element recognizes that the prolific energy sources within the county will increase the number of power plants and transmission corridors and examines the idea of developing "energy production centers or energy parks," to encourage facility co-location and prohibiting urban encroachment on existing and future energy resource areas. The element also establishes new regional transmission corridors and recommends safeguarding existing corridors that are located within the population centers while ensuring that development does not impact the corridors. The element includes maps of proposed transmission lines and potential locations for new power generating facilities, including energy parks. The element considered the possible impact that transmission systems can have on agricultural land, wildlife, and the natural desert landscape when planning and designing transmission corridors.

Area and Community Plans

Area and community plans address a particular region or community within a planning jurisdiction. They are legally part of the general plan and serve to refine general plan policies as they apply to a smaller area. Since they are legally part of the general plan, they can address energy facilities under the same statutory authority cited above.

Specific Plans

Specific plans, which are separate and legally distinct from general plans, provide criteria and standards for specific development projects or areas.

A specific plan would provide:

- The distribution, location, and extent of the uses of land, including open space, within the area covered by the plan.
- The proposed distribution, location, extent, and intensity of the major components of public and private transportation, sewage, water, drainage, solid waste disposal, energy, and other essential facilities proposed to be located within the area covered by the plan and needed to support the land uses described in the plan.
- Standards and criteria by which development may proceed, and standards for the conservation, development, and use of natural resources, where applicable.
- A program of implementation measures including regulations, programs, public works projects, and financing measures necessary to carry out the plan requirements.

Tulare County is considering creating new zoning overlay districts or a County-wide Specific plan that addresses the locations of renewable energy facilities within the County. The county has seen a surge in solar applications, which presents a challenge in preserving agricultural lands from development and locating these facilities on Williamson Act Contracted Lands.

Westlands Solar Park is a public-private effort to master plan renewable development for large scale solar projects in California's central valley. The Westlands Solar Park project study area includes approximately 30,000 acres of disturbed land for renewable development within the Westlands Water District, located in western Fresno and Kings Counties.

The Importance of Local Plans in State and Federal Processes

In addition to a local government's legal authority to conduct energy facility planning, the resulting local plans have an important role in the state and federal planning and permitting processes. State and federal agencies with energy facility siting responsibilities encourage local planning as a means of identifying local needs and preferences, reducing jurisdictional conflicts, and expediting the timely and orderly permitting and development of energy facilities when and where they are ultimately needed.

Traditionally, IOUs and POUs plan for new facilities in their individual service areas. However, utilities and local jurisdictional agencies should jointly consult on proposed energy facility projects and system planning as early as possible so that new developments can be consistent with existing local planning requirements and planning objectives can be incorporated into local land use plans and ordinances, as much as possible.

Even when local governments do not have jurisdictional authority, they may play an important advisory role in the planning and permitting process. Energy Commission staff carefully assesses each new power plant application for compliance with local LORS. Staff also takes into consideration the local policies, conditions, and preferences for the

location and type of facilities that would best serve each community. Regulations require this information be considered in staff's environmental analysis and at Energy Commission hearings on the facility application. This information is best and most accurately provided by the local government entities, as expressed in their codes, ordinances, and community planning documents.

When planning or considering proposals for linear facilities, such as transmission lines, it is helpful to have written policies discussing the nature and location of resources such as wetland habitat areas that the city or county considers valuable. Many counties also have local ordinances requiring that linear facilities share common corridors through farmlands. Consideration of local land-use plans is a requirement during environmental reviews of energy facilities permitted by state and federal agencies. When the Energy Commission or the CPUC certifies a project in those counties, the county ordinances may be incorporated in the design of the facilities. (See "Imperial County Transmission Line Element" sidebar) The BLM and the U.S. Forest Service (USFS) both require that their land management plans consider local land-use policies.

OPR collaborated with local, state, and federal stakeholders to develop the *California Advisory Handbook for Community and Military Compatibility Planning.* The handbook provides tools and strategies to help maintain compatibility between community land uses and military activities.

Local Energy Facility Planning

Long-range energy planning provides benefits to both local government and utilities. It can reduce political controversy when a specific generation facility or transmission line is proposed; improve land use and resource compatibility; avoid redundancy when siting new facilities or lines; and promote collaboration among the public, utilities, and community agency staff. The following section describes the kinds of information that could be compiled by local governments.

Prepare an inventory of current energy usage. An examination of current energy usage would be helpful in determining future energy needs for all sectors of the community including: residential, commercial, institutional, industrial, agriculture, transportation, and infrastructure. It would also be helpful to examine the environmental and economic impacts of local energy usage, considering also regional and statewide energy usage.

Determine future demands for energy supplies. Energy policies (such as AB 32) and the availability and use of fuels will largely dictate energy facility needs. However, local demands may be influenced by other considerations, such as population growth, economic and environmental impact and constraints, greenhouse gas reduction sustainability goals and climate action plans, and development/growth preferences, as expressed in general and community plans, regional transportation plans, zoning codes, and ordinances.

Determine the potential for meeting future energy demand. This determination includes the following interrelated steps:

- **Assess how well existing energy facilities can meet future energy requirements and what new or modified facilities can be used or will be needed.** For example, a community's existing electric system may be able to accommodate community growth for the next 10-15 years, but after that it may require new generation, transmission, and distribution capacity. New infrastructure may be needed to support increased roof-top solar and to meet zero-net energy building construction.
- **Assess efficiency improvement potentials.** Community efficiency improvements can be considered as a means of meeting community energy needs and as an alternative to new facilities.

- **Assess potential energy resources and sites.** In its general plan, the local jurisdiction should consider the development of local renewable and/or nonrenewable energy resources. Many California jurisdictions are developing and using solar energy, landfill gas, and combined heat and power facilities. Communities should also consider possible sites for additional transmission corridors and areas for possible substation facilities.

Determine community environmental and economic preferences for meeting future needs, considering the feasible facility options. For example, if new electric supplies are needed, a community can consider its preferences for repowering existing plants, developing renewable resources, cogeneration opportunities, building new, large central plants, or building new, smaller plants distributed closer to consumers. Each of these options has different environmental and economic implications that need to be weighed by the locality in collaboration with utilities and other stakeholders.

Cities and counties are allowed by law to procure or generate electricity for consumers within their jurisdiction. The IOUs would continue to provide transmission and distribution services. This is referred to as community choice aggregation.

Formulate and adopt policies and standards for siting, operating, and closure/reclamation of energy facilities expected in the jurisdiction. This can include clear designation of geographic areas suitable and unsuitable for energy facilities, and design and performance standards that compatibly integrate facilities with their surroundings. Geographic suitability surveys should be focused in particular on appropriate locations and zoning for electric power plants and transmission lines as these are often some of the most intrusive facilities developed in a community. Transmission line corridors should be identified where applicable.

One of the most important benefits of local planning is the guidance it provides to energy facility developers in advance of their specific project preparations. Local plans that contain policies and standards for evaluating and siting facilities help developers better understand community preferences and expectations. Facilities can be sited and designed to address guidelines from the outset, avoiding or minimizing disputes and delays in providing needed energy supplies. Local planning also reduces project-related costs for all participants. This planning also helps agencies such as the Energy Commission, which has responsibility for transmission corridor designation and must work with local governments in the designation process. Counties then must consider the designated transmission corridor zone when making any land use changes that could affect the corridor designation or if a land-use development application that could impact the transmission corridor is received.

The Information Base Necessary for Energy Facilities Planning

To effectively conduct energy facility planning, communities must compile and maintain up-to-date information on relevant energy issues and trends affecting local energy facility needs and development. Appendix C details the most recent policies and laws shaping future energy needs. A solid information base is particularly important because of changing technology, market, and regulatory conditions in the energy industry and local economic and environmental constraints. A thorough and well-organized information base can help stretch limited staff resources and facilitate planning and permitting coordination with all stakeholders. This information base allows local governments to clearly articulate why new energy facilities are needed.

To undertake energy facility planning, local jurisdictions should assemble the information presented below and shown in Table 2.1.

Population growth trends and basic demographic information. Population growth and trends will be a factor in determining potential future energy facility-related needs. Energy needs will be affected by whether "smart growth" is implemented, new construction is zero net energy, and the degree to which energy needs are reduced by

demand response and energy efficiency. Energy needs could also increase if more electronic devices and plug-in electric vehicles are used by the population. The local utilities will be an essential partner in determining future needs.

Regional energy supply system characteristics. Communities are supplied with energy largely from regional systems that produce and distribute electricity, natural gas, and transportation fuels. A first step in local planning is to learn what these systems are, who owns them, and how they operate. Systems of interest should include:

1. Electric power plants with output that serves the region.
2. Large electric transmission lines from power plants to communities.
3. Petroleum refineries that produce petroleum products from crude oil.
4. Large pipelines that convey natural gas and petroleum products from production sites to communities.
5. Storage facilities for gaseous and liquid fuels.
6. Interconnective infrastructure facilities for communities not directly served by large pipeline or transmission line corridors.

Because these regional systems influence local facilities, it is important to know if they are operating satisfactorily, if there are plans to expand them, where future expansion may occur, and the potential impact regional changes can have on local jurisdictions.

Existing energy facilities in your jurisdiction. In addition to regional facilities, it is also important to know what types of facilities are present locally. The same type of data should be inventoried, particularly facilities that may be expanded, or in the case of some older power plants, repowered. Any pending proposals for new energy facility development should also be included. These data will indicate where the jurisdiction's energy services are adequate or constrained.

Technologies likely to be used in new energy facilities. An understanding of the technologies used in energy facilities is necessary to assess their probable operating characteristics and environmental impacts, and in turn, the policies and standards that should be applied to them. Appendix D identifies the most common energy infrastructure encountered by local governments and the environmental issues associated with this infrastructure.

Indigenous natural energy resources. Energy facilities are often developed in conjunction with local indigenous resources used to fuel the facilities. Renewables such as wind and solar resources are "fuels" that must be considered along with the electricity generation facilities that use them. Use of these resources may involve large land areas, raising significant planning issues about compatible land uses and environmental impacts. The same is true for oil and natural gas fields that require collection and storage facilities. If a jurisdiction has significant indigenous energy resources, advance planning allows communities to determine which sites should be protected for future energy production or reserved for a more important competing use. This planning can protect significant energy sites from conflicting uses and insure long-term energy availability and output. An example is the Solano County Wind Turbine Plan. (See sidebar)

Table 2.1: Framework for a Local Energy Facility Plan

Key Issue Questions	Stakeholders/Information Sources	Policy & Implementation Choices
What is the forecasted increase in energy demands? What are the reasons for the increase? Have demand-side efficiency improvements in land use, transportation, and infrastructure already been accounted for?	Electric and natural gas utilities, Energy Commission, CPUC, Council of Governments (COG)	See ***Energy Aware Planning Guide*** (Volume 1) options such as mixed use development; clustering and compact, diverse housing; integrated street networks, and transit-orientated development.
What facilities currently deliver energy supplies into the community from the surrounding region? How diverse and reliable are they? Are they sufficient to meet current demand?	Utilities, independent power producers (IPP), Energy Commission, CPUC	Coordination mechanisms with other communities sharing the same regional supply networks, participation and advocacy in regional planning processes.
What energy facilities presently exist in the jurisdiction, and what are their capacities and condition? Any being decommissioned or repowered?	Utilities, IPPs, Energy Commission, CPUC	Trade-offs between decommissioning, repowering, and new facilities.
What new energy facilities will be required in the future to accommodate local growth or to meet state energy goals? What are preferable fuels and technologies?	Local interest groups, utilities, IPPs, Energy Commission, CPUC, CAISO	Advocacy of preferred fuels and technologies; emissions inventories.
What locations in the jurisdiction are especially suitable or unsuitable for energy facilities? What are major siting issues?	Natural resources agencies, local interest groups, utilities, IPPS, Energy Commission, CPUC, COG	Site-banking and protection of significant long-term energy production areas, designation of unsuitable energy facilities areas; zoning designations and development standards.
What local natural resources are attractive to energy developers and how acceptable is their use?	Natural resources agencies including the State Lands Commission; local interest groups; utilities; IPPs; Energy Commission; CPUC; WGA	Sustainable resource management plans and best management practices for sites deemed suitable for facilities; habitat conservation plans.
How many local jobs are currently supported by energy facilities, and how many new jobs are possible in the future with new facilities? Would there be property tax exemptions for certain types of facilities?	Utilities, IPPS, economic development agencies, chambers of commerce	Incentives for facilities with positive local employment effects.
What legal authorities and regulations apply to energy facility development?	Energy Commission, CPUC, FERC, natural resource agencies	Coordination and mechanisms for efficient intergovernmental action.

Source: Updated from 1996 Energy Aware Planning Guide

Solano County Wind Turbine Siting Plan

Solano County is geographically distinguished for wind energy production. The Solano County Energy Element includes The Solano County Wind Turbine Siting Plan. The plan establishes goals specifically related to wind energy by:

- Encouraging the siting of large-scale wind turbine electric generation facilities.
- Delineating wind resource areas.
- Providing policies that will conserve wind resource areas.
- Providing policies that will protect these areas from non-compatible uses.

The plan became part of the energy element when it was adopted in 1987 and has been updated several times since then.

Solano County has incorporated the Energy Commission's wind resource area maps in its general plan. Applicants interested in obtaining permits for commercial wind turbine installation are directed to these maps to determine if the wind resource in their area is sufficient.

Energy Planning Considerations

Economic development opportunities. In addition to providing a reliable supply of power, energy facilities also provide jobs and other economic benefits. When establishing local policies and standards, it is important to recognize job creation, goods and service purchases, and tax revenues that can result from energy facility development. For example, a jurisdiction whose goal is energy supply diversification could give preference to local renewable resource development for both its diversity benefits and local employment created by facility construction and renewable energy production. Conversely, some solar energy facilities can impact community services but are exempt from local property taxes.

This employment can include resources production, such as geothermal steam supply jobs; power production, such as solar panel manufacturing for rooftop solar and distributed generation solar facilities; and maintenance jobs to support such facilities and operations. All of this energy facility employment, in turn, creates "multiplier" jobs that are spin-offs from direct energy jobs.

Environmental conditions and constraints. Energy facilities can have significant requirements for land area, water supplies, pollution control technologies, access, and hazardous materials handling. They can also have significant direct, indirect, and cumulative impacts on local aesthetics, noise levels, wildlife habitat, and other sensitive environmental resources. A thorough environmental database is essential for correctly gauging these potential impacts and formulating plans accordingly. For example, recycled water supplies from a community wastewater treatment facility may have multiple potential users, including power plants, and upfront planning for future use of the recycled water should be considered.

Local Environmental Planning Documents

Program level EIRs (PEIRs) address impacts from a specific type of program or related projects such as energy or transportation. They are applicable to actions that can be characterized as one large project, that are either (1) geographically related, (2) logical parts of a chain of contemplated actions, or (3) similar actions subject to the same permitting authority with similar environmental effects and subject to the same kinds of mitigation.

A program level EIR can ensure consideration of cumulative impacts that might be slighted in a case-by-case analysis and allow the lead agency to consider broad policy alternatives and program-wide mitigation measures early in the process when the agency has greater flexibility.

Use of program level EIRs may also reduce the environmental review necessary for later project specific EIRs or may even eliminate the need for an EIR altogether, allowing use of a negative declaration or even a categorical exemption to address project specifics. However, California Environmental Quality Act Guidelines provide that where subsequent activities involve site specific operations, the agency should use a written checklist or similar method to document the site evaluation and its consistency with the program EIR. Program level EIRs do not require a list of specific projects that will be accomplished under the program.

Kern County and other counties in California are exploring opportunities to streamline environmental review through use of program level EIRs to help facilitate faster permitting of projects[5]. Kern County has approved a resolution to support legislation that would exempt renewable energy projects within a PEIR from challenges under CEQA. Senator Rubio introduced legislation (SB 250) in early 2011 that would have provided that a program EIR or a master EIR prepared for the siting or permitting of a renewable energy project that qualifies as an eligible renewable energy resource under the state RPS Program or related transmission projects would not be subject to judicial review under CEQA. Language relating to this exemption was subsequently deleted.

Master EIRs (MEIRs) may be prepared for a phased project with smaller individual components as well as for general policy or multiphase projects, such as a general plan, specific plan, redevelopment plan, development agreement, state highway or mass transit project, or regional transportation plan. MEIRs may be prepared for general plan energy elements, specific plans that include energy facilities, or a large energy project consisting of smaller individual facilities being phased in over time. A master EIR must include sufficient information about anticipated projects within its scope, such as size, location, intensity, and scheduling. It must also preliminarily describe potential impacts of those projects for which insufficient information is available to support a full impact assessment. It is intended to streamline the environmental review of individual activities included in its overall analysis.

The lead, trustee and responsible agencies identified in the MEIR may use the MEIR to limit review of subsequent projects. In contrast to PEIRs, MEIRs always require an initial study to determine whether the subsequent project and any significant environmental effects were included in the MEIR. If the agency finds the subsequent project will have no additional significant environmental effect, and that no new mitigation measures or alternatives are required, it does not have to prepare a new environmental document.

In lieu of such a finding, the lead agency must prepare either a mitigated negative declaration or a "focused EIR" for the subsequent project. A focused EIR is another streamlining option that allows jurisdictions to analyze only those additional project-specific environmental effects, mitigations, or alternatives not addressed in a MEIR.

Both PEIRs and MEIRs are recognized under CEQA as appropriate for evaluating the cumulative, growth-inducing, and irreversible significant effects of future energy infrastructure development in a jurisdiction.

[5] http://www.californiaenvironmentallawblog.com/energy/

A **master environmental assessment (MEA)** is another tool a jurisdiction can use to identify and organize the environmental characteristics and constraints of an area. It can be used to influence the design and location of individual energy facility projects and may provide information that can be used to determine whether specific environmental effects are likely to occur and whether they will be significant.

A MEA can provide a central source of current information for use in preparing individual EIRs and negative declarations. An MEA can also assist in identifying long-range, areawide, and cumulative impacts of individual projects.

MEA in the City of Lancaster

The city of Lancaster prepared an MEA for its General Plan 2030 update. The energy element of the MEA analyzes the city's current energy supply, future consumption, and the factors that contribute to these outcomes. The energy element of the MEA consists of existing transmission ROW locations.

The locations of existing high-voltage transmission lines are identified along with the locations of existing corridors. The locations of regional and neighborhood substations are also listed along with the general locations of underground electrical lines.

Locational Data Resources

There are a number of tools that can aid when performing location suitability analyses:

Geographic information systems (GIS) are valuable in guiding facility development. GIS **jurisdiction** surveys can assist in identifying suitable facility locations and allow efficient comparison of numerous suitability criteria over large geographic areas. Such surveys can inform communities and developers about areas with significant environmental constraints or conflicting land uses, versus locations that are relatively compatible with future energy facilities. GIS can also provide accurate locations of existing infrastructure.

Planning for Community Energy, Economic and Environmental Sustainability (PLACE^{3}S). PLACE^{3}S, an acronym for PLAnning for Community Energy, Economic and Environmental Sustainability, is an internet-based land use modeling tool designed for use by local and regional government planners. The Energy Commission updated the tool in 2008 by adding the capability to calculate the energy use of different development scenarios. The new energy module allows users to estimate the overall energy consumption of various building types and land uses, allows analysis of distributed generation technologies and selected building energy efficiency measures, and allows planners to compare the relative energy use and related emissions of different development scenarios. Future enhancements may add an economics component and expand the energy module's analytical capabilities, particularly in the energy efficiency and distributed generation areas. A tutorial on using the energy module can be found at: http://places.energy.ca.gov/places/energy_tutorial/.

Planning Alternative Corridors for Transmission Lines (PACT). A stakeholder process has developed the Planning Alternative Corridors for Transmission Lines (PACT) decision model. Key stakeholders include:

Agencies. Energy Commission, CPUC, USFS, BLM, Native American Heritage Commission, San Francisco Bay Conservation and Development Commission, U.S. Department of Defense.

Utilities. Los Angeles Department of Water & Power, PG&E, Sacramento Municipal Utility District, SDG&E, San Francisco Public Utilities Commission, SCE, Western Area Power Administration.

Other Groups Represented. California Farm Bureau Federation, California Independent System Operator, California Institute for Energy and the Environment, Energy Policy Initiatives Center, League of California Cities, League of Women Voters, Regional Council of Rural Counties, and Southern California Association of Governments.

The main objectives of the PACT project are to:

- Develop a decision framework to assess alternative transmission line routes.
- Provide objective, consistent, and comprehensive analysis.
- Ensure transparency in methods, databases, and assumptions.

To meet these objectives, an interactive Web-based tool was developed for the siting and assessment of future transmission line corridors and their possible alternatives. The assessments are based on environmental sensitivities, community concerns, public health and safety, engineering feasibility, and economic considerations.

The database can be used to:

- Find feasible routes.
- Screen alternative routes to meet the project purpose and need.
- Evaluate alternative routes from different perspectives.
- Choose preferred and alternate routes.
- Document environmental assessment results.
- Communicate with management, regulatory agencies, and other interested stakeholders.

By facilitating the identification of viable transmission corridors, PACT is intended to provide both the public and decision-makers with an understanding of how these corridors and their alternatives are selected and what the trade-offs are in a consistent, objective, and comprehensive manner. It is also intended to help stakeholders understand the implications of route selection and provide a means for decision-makers to justify and defend their decisions.

How to Improve Public Involvement in Facility Planning

Building public acceptance of energy facilities is an important challenge for government at all levels. Although they are indispensable to communities, energy facilities are often unwanted locally because of legitimate citizen concerns over aesthetics, land use compatibilities, public health and safety, impacts to natural and cultural resources, and environmental justice. Community involvement, both upfront and during the permitting process, can help the timely, efficient and economic approval of projects. For the California Valley Solar Ranch, a 250 MW solar PV project in San Luis Obispo County, the County held a scoping meeting, a Draft EIR meeting, a Planning Commission Study Session and Planning Commission site visit (both open to the public and public could comment), several Planning Commission hearings to consider the Conditional Use Application, and a Board of Supervisors Hearing to hear the appeal of the Planning Commission approval.

A major benefit of local planning is the opportunity it creates to reduce barriers through public education and involvement in advance of actual facility permitting and development. If the public is involved in long-range planning that recognizes the necessity and benefits of reliable energy supplies, as well as local efforts to maximize the efficient use of energy, it will be more likely to accept facilities when and where they are eventually needed.

An effective public involvement program will have the following characteristics:

Inclusion of all stakeholders. It is important for all segments of the stakeholder population to participate in the energy facility planning process so they can share consistent information and establish dialogue among disparate groups. In addition to local electric and natural gas utilities and the general public, outreach efforts should also involve local elected officials, potentially affected Tribes, independent energy industry representatives,

environmental interest groups, and relevant regulatory agencies. An effective method of involving these stakeholders is through appointment to a special energy facility planning advisory committee or task force where they can contribute valuable technical input to the planning process and serve as a sounding board for proposed local policies and standards.

Environmental justice is an important consideration in planning and permitting energy infrastructure. (See sidebar on the Energy Commission's consideration of environmental justice in its permitting of power plants) Outreach to affected parties should be particularly emphasized.

Consider Environmental Justice Issues When Permitting Facilities

California was one of the first states in the nation to pass legislation to codify environmental justice in state statute. Environmental Justice is defined in statute as "the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations and policies." (Government Code Section 65040.12).

The Energy Commission has been integrating environmental justice into its siting process since 1995, as part of its thorough CEQA analysis of applications for siting power plants and related facilities. The cornerstone of the Energy Commission approach is based on wide-reaching public outreach efforts to notify, inform, and involve community members, including non-English-speaking people.

This comprehensive method to identifying and addressing environmental justice (EJ) concerns requires the early involvement of affected communities and other stakeholders. Additionally, approaches to effectively address EJ issues require partnership and coordination. Most significantly, in efforts to pool all available knowledge and bring it into the process, the Energy Commission's Public Adviser focuses outreach in power plant siting cases to involve local, affected community members and stakeholders with a background and understanding of a particular area.

Those who live with the outcome of environmental decisions—state, Tribal, and local governments; environmental groups; business; community residents—must have every opportunity to engage in public participation in the making of those decisions. An informed and involved community is a necessary and integral part of the process to protect the environment.

Information sharing and public outreach. The information base described previously should be widely and thoroughly disseminated, and the public should be invited to help expand and refine the information. Facility planning processes should be publicized at their outset and outreach efforts made to all stakeholders. Publicity should clearly describe the planning process, location, and availability of planning data, and specific opportunities for public input. In addition to meetings and printed material, information can be shared electronically through dedicated Web pages or similar Web locations. Coverage of public meetings on local community television or through internet meeting sites is also an option in some areas.

Formal informational events. Because energy facilities are technically, environmentally, and politically complex, it may be useful to formalize public involvement at special educational workshops, meetings, and events such as site visits to potentially desirable locations or tours of exemplary facilities already sited and operating or under construction. Presentations by local governments that have successfully completed the facility planning process or permitted energy generation or transmission line infrastructure may also be helpful.

Informal collaboration. An important adjunct to formal events can be informal, non-judicial forums of collaborative "brainstorming" among developers, citizens, and regulators. Using the architectural technique of a design "charette," energy facility stakeholders can jointly develop preliminary facility siting and performance ideas for consideration in the more formal processes.

Ongoing activities. Public involvement needs to be an ongoing process that periodically examines current events and monitors the need for revision or fine tuning of established plans. The stakeholder's advisory group mentioned earlier can be reconvened annually or as necessary to re-examine the local energy plan and recommend appropriate updating where warranted.

Information Resources

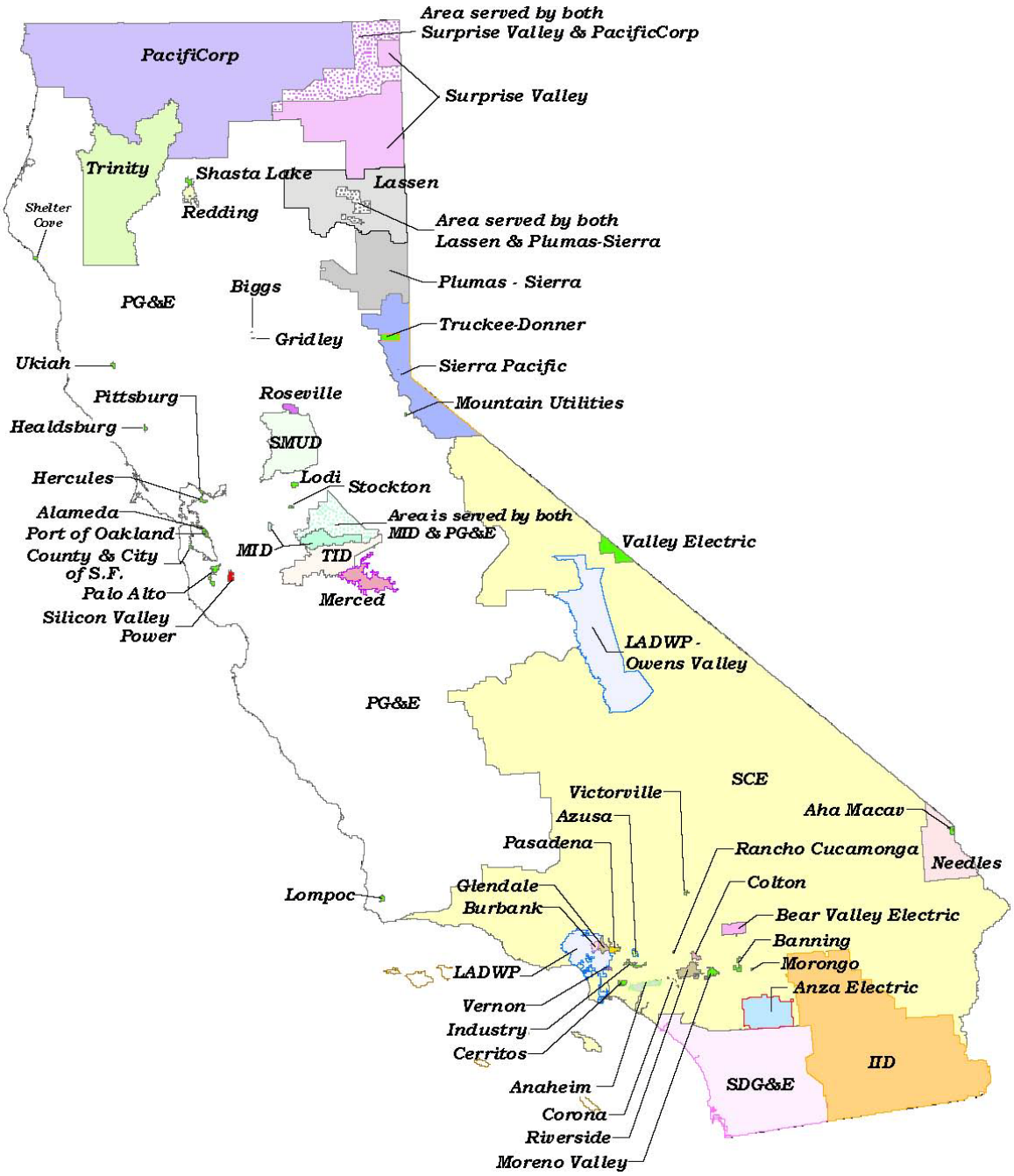
Multiple resources are available to local governments to assist in energy facility planning. Resources range from staff expertise in other agencies to national laboratories. Major information sources include the following key resources:

- Utilities and independent power producers
- California Energy Commission
- Other state and federal agencies
- Local governments
- University research centers
- Energy industry trade groups

Utilities and independent power producers. One of the best information sources for local agencies are electric and/or natural gas utilities that serve a planning area, as well as independent power producers who may have local plants. All California electric and natural gas utilities maintain service territory plans for their generation and distribution systems. These plans are essential information baselines for any local planning effort, since they form the backbone of a community's energy system. Utilities will also have useful data on future energy demands; available conservation and efficiency improvement opportunities; electric and magnetic field (EMF) management (See Appendix E); and the feasibility of employing new, innovative technologies in their service area. Figure 2.1 shows the state's IOUs and POUs that deliver electricity to customers.

California Energy Commission. The Energy Commission can provide information for energy technologies, electricity and fuels use and forecasts, energy facility siting and generating efficiency, and environmental assessments. In particular, local agency Siting and Permit Assistance Program staff can provide additional sources of area-specific information and advice. The Energy Commission has an extensive user-friendly website that provides both general information and dedicated Web pages for facility applications that are underway.

Figure 2.1: California's Electrical Utility Service Areas



Source: California Energy Commission

Other state and federal agencies. Several other state and federal agencies have technical staff and publications relevant to local energy resources and facility planning and development, including:

- Governor's Office of Planning and Research.
- California Public Utilities Commission.
- California Department of Conservation – Division of Oil, Gas and Geothermal.
- California Environmental Protection Agency.
- Department of Forestry.
- Department of Water Resources.
- Air Resources Board.
- California Department of Resources, Recycling and Recovery.

At the federal level, the U.S. Departments of: Interior (including the Bureau of Land Management), Energy, U.S. Environmental Protection Agency, and the national laboratories have technical assistance programs and publications that address resources, technologies, and impacts.

Local governments. The informal network of local jurisdictions that have already prepared energy-related plans can also be an efficient and relevant source of assistance. Counterparts in other communities can often identify likely issues and effective methods for addressing and resolving them.

University research centers. California universities and associated national laboratories offer a large array of research and analytical capabilities that communities can use in compiling and evaluating technical planning information.

Energy industry trade groups. The energy industry is represented at state and national levels by several trade groups that can provide useful information on technologies and industry trends. Examples include:

- American Wind Energy Association
- California Biomass Collaborative
- California Gas Producers Association
- California Municipal Utilities Association
- California Wind Energy Association
- California Solar Energy Industries Association
- Large-scale Solar Association
- Electric Power Research Institute
- Geothermal Resources Council
- Independent Energy Producers Association

Assistance is also available in the form of periodicals, research studies, and conference proceedings. Many energy conferences are annual events that local staff can plan on attending for regular updates. Widespread information and relevant examples regarding energy infrastructure and planning for counties and cities are available online.

Local Involvement in Energy Infrastructure Permitting

The first part of this chapter discusses local government energy planning. The remainder of this chapter discusses local government permitting of energy infrastructure.

The nature of how electricity is generated and transmitted is changing rapidly. New energy projects are being proposed in local communities, closer to the point of use. Transmission lines traversing new land areas may be needed to bring wind and solar-generated power from remote locations. These developments increase the permitting challenges faced by local governments. This section provides information to make the permitting process more efficient and effective and guidance for obtaining results that reflect input from the community and all other interested parties.

Growing Energy Demands and Local Roles in Permitting

Whether your local government promotes new growth and development or discourages it, increasing growth in California means that your community or your neighboring community may need additional energy resources that require new infrastructure. The Energy Commission in its 2009 *IEPR* identified that demand for electricity in California will grow by roughly 1.2 percent annually from 2010 to 2018 (298,545 MW to 345,566 MW), with peak demand growing an average of 1.3 percent annually over the same period (62,946 MW to 73,738 MW).

New energy infrastructure is also essential if the State is going to reach its mandated goal of 33 percent renewable energy by 2020 and the 2020 GHG reduction goals.

New renewable energy infrastructure, power plants, transmission lines, pipelines, and other energy facilities will be necessary to address GHG reductions, the growing demand for electricity, the retirement of old facilities and the refurbishment of existing facilities, and to reduce environmental impacts. Efforts by communities to increase the local use of renewable energy and initiatives like the California Solar Initiative, Go Solar California and Zero Net Energy mean that small-scale solar and other renewable permit applications will significantly increase in the future. Local governments are and will continue to play a major role in permitting these new facilities, whether for privately owned ventures or for the investor owned utilities governed by the CPUC.

Local agencies may also find that their permitting processes or ability to effectively participate in other agencies' processes will play an important role in ensuring energy facilities are built with the interests of their community in mind. In light of this potential role, the following suggestions are offered:

Realize planning is vital to an effective permitting process. The community planning documents, such as the previously described general plan, community plans, specific plans, and the zoning codes that define them, are the foundation of a local agency's permitting process. The permitting process is one of the ways that local plans are implemented. Effective and comprehensive permitting processes:

- Provide for early public involvement.
- Clearly define permit-related issues.
- Minimize delays and costs.
- Facilitate coordination with developers, utilities, other governmental agencies (federal, state, tribal, regional), and interest groups.
- Result in reasonable, enforceable mitigation measures, and conditions of approval.

A well-designed process will permit economical, reliable, safe, and environmentally sound energy facilities in a timely manner. Developing clear, comprehensive energy facility permitting processes that effectively reduce time requirements, cost, and contentiousness can be a valuable endeavor.

Exert your influence in federal and state permitting processes. Where federal or state agencies, or municipal utilities are the lead permitting agency, local agencies can influence these processes by:

- Knowing and understanding their legal authority and limitations.
- Participating as early as possible.
- Adopting plans, policies, ordinances and standards that identify resources of interest which may be used as criteria for development.
- Staying informed about plans for future energy facilities.
- Developing and maintaining cooperative relationships with utilities, governmental agencies, and other energy-related organizations.
- Locating and using available resources and assistance.

An example of active local government involvement in energy planning is San Bernardino County's memorandum of understanding with the BLM regarding new energy applications received on federal land in the county. (See sidebar)

Understand the needs of developers and the public. Developers and the public often find permitting processes very slow, complicated, costly, and without clearly specified criteria or requirements. Lack of agency coordination, inconsistency among agency requirements, and obstacles to public involvement complicate energy infrastructure permitting processes.

Developers and the public prefer clear permit requirements and a logical, predictable process. Developers seek some assurance that their projects will be approved if they satisfy all permit requirements and criteria. The public desires a forum to voice concerns and have issues addressed.

San Bernardino Permitting

San Bernardino County is an example of active local involvement in permitting. In 2008, the county and the Bureau of Land Management (BLM) entered into a memorandum of understanding (MOU) to make sure the county and BLM work cooperatively in the environmental review process and public participation for renewable projects proposed in desert areas within the county.

As of January 2008, the Community Development Department had received more than 80 solar energy applications and more than 60 wind energy applications, most on federal lands. (The county has jurisdiction if the projects include private land or require county permits.) The MOU provides the county with a major seat at the permitting table.

San Bernardino County also aided BLM in developing the West Mojave Plan (WEMO or Plan) that focuses on the conservation of 9 million acres in the West Mojave Desert. The WEMO was created to establish a conservation plan in the wake of immense renewable energy development as well as a method of streamlining the endangered species permitting process. A local government habitat conservation plan (HCP) is required to carry out the plan on private lands in the West Mojave. In September 2008, San Bernardino County, in union with Kern, Inyo, and Los Angeles counties and 11 desert cities, completed a draft HCP for the local government portion of the West Mojave Plan.

How to Improve the Local Government Energy Facility Permitting Process

As mentioned earlier in this chapter, local governments are the permitting authority for electricity generators under 50 MW and for non-thermal generators (e.g., PV and wind facilities). Four general areas of the energy facility permitting process local governments can change to improve and shorten the process are:

- **Developer guidance for energy facilities** can include policies, standards, and siting criteria; information on the roles of affected agencies; and public information manuals, with legal and procedural requirements.
- **Permit streamlining techniques** by including pre-application packages and meetings, one-stop permitting "shops," use of MEAs and program level EIRs, and an "ombudsperson" to resolve conflicts.
- **Interagency coordination** can include joint application review panels, consistent policies among agencies with overlapping jurisdictions, and elimination of duplicate permit approvals where feasible.
- **Public involvement** must occur early in the permit process to be effective and may include the use of technical advisory committees, frequent public workshops, electronic access to project information, and computer simulations.

Guidance to Developers

One of the surest and easiest ways to improve the energy infrastructure permitting process is to ensure project developers are given accurate, comprehensive, and timely information on permit requirements, information to include with applications, time frames, and costs. The more information the developer has as early in the process as possible, the more complete the application will be. If the developer knows which local, state, and federal requirements apply to the project before the application is submitted and the project plans are completed, costly revisions and delays are less likely to occur.

Local government guidance in various forms for energy infrastructure can be made available to prospective permit applicants. For example, the REAT[6] *Best Management Practices and Guidance Manual: Desert Renewable Energy Projects* includes guidance for completing applications and meeting with relevant agencies. Although much of the emphasis is on state and federal processes, the guidance may help with addressing local issues. Even in cases where local authority over a given energy project is limited, local adopted policies and regulations are considered by many of the lead state and federal agencies. Jurisdictions that have not developed such guidance may want to consider doing so.

This information is beneficial to the local community, the developer, and other regulatory agencies. The community can express its preference for facility type(s) and location(s). The developer does not waste time and money on projects that are unlikely to be approved or welcomed. These policies may also reduce the number of discretionary approvals needed later, reducing permitting time.

Screening Criteria and Mitigation Measures. A community can develop screening criteria pursuant to the California Environmental Quality Act (CEQA) for various issues, such as hazardous materials, air quality, and noise. The project evaluator and the lead agency are still responsible for all CEQA requirements, whether or not they are part of the screening criteria. Screening information will alert project developers to specific data needed to determine impacts and appropriate mitigation measures. Advance information to developers will result in more complete applications, greater consistency, and improved review efficiency.

[6] The Renewable Energy Action Team was formed to help implement Executive Order S-14-08. The REAT agencies are the California Energy Commission, the California Department of Fish and Game, the U.S. Bureau of Land Management and the U.S. Fish and Wildlife Service

Local governments can provide information on mitigation required for similar projects, as well as mitigation measures they may require for future projects. The *REAT Best Management Practices Manual* helps developers design renewable energy projects that minimize environmental impacts and assists in accelerating renewable energy project environmental review at local, state, and federal levels.

Pertinent siting information. Communities with a data bank or GIS can easily provide developers with pertinent siting information. Information such as the location of sensitive receptors, soil types, species of concern, and sensitive biological areas can help a developer choose a facility site that is more likely to be approved.

Public information manual. A public information manual can include the information recommended above. It can also contain legal and procedural requirements; projected costs and time frames; and roles and responsibilities of other agencies and utilities for energy facility permits. Such a manual will be useful to energy developers before they start the permitting process by reducing the possibility of delays and associated permitting costs. It would also be helpful to those interested in providing input on specific projects or the general permitting process.

Permit Process Streamlining Techniques

Permit streamlining will reduce the time and costs of issuing and obtaining permits. Examples of useful techniques include: one-stop permit centers, pre-application packages and conferences, simplified permit language, one point of contact for all local permits, cross training of staff, the use of MEAs and program-level EIRs and familiarity with energy technology.

One-stop permit centers centralize local government permitting information for multiple local agencies in one place and can reduce the time and frustration associated with the energy facility permitting process. Employees at the center are usually cross-trained regarding the requirements of all local agencies. Ideally, the center contains a shared database so applicants fill out only one application. The information contained in the application can be shared by all agencies represented at the center to eliminate duplication. One-stop permit centers may also provide the required forms and information from and coordination with state, federal, and other local governments.

Providing a single "point of local government contact" for the project developer to work with will reduce the potential confusion and frustration associated with a permit application, particularly when issues or concerns arise. A single contact person can identify and resolve interagency conflicts before dispensing information to a developer, act as an ombudsperson to resolve conflicts between a project developer and local agencies, handle concerns from the public regarding an application, and improve conflict resolution. By working with all departments, the contact person understands the entire local permitting process, project details, and the agency requirements.

Cross-train staff. When a single local point of contact is not possible, cities and counties can cross-train staff within each agency to better understand the entire permitting process. Understanding the entire process and the ultimate goals of regulations should help reduce unnecessary conflicts over insignificant details, delays, and requests for information.

Early Consultation. A pre-application conference between the applicant and representatives from all local, regional, state, and federal agencies requiring permits or approvals or those otherwise interested in the project can identify issues early. All interested parties have the opportunity to provide the potential developer with their concerns and requirements. The developer can then design in the requirements from the start without going through costly and time consuming application revisions or re-submittals. Information about the type and number of permits, approximate costs, and length of approval time can be identified and discussed. Interagency conflicts regarding permit conditions can also be identified and resolved.

Clear Requirements. Energy facility permit problems can be caused by the intricate and confusing language of some regulations. Writing regulations clearly will help to eliminate any confusion that currently exists. Certain ordinances and regulations will require precise, technical language to ensure their compliance. When this is the case, a lay person's translation should also be provided.

Understanding Energy Technology. Becoming familiar with energy technology will help reduce the time associated with permitting these projects. When confronted with a new technology or facility type, local government agencies are understandably cautious. Once a local community has experience permitting an energy technology, it will be able to more efficiently focus on key issues and their resolution, making the next application for a similar facility easier.

There are also legislative efforts to coordinate or expedite permitting which may require agencies to eliminate duplicative regulations or change their permitting processes.

Interagency Consultation and Coordination

Energy facilities often have complicated issues that require permit approval from many agencies at various government levels (see Appendix B). Coordinating permit requirements among the agencies and jurisdictions responsible for energy facility permitting is another way to reduce time and confusion. Coordination can involve joint review of permit applications; sharing information between agencies and jurisdictions; eliminating inconsistent policies, standards, and duplicative permit approvals; using parallel permit processing; and delegating permit authority. If a state permit for a particular project characteristic protects the local government's concern in the matter, two permits may not be necessary. However, state permits usually preempt local authority, and the elimination of a local permit is usually due to this preemption.

Joint permit application review panels reduce conflict and help ensure complete applications. Pre-application conferences, where the developer and representatives of affected agencies gather to discuss permit requirements, provide the developer with necessary information before completing the application(s) or committing to a project. Regardless of when joint review happens, it coordinates agencies' efforts and lessens potential conflicts. Joint review will also help assure the participation of responsible agencies for compliance monitoring after the facility is in operation.

Cities and counties can develop contacts with other local jurisdictions with previous energy facility siting experience and avoid having to "reinvent the wheel." Jurisdictions may wish to consider forming a regional work group to discuss ideas for developing consistent energy facility permitting processes and/or resolving mutual problems encountered as a result of energy facilities.

Early participation and response to scoping notices and the CEQA notice of preparation significantly increases local government's ability to influence other agencies and developers. Active participation in other agencies' formal scoping and data gathering workshops is also critical for effectively influencing lead agencies. Participation provides an opportunity for early input regarding local concerns, identified constraints, policies, and preferences. Scoping meetings and workshops are normally scheduled according to the amount of interest shown toward the proposed project. Therefore, your expressed interest at the beginning of the process will provide greater opportunities for input later.

Ensuring consistent policies and standards among agencies that have overlapping jurisdiction will eliminate conflicts between jurisdictions when permits are sought. There may be instances, however, when there is a need for differing requirements. Inconsistencies may also exist with regulations within a single jurisdiction. Local policies, ordinances, regulations, and standards enacted at different times or by different departments may conflict. Local government

agencies should review local policies and ordinances and change or eliminate those that are inconsistent with the community's goals and objectives. Cities and counties may also consider consolidating or reorganizing departments and/or their jurisdictional authority to eliminate overlapping requirements.

Parallel processing can speed up the permit approval process. Often when multiple approvals are necessary, the application must be approved in a specified order. Sequential processing is usually done to avoid unnecessary work. If one department does not approve a permit, there is no reason to have other departments spend time on it. Unfortunately, this often increases the time necessary to obtain a permit. Parallel processing works as long as the application does not change in a way that affects the concerns of other departments and there is good department/agency coordination. This is not the same as combined processing, as each department or agency retains its authority over the project.

Combined processing is often used if there are co-lead agencies and no interagency agreement has designated one "lead agency." Cooperative and combined processing can also be used if many departments are reviewing the permit at the same time, most of the approvals can be obtained simultaneously, and only those departments with problems will require alterations and re-submittal. This type of review generally results in a single permit that incorporates the conditions of approval from the various reviewing departments.

The efficiency of the permitting process can also be enhanced by use of interagency agreements when more than one local agency has authority over a permit area. These agreements specify which, and under what circumstances, one of them would become the "lead agency." In such cases, the "responsible" agencies use the environmental documents prepared by the other agency in their permitting processes. The agreement describes performance standards and conditions and criteria the lead agency must use on behalf of the other agencies. Review, approval, and appeal procedures should be clearly defined.

Public Involvement

Public involvement can greatly enhance the energy facility permitting process, provided the participants are well-informed and actively involved throughout the process. The public can provide useful advice and support provided there is a meaningful attempt to understand and resolve local issues. The process should not be seen as just a public education, coercion, or an attempt to kill a project. Identifying goals and stakeholders, holding frequent public workshops, using technical advisory committees, and facilitating communication are ways that local governments can focus and improve public input. See the Chula Vista Power Plant sidebar example of public involvement in energy planning.

Identify goals and stakeholders. Once public involvement goals have been defined, key community leaders, individuals, groups, or organizations that may have an interest in the success or failure of the facility permit should be identified and invited to become part of the process. The stakeholders should be involved as much as possible and kept informed of activities in which they do not participate. It is important for these stakeholders to be provided access to the permit agency, the developer, and supporting project documents.

Frequent public workshops. Public workshops will provide meaningful opportunities for addressing community issues. Since they are less formal than public hearings, they provide an opportunity to create a dialogue and facilitate important public input and support. Workshops are more effective at addressing public concerns when held early in the permit process when changes are easier to make. Public hearings that come late in the process, after time and energy have been invested in a facility application, and without benefit of outreach throughout the project, can be ineffective.

Citizen and technical advisory committees. Citizen advisory committees, composed of community representatives, can be organized to advise local governments on energy facility issues and serve as public representatives in the rulemaking process of a regulatory agency. Committee members should be integrated into the permitting process, with their concerns and suggestions considered at all stages of the project. They can also be included in the rulemaking process, possibly reducing later conflicts on specific permits. In addition to a citizen advisory committee, local governments may consider integrating a technical advisory committee (TAC) into the permitting process. TACs are usually composed of representatives from local departments and other community agencies with specific expertise or responsibility over the project. This might include the various city or county departments, such as public works or environmental health; local water and sewer districts; fire department; police or sheriff's department; or parks district. Project review by a TAC, early in the permitting process, can bring a valuable perspective to a project and provide citizens and the permitting agency with a wider range of knowledge and experience.

Chula Vista Experience

This case concerning the permitting process of the Chula Vista Energy Upgrade Project (CVEUP), in San Diego County, is an example of the importance of public involvement. In August, 2007, MMC Energy, Inc., submitted an application for certification (AFC) to construct and operate the CVEUP, a simple cycle electrical 100- MW peaking power plant facility at the site of an existing power plant site. The project was to be located on a 3.8-acre parcel in the city of Chula Vista's Main Street Industrial Corridor and within the city's light industrial zoning district. An emergency peaker was permitted at the site in 2001 but was not constructed. The CVEUP was proposed to augment the existing plant.

Public involvement during the application review was extensive. Almost 50 individuals offered public comment at the prehearing conference and 75 individuals offered public comment at the evidentiary hearing. Chief concerns were:

- Inconsistency with the city's general plan guidelines in the area of environmental justice.
- Siting of a power plant project in an inappropriate location near homes and schools.
- Economic impacts to local businesses.

In June 2009, the Energy Commission voted to deny certification of the proposed CVEUP. The major reasons were:

- The facility would conflict with certain provisions of the city's general plan intended to separate industrial and residential uses.
- The facility would conflict with the city's general plan intent of maintaining the Main Street Corridor as a light industrial district.
- The facility would violate the city's zoning ordinance because the existing zoning designation, limited industrial, is inappropriate for a natural gas-fired electrical generating facility.

Chapter 3: Expected New Renewable Energy Infrastructure Developments

This chapter identifies what and where new utility-scale generation and transmission development is likely to occur over the next 20 years. Since future infrastructure is being studied by various groups, some of the study processes and results are briefly summarized here and presented in more detail in Appendix D. Locations and descriptions of proposed generation and transmission infrastructure are provided, although these reflect only a point in time, and new legislation, policy, and study may result in changes. Actual projects under consideration or recently approved are also identified.

Renewable Energy Transmission Initiative

Between 2008 and 2010 considerable work was done by stakeholders involved in the Renewable Energy Transmission Initiative (RETI). The Stakeholder Steering Committee (SSC) included: representatives of environmental groups, renewable developers, public and investor-owned utilities, state, federal, and local governments, Native American tribes, and consumers. The California State Association of Counties (CSAC) and Regional Council of Rural Counties (RCRC) represented local governments on the SSC.

RETI identified, characterized and ranked Competitive Renewable Energy Zones (CREZ) specified for solar, wind, geothermal, or biomass energy facilities in California and neighboring states. It then developed a statewide conceptual transmission plan to access priority CREZ.

RETI ultimately identified Renewable Foundation, Delivery and Connector Transmission Lines. Foundation lines would increase the capacity of the California transmission network between Palm Springs and Sacramento. Delivery lines would move energy from Foundation lines to major load centers. Collector lines would carry power from CREZ to Foundation and Delivery lines. These various lines are show on Appendix D Figure D.1.

RETI recommended that entities planning new transmission lines engage local governments to identify and assess potential alternatives, including other transmission alternatives and non-transmission alternatives, early in the planning process. RETI's work is being incorporated into formal transmission planning and regulatory programs. RETI is currently inactive.

California Transmission Planning Group 2010 Statewide Transmission Plan

The California Transmission Planning Group was formed in 2009. Its members are transmission owners and operators. CTPG used RETI data in developing a state-wide transmission plan that identifies the transmission infrastructure needed to reliably and efficiently meet a 33 percent RPS by year 2020. CTPG released the *2010 Statewide Transmission Plan* in February 2011. The Plan identifies high and medium potential transmission upgrades and corridors. These are identified in Figure 4 of the Statewide Transmission Plan (see link above) and more fully described in the Plan. The California ISO used the CTPG's information when developing the California ISO Transmission Plan, adopted in May 2011 (Appendices B and D). Local governments should review these transmission line locations to determine whether activity is being planned in their jurisdictions.

Desert Renewable Energy Conservation Plan

In November 2008, Governor Schwarzenegger ordered the development of the *Desert Renewable Energy Conservation Plan* (DRECP) for the Mojave and Colorado deserts and work is progressing during Governor Brown's tenure. When complete, the Plan will provide binding, long-term endangered species permit assurances; provide a process for conservation funding; and facilitate renewable energy project review and approval processes. The DRECP will encompass development of solar thermal, utility-scale solar photovoltaic, wind, and other forms of renewable energy and associated infrastructure such as transmission lines necessary for renewable energy development within the

Mojave and Colorado Desert regions. The DRECP is a Natural Community Conservation Plan (NCCP) and will also serve as the basis for one or more HCPs under the Federal Endangered Species Act. The DRECP boundary is shown in Figure 3.1.

The DRECP management team consists of representatives from the REAT agencies (i.e., Energy Commission, BLM, CDFG, and USFWS), the Governor's Office, DOI, and California Natural Resources Agency. A Stakeholder Committee provides input to the DRECP management team through the planning process, provides feedback on interim products, and provides a forum for public participation. Stakeholders include local governments (Counties of Imperial, Inyo, Kern, Los Angeles, Riverside and San Bernardino), non-governmental organizations, electric utilities, renewable energy industry associations, renewable energy project developers, Native American organization and off-highway vehicle associations. Federal and state agencies participate but are non-stakeholders.

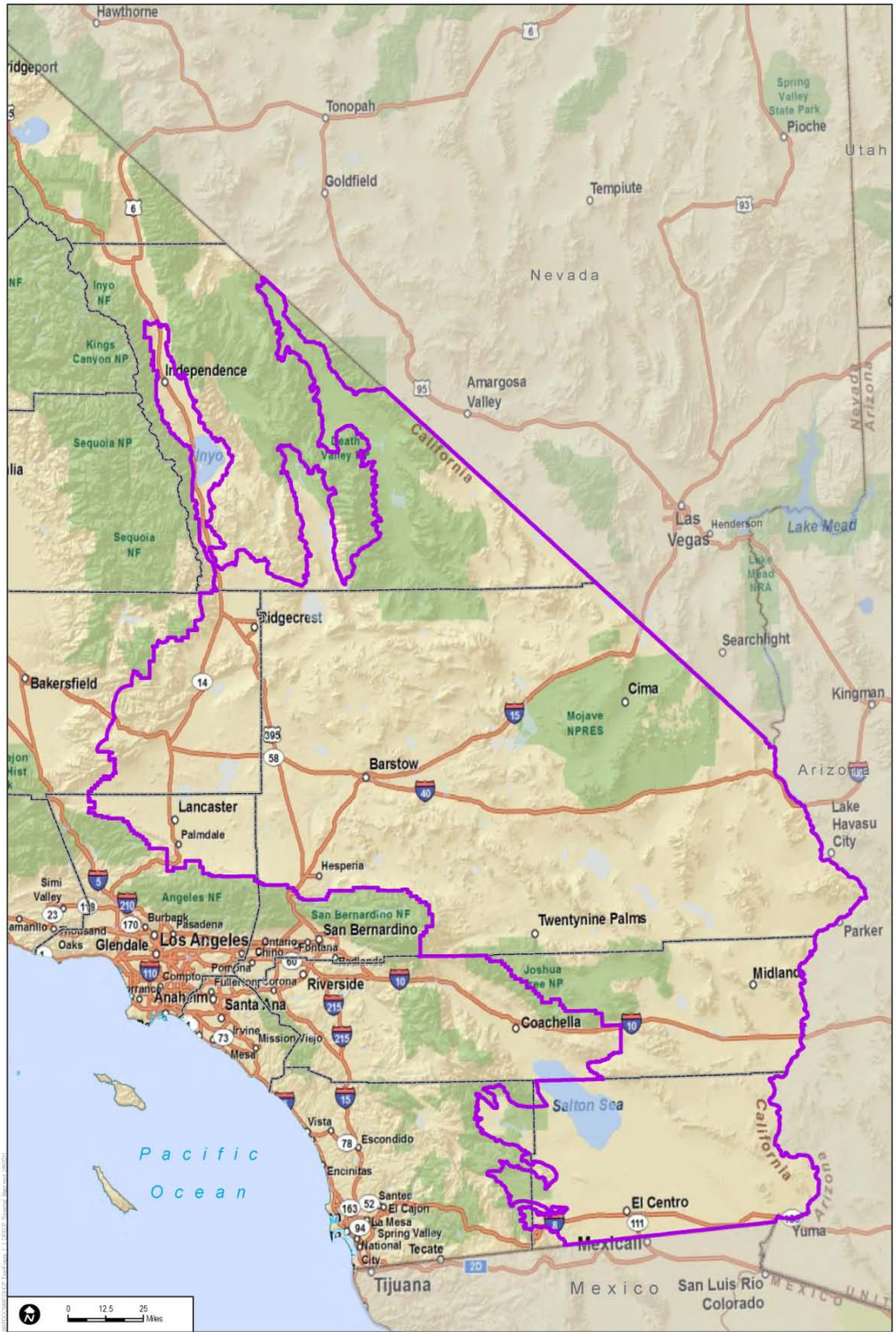
County government bodies are central to the DRECP effort since they could serve as applicants for take permits for solar thermal projects under 50 MW and all solar PV and wind projects located on private lands. As of May 2011, no counties have formally signed on as DRECP applicants.

Counties have raised a number of concerns regarding the DRECP. Large areas identified for conservation could limit the availability of private land for future use and could lead to lost economic development potential (jobs, property tax revenue), lost recreation potential and lost historical resources (farmland, historic sites). The counties are not compensated fully for the services they provide on BLM lands and additional development would further the strain on county services (for example, fire protection).

A number of reports are being developed during the DRECP process. Documents relating to the DRECP can be accessed at www.DRECP.org. Key reports include:

- Independent Science Advisors Report
- Framework Conservation Strategy
- Preliminary Biological Goals and Objectives for the Covered Species
- Preliminary Biological Goals for Natural Communities
- Preliminary Conservation Strategy
- Administrative Draft DRECP
- Public Draft DRECP

Figure 3.1 DRECP Boundary Map



Source: California Energy Commission, USGS

BLM Renewable Energy Zones

The U.S. Office of Energy Efficiency and Renewable Energy (EERE), U.S. Department of Energy (DOE); and the Bureau of Land Management (BLM), U.S. Department of the Interior (DOI), have prepared a Programmatic Environmental Impact Statement (PEIS) to evaluate utility-scale solar energy development; to develop and implement Agency-specific programs or guidance that would establish environmental policies and mitigation strategies for solar energy projects; and to amend relevant BLM land use plans with the consideration of establishing a new BLM Solar Energy Program. PEIS documents were prepared for wind and geothermal development in the west in 2005 and 2008, respectively. These efforts are meant to help streamline the federal permitting process.

Although the PEISs address renewable energy potential and related impacts and mitigation on federally-managed lands, projects on these lands may affect lands and related uses overseen by local governments. For example, project construction vehicles and traffic may affect use of local roads.

The draft Solar PEIS was released in December 2010. The PEIS analyzes a no action alternative and two action alternatives—the solar energy development program alternative and the solar energy zone (SEZ) program alternative. The BLM defines SEZs as areas with few impediments to utility-scale production of solar energy where the BLM would prioritize solar energy and associated transmission infrastructure development under the two action alternatives. In California, approximately 11,067,366 acres of land would be available for right-of-way (ROW) application under the no action alternative, and 1,766,543 acres of land would be available under the solar energy development program alternative. Four SEZs would be identified: Imperial East (5,722 acres), Iron Mountain (106,522 acres), Pisgah (23,950 acres), and Riverside East (202,896 acres). BLM accepted public comments on the draft and is currently working on finalizing the PEIS.

Figure 3.2 shows the locations of BLM-administered lands in California that (1) are not available for solar energy development currently (i.e., are currently off limits), (2) would continue to be available under the no action alternative, and (3) would be available for ROW application under the solar energy development program alternative. The map also shows the locations of the four proposed SEZs in California.

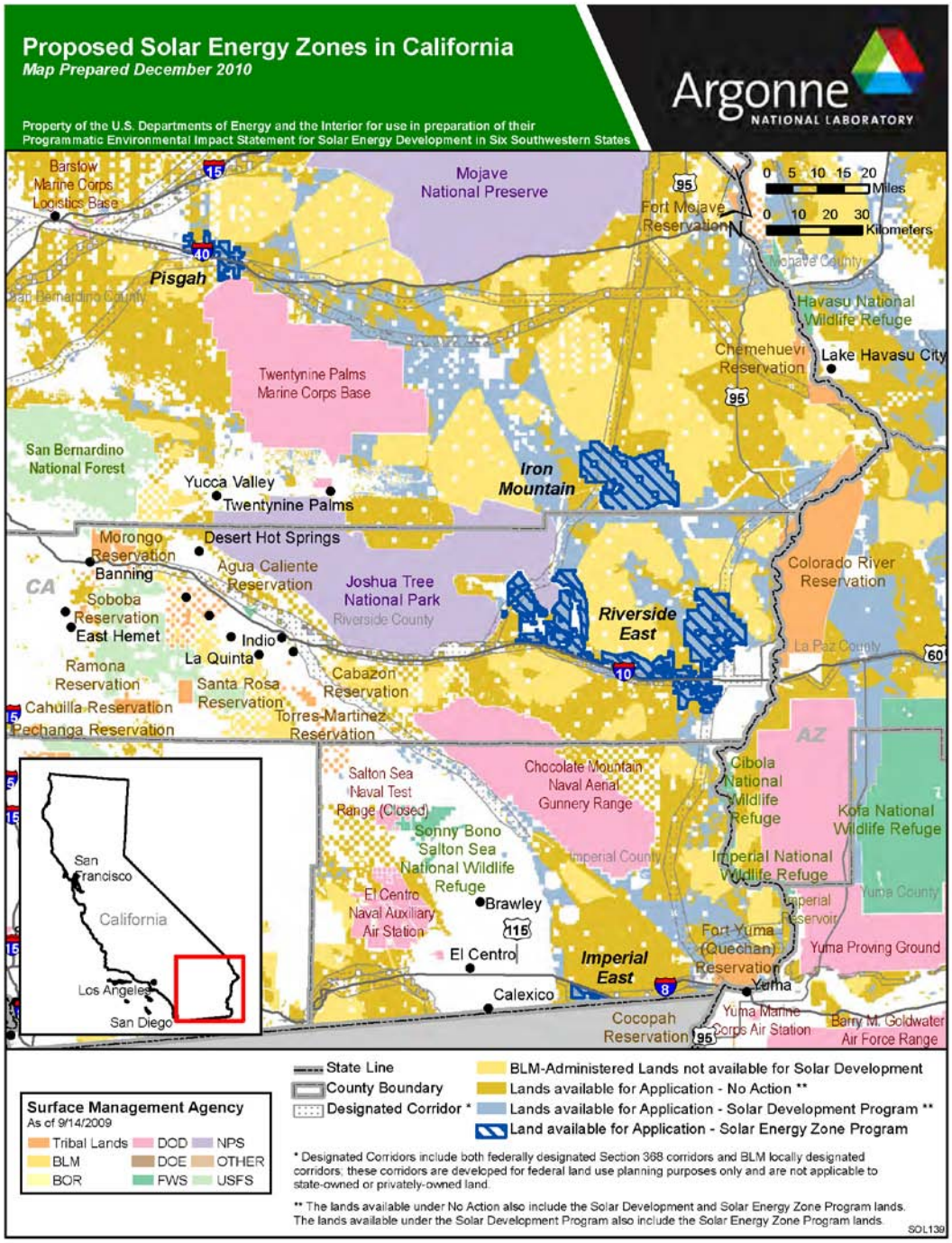
Utility-Scale Renewable Projects under Recent Review

The Energy Commission's *2010 IEPR* discusses funding provided by the American Recovery and Reinvestment Act of 2009 (ARRA) triggered a large number of applications for the development of utility-scale solar energy projects in California. During 2010, the Energy Commission certified nine solar thermal power plants (total of 4,180 MW) seeking ARRA funding. A key issue identified by local governments during review of these projects was fire protection and emergency service response resources. Locations of these plants are shown in Figure 3.3. Figure 3.4 shows the locations of current BLM Renewable Energy Projects and Utility Corridors.

At the local level during 2010, an 800 MW wind project, a 230 MW photovoltaic project, and a 10 MW photovoltaic project were permitted by Kern and Los Angeles counties, as well as a 37 MW wind project by Solano County and a 20 MW photovoltaic project by Kings County, for a total of 1,097 MW of non thermal capacity on private land sites.

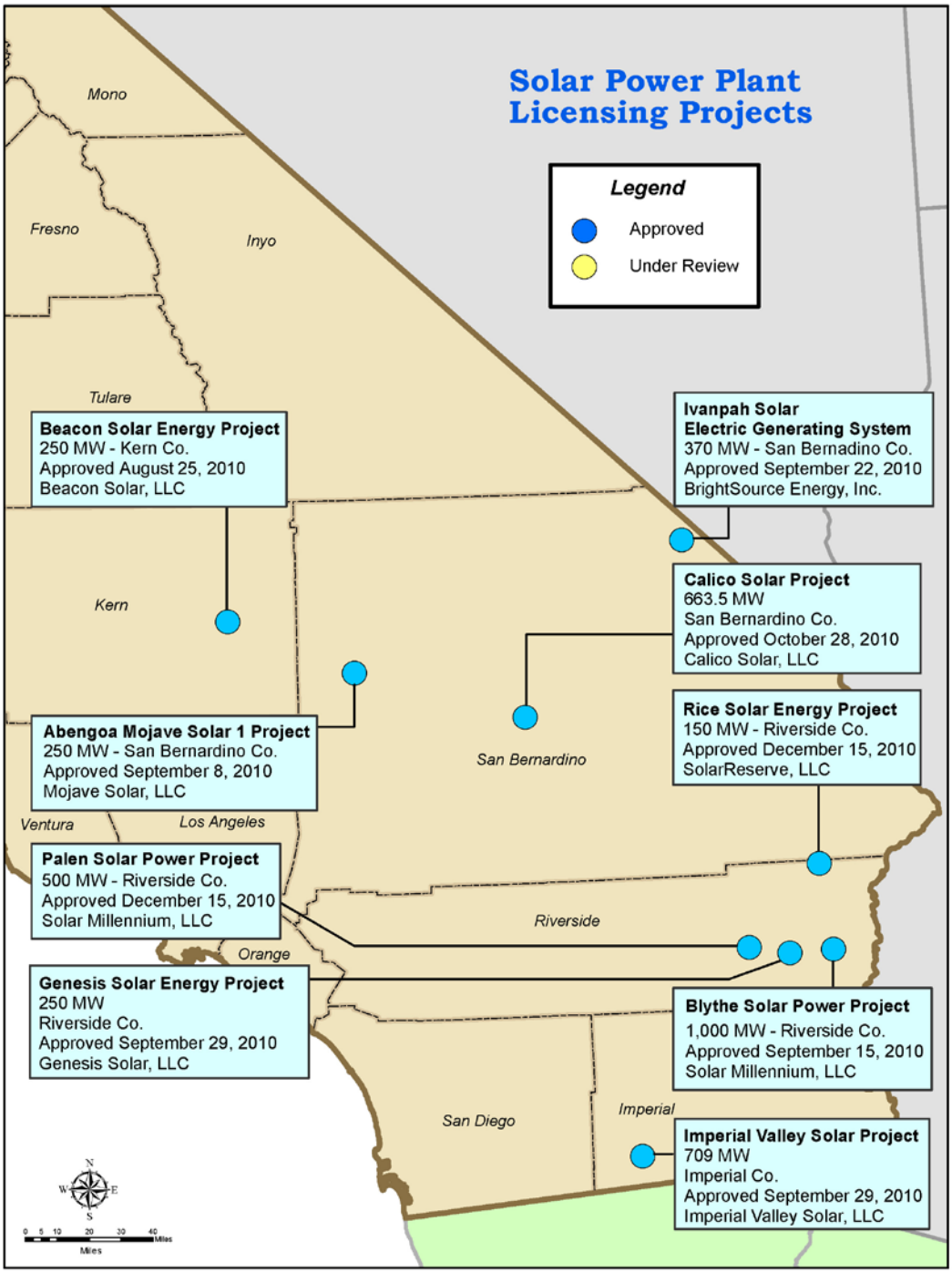
Table 3.1 lists some of the remote renewable energy projects under environmental review by the BLM, Energy Commission, and counties. Many more renewable projects are proposed to be developed. The Energy Commission identifies 279 renewable energy projects on its website, and a number of other counties also identified projects besides those located in the general areas studied by RETI, DRECP, and Solar PEIS.

Figure 3.2 Proposed Solar Energy Zones in California



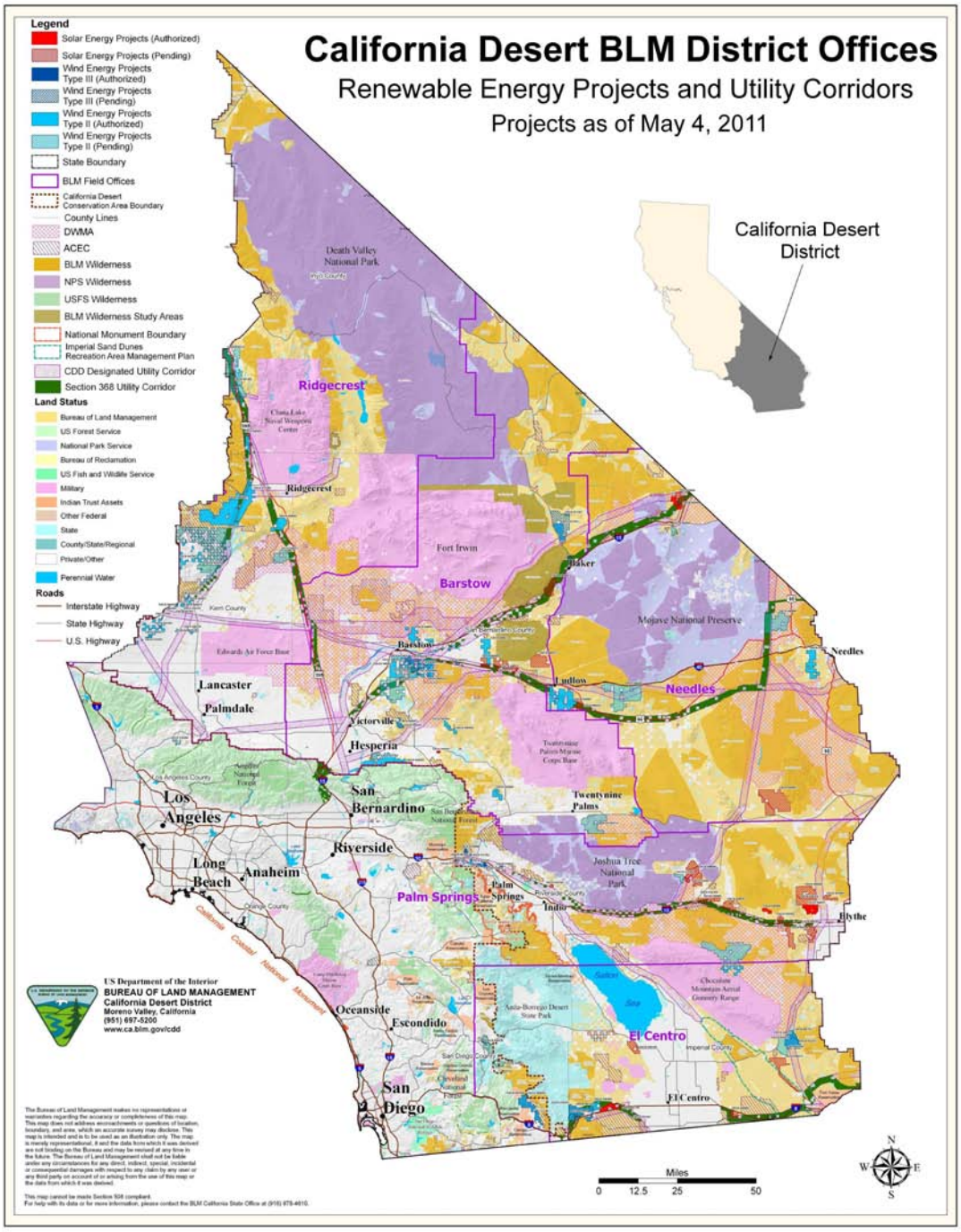
Source: Bureau of Land Management

Figure 3.3: Energy Commission's Solar Power Plant Licensing Cases



Source: California Energy Commission

Figure 3.4: BLM Renewable Energy Projects and Utility Corridors



Source: BLM

Table 3.1: Examples of Remote Renewable Projects Under Review or Permitted*

Project Name	Location (County)	Status
Solar Photovoltaic		
NRG Alpine Solar Project (66 MW)	Los Angeles	Under environmental review
Panoche Solar Valley Farm (420 MW)	San Benito	Approved
Blythe Airport Solar 1 Project (100 MW)	Riverside	Approved
Desert Sunlight (550 MW)	Riverside	Approved
California Valley Solar Ranch (250 MW)	San Luis Obispo	Approved
Lucerne Valley Solar Project (62 MW)	San Bernardino	Approved
Element Power, Atwell (150 MW)	Tulare	Under environmental review
First Solar, Topaz Solar Farm (550 MW)	San Luis Obispo	Final EIR published
Antelope Valley Solar Ranch One (230 MW)	Los Angeles	Approved
SGS Rosamond Solar Project (120 MW)	Kern	Approved
Maricopa Sun Solar Complex Project (700 MW)	Kern	Approved
Willow Springs Solar Array (160 MW)	Kern	Under environmental review
Monte Vista Solar Array (126 MW)	Kern	Under environmental review
Antelope Valley Solar Project (650 MW)	Kern	Draft EIR published
Nextlight Lost Hills Solar Project (32.5 MW)	Kern	Draft EIR published
Solar Thermal		
Ivanpah Solar Energy Generating System (400 MW)	San Bernardino	Approved
Beacon Solar Energy Project (250 MW)	Kern	Approved
Imperial Valley Solar (formerly Stirling Solar Two) (750 MW)	Imperial	Approved
City of Palmdale Hybrid Gas-Solar (555 MW natural gas, 62 MW solar thermal)	Los Angeles	Approved
Calico Solar (formerly Stirling Solar One) (850 MW)	San Bernardino	Approved
Abengoa Mojave Solar Project (250 MW)	San Bernardino	Approved
Solar Millennium Palen Solar Power Project (484 MW)	Riverside	Approved
Solar Millennium Blythe Solar Power Project (1,000 MW)	Riverside	Approved
Genesis Solar Energy Project (250 MW)	Riverside	Approved
Rice Solar Energy Project (150 MW)	Riverside	Approved
Wind		
Bear River Ridge (50-75 MW)	Humboldt	EIR/EIS published
Granite Mountain Wind Energy Project (73 MW)	San Bernardino	Draft EIS/EIR published
West Fry Wind Energy Project	San Bernardino	Under environmental review
Alta-Oak Creek Mojave Project (up to 800 MW)	Kern	Final EIR published
Manzana Wind Project (246 MW)	Kern	Approved
Shiloh III (200 MW)	Solano	Final EIR published
Lompoc Wind Energy Project	Santa Barbara	Approved
Pacific Wind (Iberdrola) (200 MW)	San Diego	Under environmental review
AltaGas/GreenWing Energy, Walker Ridge Wind Farm (up to 70 MW)	Colusa	Under environmental review
Geothermal		
West Chocolate Mountain (640 acres)	Imperial	Under environmental review
Hudson Ranch (49 MW)	Imperial	Under construction
Black Rock (159 MW)	Imperial	Under environmental review

***The full list of renewable projects proposed to be built in California as of April 2011 can be found at the Energy Commission website: http://www.energy.ca.gov/33by2020/documents/index.html. It should be noted that this list is likely to change and be updated periodically. Additional projects were identified from Kern County's website:* http://www.co.kern.ca.us/planning/pdfs/renewable/solar_projects.pdf**

Chapter 4: Generation and Transmission Facilities—Regulatory Processes, Authorities, and Roles

Introduction

Detailed processes are in place to permit new electricity infrastructure. Which agency takes the lead in processing an application depends on the nature of the project and its location. The type of environmental review is based on the level of anticipated impact and whether both state and federal environmental reviews are required. This chapter discusses the general permitting processes for energy infrastructure, including land use approvals and environmental review. Opportunities for local government participation are identified throughout this chapter.

Land Use Approvals

The California Constitution, various state statutes, and case law give local governments authority to regulate development to protect the welfare, security, health, and safety of its citizens. The most common use of regulatory power, as it relates to the planning and permitting process, is through adoption and enforcement of local land use and building regulations, including zoning codes and other enactments needed to secure a community's welfare. The scope of this power is quite broad, so long as it does not conflict with state or federal. Where conflicts arise, the local enactment will often be preempted, depending on the legal circumstances. Characteristics of a project, including the facility type, size, location, and type of project applicant, all help identify if the project is under a local agency's authority.

In terms of electric generating facilities, there are two types that trigger preemption of local authority regardless of the project applicant.

First, the licensing of thermal power plants 50 MW or greater and their related facilities, including transmission lines, are normally under the authority of the Energy Commission. The Energy Commission must review projects within its jurisdiction for compliance with local laws, ordinances, regulations, and standards (LORS). Although the Energy Commission has exclusive authority to certify sites and related facilities (PRC §§ 25500 *et al*), it encourages local agencies to participate in its licensing process and strives to maintain consistency with local LORS. The two processes that are currently available are the 12-18 month review (application for certification - AFC) and the small power plant exemption (SPPE). The SPPE is available for projects between 50 MW and 100 MW provided the proposed project does not create an unmitigated significant impact on environmental resources.

Secondly, non-federal hydroelectric facilities (those not built by the federal government) are normally under the licensing authority of the Federal Energy Regulatory Commission (FERC). FERC issues two types of exemptions:

- Small hydropower projects, which are 5 MW or less, that will be built at an existing dam, or projects that utilize a natural water feature for head or an existing project that has a capacity of 5 MW or less and proposes to increase capacity;
- Conduit exemption that would be issued for constructing a hydropower project on an existing conduit (for example irrigation canal); and
- Conduit exemptions for generating capacities 15 MW or less for non-municipal and 40 MW or less for a municipal project. The conduit has to have been constructed primarily for purposes other than power production and be located entirely on non-federal lands.

Exempted hydroelectric projects are subject to state environmental review.

Most local government land use plans do not include large-scale renewable energy facilities as an approved land use. A developer may have to apply for an amendment to the city or county general plan. If a city or county zoning ordinance does not allow the building of a large-scale renewable energy facility, the developer must file an application to rezone the land. In addition to rezoning, if the land is under a Williamson Act contract for long term agricultural use, the contract may need to be terminated if the contracted land uses do not allow for energy development. Termination by the local government and land owners involves lengthy timeframes. Local funds are lost and agricultural production is reduced.

For land that is already zoned for a broad purpose (for example, industrial use) and specifically identifies energy production, the developer may need to apply for a conditional use permit (CUP) from the city or county.

Federal land, such as BLM land in the Mojave Desert, is subject to federal land use decisions. Resource management plans define the allowable resource uses of the land and the use of the land for solar energy production is not currently approved. Therefore, in addition to a right-of-way (ROW) lease, a plan amendment is needed to allow such a use. The plan amendment allows the use of the land for solar energy generation by a specific project. BLM has also revised its resource management plans allowing wind and geothermal development in certain areas of the West. Currently, through its Solar PEIS, BLM is considering whether to establish a new Solar Energy Program to supplement or replace existing policies, and to amend existing land use plans in the six-state study area (Arizona, California, Colorado, New Mexico, Nevada, and Utah) to adopt the new program. BLM expects to identify BLM-administered lands that may be environmentally suitable for solar energy development and lands that would be excluded from such development.

Environmental Review Process

A major element of permitting for new infrastructure is an environmental review. For projects within California, CEQA identifies the environmental review process and requirements. An initial study serves as a preliminary analysis to determine whether an environmental impact report (EIR) or a negative declaration (ND) must be prepared or to identify the significant environmental effects to be analyzed in an EIR. Typically an EIR, or equivalent document, is prepared for electricity infrastructure projects unless the project is very small (for example, a 1 MW solar PV project). In that case, a ND or mitigated negative declaration (MND) may be prepared instead. These terms are defined in the accompanying sidebar.

For projects requiring federal action, including, but not limited to, federal construction projects, plans to manage and/or develop federally owned lands, and federal approval of non-federal activities, such as grants, licenses, and permits, the National Environmental Policy Act (NEPA) identifies the environmental review process and requirements. An environmental impact statement (EIS) is the parallel document to the EIR. An environmental assessment (EA) is the NEPA document parallel to a CEQA Initial Study. A Finding of No Significant Impact (FONSI) is equivalent to a CEQA ND.

For projects requiring both state and federal actions, a joint CEQA/NEPA document is generally recommended. For example, solar thermal power plants of 50 MWs or larger require certification (licensing) by the Energy Commission and must be reviewed under CEQA. As many of these projects are proposed on federal lands, NEPA review is also required. These combined documents must meet the review and public involvement requirements of both processes.

The requirements of CEQA and NEPA differ slightly in scope, timing, and degree of analysis of certain issues. A discussion of environmental review processes for new energy infrastructure is presented later in this chapter, including a table comparing CEQA and NEPA requirements.

The Williamson Act, Solar Power and Local Governments

The Williamson Act charges the Department of Conservation with overall oversight of the Williamson Act, and charges local governments with the primary responsibility for implementation of the Act. Under the Act, cities and counties may establish agricultural preserves which are designated areas consisting of one or more parcels totaling at least 100 acres, and devoted to agricultural, open space or recreational use. Once a preserve is established, a city or county may enter into contracts with land owners within the preserve to restrict the use of the land. Some Williamson Act-based restrictions apply to all parcels in an agricultural preserve, so even if a specific parcel is not under contract, its location within an agricultural preserve can have an effect on the siting of a solar project.

The Act grants cities and counties broad discretion to adopt local rules defining allowable (compatible) uses on all parcels within agricultural preserves, and to draft the terms of individual Williamson Act contracts. Local rules may add requirements or may establish definitions for terms that are not defined in the Act. For example, the term "electric facilities" is not defined in the Williamson Act and as a consequence some counties have chosen to narrowly restrict its definition to electrical transmission lines and related transmission improvements. Other counties have adopted a broader definition that includes the construction of electrical generation facilities, while many counties are silent on the issue and have the option of addressing the issue as it arises.

The Williamson Act does not specifically address the placement of solar power generation facilities on land subject to it. However, depending on the specific characteristics of a particular facility, and the wishes of the landowner, there are four ways in which a solar power generation facility may be located on land subject to the Williamson Act. First, locating a solar power generation facility on land within an agricultural preserve may be allowed as a compatible use depending on the local rules governing compatibility. Second, the landowner may provide notice of non-renewal to the city or county administering the Williamson Act contract on the land, and eventually remove the Williamson Act's restrictions over use of the land. Third, the contract may be "cancelled" pursuant to required statutory processes under appropriate circumstances. Here, in almost all cases, the landowner would be responsible for paying a cancellation fee. Fourth, a public agency with the power of eminent domain may acquire land subject to a Williamson Act contract (through eminent domain or in-lieu of eminent domain), thereby "nullifying" the contract and rendering the land free from the contract's restrictions.

Source: Excerpted from the Department of Conservation paper (Solar Power and the Williamson Act)
http://www.consrv.ca.gov/dlrp/lca/Documents/WA_solar_paper_2010.pdf

State agencies follow CEQA, with a specified 12 month time frame for completion of the process. In addition to the 12 months, many agencies typically allow for a data adequacy period, which California's Permit Streamlining Act limits to 30 days. Also, a three-month extension can be granted under the Permit Streamlining Act with the applicant's consent.

While agencies strive to meet streamlined time frames, the complexity and controversy of projects can often extend the review period. A 2008 California State Auditor report indicates that the average time for obtaining Energy Commission approval to build a power plant was 22 months and the time to permit a transmission line was 18 months. In general, NEPA does not set a time limit for completion of environmental assessments (EA) or an EIS.

Types of Environmental Analysis Prepared by State and Local Agencies under the California Environmental Quality Act

Environmental Impact Report: A detailed written document prepared under CEQA describing and analyzing the significant environmental effects of a project and discussing ways to avoid or reduce the effects.

Negative Declaration: A written document briefly describing the reasons that a proposed project not exempt from CEQA will not have a significant effect on the environment and therefore does not require the preparation of an environmental impact report.

Mitigated Negative Declaration: A negative declaration that can be prepared when the initial study has identified potentially significant environmental effects, but changes to the project before the proposed negative declaration and initial study are released would reduce those effects to the point where there is clearly no significant effect on the environment.

Source: California Code of Regulations, Title 14

The environmental review process includes discovery and analysis. The decision-making process follows the analysis and may include hearings. These terms are used to characterize the activities at each stage of the process and are not necessarily used by all agencies. For example, not all agencies follow the Energy Commission's formal data adequacy stage prior to the start of the environmental review process. However, most permitting processes have a "prefiling" or application period, which provides an opportunity for applicants, lead agencies, and responsible agencies to review the application, request additional information, and identify potential concerns.

When dealing with the Energy Commission, CPUC, FERC, and other state and federal agencies, the greatest opportunity for local governments to become involved occurs during the discovery process. State and federal agencies actively solicit information and direction from local agencies to ensure compliance with LORS and compatibility with the affected communities. Public meetings and informational hearings offer additional opportunities for local agencies, and the general public, to offer input. The type of information that can be submitted and actions that can be taken may be limited once the hearings begin.

A more in-depth review of the environmental process currently underway for renewable energy projects is provided later in this chapter. The timeline and process for designating transmission corridors are also provided as is the general environmental review process undertaken by the CPUC for transmission line projects.

The upfront identification of BMPs can limit the need for extensive mitigation measures. As described in detail in Appendix C, the REAT agencies (i.e., the Energy Commission, CDFG, BLM, and USFWS) have prepared a *Best Management Practices and Guidance Manual: Desert Renewable Energy Projects* to assist in the development of effective mitigation measures for California desert projects. The manual provides recommendations to help renewable energy developers, and federal, state, local and Tribal governments, navigate the complex permitting and approval process for renewable energy projects, and address issues before completing applications or early in the discovery phase.

Determining the Lead Agency

Determining the lead agency for CEQA or NEPA purposes when more than one agency has jurisdiction is not always easy. As discussed above, some agencies have clear preemptive authority over specific energy projects, giving them lead agency status for environmental review purposes. This section attempts to shed some light on the issue of lead agency status for environmental review of electricity infrastructure projects, including power plants, transmission lines, and pipelines.

There are some general guidelines that can be followed to determine which agency (ies) will likely have primary authority over a given energy project. For example:

- Local governments are the lead agency for wind, and solar PV plants, for thermal plants 50 MW or less, generally for geothermal wells, resource conveyance lines, and other equipment related to geothermal field development, biofuel refineries, and digester, or biogas facilities.
- The Energy Commission is the state lead agency for thermal power plants 50 MW or greater and their related facilities.
- The CPUC is the state lead agency for investor-owned utility energy projects such as transmission lines, natural gas storage fields, and pipeline projects.
- Municipal utilities are normally the lead agency for their own thermal power plants under 50 MW, non-thermal plants, intrastate transmission lines, and pipeline projects. Tribal governments are the lead decision makers for power plant and transmission lines projects proposed on their lands.
- The FERC Office of Hydro-power Licensing is normally the NEPA lead agency for non-federal, (for example, projects not built by the federal government) non-exempt hydroelectric projects.
- FERC is generally the NEPA lead agency for interstate electrical transmission and natural gas pipeline projects. Facilities located in California may also have a CEQA component. .

These are not absolutes by any means. Even within each of these rather certain conditions, there are exceptions. This is particularly applicable when a project involves significant amounts of public lands or resources under the jurisdiction of a state or federal agency. Under those circumstances, the agency with ownership or control may act as the lead agency for environmental review purposes. For instance, if a proposed interstate transmission line facility crosses substantial federal lands under the management of the U.S. Forest Service, the Forest Service may be the lead agency rather than FERC.

In situations where both NEPA and CEQA apply to a project, joint or coordinated environmental analysis and documentation is common. In 2010 and for large solar thermal projects on BLM land within California, joint staff assessment/ draft environmental impact statements (SA/DEIS) were prepared by the Energy Commission and BLM. Each agency published its final document separately: a revised staff assessment by the Energy Commission and a final EIS by BLM.

When NEPA and CEQA are required and they are not jointly prepared, agencies are encouraged to avoid redundancy. According to the CEQA guidelines, if the NEPA process is completed first, the lead agency for the CEQA analysis should rely, whenever possible, on the NEPA documents instead of redoing the work. When the CEQA analysis is started first, the state or local lead agency is encouraged to initiate early consultation and work closely with the federal lead agency.

Identifying Secondary or Responsible Agencies

Secondary agencies are those that have some permitting or approval requirement over a project but are not the lead agency. Both CEQA and NEPA identify secondary agencies. CEQA defines these agencies as "responsible" and "trustee" agencies, with responsibility for carrying out or approving some part of a project in addition to the duties of the lead agency. Over the years, the relationship between a "responsible agency" and the "lead" agency has been described in both statutes and case law. Important aspects of this relationship include:

- Lead agencies must consult with responsible agencies prior to the completion of an EIR.
- Responsible agencies will comment only on aspects of the project for which they have jurisdictional authority or expertise. The lead agency is required to respond to these comments before certifying the final EIR.
- A responsible agency is limited in the scope of environmental analysis it can prepare beyond that produced by the lead agency for a given project.
- Trustee agencies[7] have jurisdiction over certain resources held in trust for the people of California.

In cases of licensing programs that have been found to be functional equivalents to CEQA EIR processes, these principles hold true, although the processes may vary slightly. Table 4.1 identifies agencies that may be considered secondary or responsible/trustee agencies for energy projects including power plants, transmission lines, storage facilities, and natural gas or oil pipelines. Under NEPA, the lead agency may request that any other federal agency which has jurisdiction by law or which has special expertise with respect to any environmental issue which should be addressed in the EIS be a cooperating agency. Additionally, a federal, state or local agency may request that the lead agency designate it as a cooperating agency.

Each cooperating agency would participate in the NEPA process at the earliest possible time, including the scoping process and assume responsibility for developing information and preparing portions of the EIS at the request of the lead agency for which it has special expertise. NEPA requires coordination with other agencies and tribes to ensure that other environmental regulations are satisfied. Therefore, lead agencies often coordinate with USFWS on the Endangered Species Act, EPA on the Clean Water Act and Clean Air Act, and with State Historic Preservation Officers on the National Historic Preservation Act.

Tables 4.2 through 4.5 provide general permitting matrices for land-based renewable energy projects under different agency jurisdictions. Because the USFWS and CDFG play a major role in the CEQA/NEPA process and its timing, they are included in these tables, along with the Energy Commission, the CPUC, local government, and BLM.

[7] Trustee agencies include the State Lands Commission, the Department of Fish and Game, Department of Pesticide Regulation and the University of California

CEQA Monitoring Requirements

Typical Implementing Ordinance Provisions of a Monitoring Program

- State purpose of and need for the program.
- Designate a monitoring program manager.
- Assign responsibilities to various departments within the agency (for example, planning or public works).
- Develop cooperative agreements with other agencies.
- Identify the project applicant's role.
- Establish an equitable fee structure to cover monitoring expenses.
- Establish enforcement procedures and penalties. Create conflict resolution and appeal provisions.
- Design reporting forms.
- Specify the review process for reporting monitoring results.
- Provide for quarterly and/or annual monitoring reports that summarize the results of the program and allow feedback to staff and decision makers.

Program Application on Specific Projects

- Require greater specificity in mitigation measures, such as to include measurable performance standards.
- Prepare a master mitigation checklist for each project.
- Assign project-specific monitoring responsibilities to agency staff or other entity for each category of mitigation measure.
- Develop a project-specific monitoring schedule for each mitigation measure category.
- Establish specific reporting requirements, including both agency monitoring reports and applicant field verification reports.

Ensuring Permit Compliance –Mitigation Planning and Monitoring

CEQA gives decision makers an opportunity to avoid or substantially reduce potentially significant adverse environmental effects by requiring impact mitigation measures. In an attempt to correct this deficiency, the California Legislature enacted PRC § 21081.6 in 1988 to ensure effective implementation of mitigation measures. The statute states that the approving entity (whether the lead agency or a responsible agency) must adopt a reporting or monitoring program that is designed to ensure compliance during project implementation. The law applies to all adopted mitigation measures included as part of a certified EIR or MND. The statute allows for substantial local flexibility in devising an appropriate mitigation monitoring program, but the mitigation measures must have a nexus to the impact, be feasible and enforceable and the monitoring program must be implemented for the life of the project or until all mitigation requirements have been met.

As a result, local agencies have generally viewed the statute as requiring both programmatic and project-specific implementation procedures. Some agencies have first developed overall implementation programs by ordinance or resolution and then applied those programs to individual projects on a case-by-case basis. The commonalities of these programs are shown in the sidebar "CEQA Monitoring Requirements."

Table 4.1: Agencies with Permit, Leasing, or Review Requirements[8]

Agency	Permit/Review	Legal Authority
FEDERAL		
Federal Energy Regulatory Commission	Hydroelectric License Application	18 CFR Part 5
Bureau of Land Management	Right-of-Way Grants Land Leases	Federal Land Policy and Management Act Mineral Leasing Act and Energy Policy Act
Bureau of Indian Affairs	Right-of-Way Grants	Title 25, United States Code sections 323-328
U.S. Fish and Wildlife Service	Biological Assessment Biological Opinion Jeopardy Opinion	Fish and Wildlife Coordination Act Endangered Species Act Federal Power Act Migratory Bird Treaty Act Eagle Protection Act
U.S. Army Corps of Engineers	404 Permit/Jurisdictional Determination	Clean Water Act
USDA Forest Service	Special Use Permit Project-specific Plan Amendment (if not designated for the use)	36 CFR 251
National Park Service	Right-of-Way Permit (for transmission lines)	Title 16, United States Code section 79
US Environmental Protection Agency	Adequacy of NEPA review Prevention of Significant Determination	Section 309, Clean Air Act Section 112, Clean Air Act
Bureau of Reclamation	Hydroelectric License Application Overhead Crossing Permit Lease of Power Privilege	Federal Power Act Reclamation Act
Department of Defense	Land use Compatibility	Special Use Airspace Military Training Routes
Department of Energy	Designate energy transport corridors Designate national interest electric transmission corridors	Section 368, Section 1221(a) Energy Policy Act of 2005
Department of Transportation	Transport of Hazardous Materials	Title 49, Code of Federal Regulations, 100-185
Federal Aviation Administration	Airspace Review	Title 14, Code of Federal Regulations, Part 77
Advisory Council on Historic Preservation	Historic Preservation Advisory Comments	National Historic Preservation Act of 1966, as amended 36 CFR Part 800
CALIFORNIA		
Energy Commission	Certification	Warren-Alquist Act
Public Utilities Commission	Certificate of Public Convenience and Necessity Permit to Construct	Public Utilities Act
State Lands Commission	Land Use Lease Geothermal Exploration or prospecting leasing (oil, gas & other minerals)	Public Resources Code section 6000 et seq.
Department of Fish & Game	Approval Stream or Lake Alteration Permit Dredging Permit Endangered Species Take Permit	CA Endangered Species Act, Fish & Game Code section 2090 Fish and Game Code section 1600-7 5650-53.9, 11037
Department of Transportation	Encroachment Permit	Facilities that impact state highways
Dept. of Conservation, Div. of Oil, Gas & Geothermal Resources	Notice of Intention Oil, Gas, or Geothermal Well Permit	Title 14. California Code of Regulations. Div 2
Dept. of Water Resources, Div. of Safety of Dams	Plan Approval	Water Code, Div. 3, Part 1 & 2

[8] Appendix C summarizes many of the authorities referenced in Table 4.1.

Agency	Permit/Review	Legal Authority
Department of Resources Recycling and Recovery	Solid Waste Facility Permit	Government Code sections 66796.32 Public Resources Code section 40000
Dept. of Toxic Substances Control	Permit to Operate	Health & Safety Code, Div. 20, Ch. 6.5
Coastal Commission, San Francisco Bay Conservation and Development Commission	Development Permit Consistency with Local Coastal Plan Consistency with federally approved Coastal Management Plan	CA Coastal Act 1976, Public Resources Code section 30000 et seq. McAteer-Petris Act, Public Resources Code section 66600 et seq. Suisun Marsh Preservation Act of 1977, Public Resources Code section 29000 et seq. Coastal Zone Management Act, 16 United States Code section 3501 et seq.
Cal-OSHA	Construction-related Requirements	29 CFR 910.0
State Fire Marshal, Office of Pipeline Safety	Hazardous Materials report approvals DOT approvals	Hazardous Liquid Pipeline Safety Act o f 1979, as amended
State Historic Preservation Officer	Section 106 c consultation	National Historic Preservation Act of 1966, as amended 36 CFR Part 800
Department of Forestry & Fire Protection	Timber Operations License Timber Harvesting Plan Timberland Conversion Permit Fire Permit	Public Resources Code section 4511 et seq., 4521 et seq. Public Resources Code section 4100 et seq.
Department of Parks & Recreation	Right-of-Way Permit	Public Resources Code section 5012
State Water Resources Control	Certification of Adequacy of Water Rights Permit to Appropriate Water Statement of Diversion and Use NPDES permit Clean Water Act Section 401 Certification	Public Utilities Code section 2821 Water Code, Div. 1 & 2
Reclamation Board	Encroachment Permit	Water Code section 8590 et seq.
OTHER AGENCIES		
Local Agencies	General Plan Compliance, Specific Plan Compliance Zoning Code/Ordinance Compliance Coastal Development Permit (if in Coastal Zone) & Coastal Consistency Determination Local Coastal Plan/Program Compliance (if in Coastal Zone) Encroachment Permit Building Permit Subdivision Map Act Compliance Williamson Act Compliance Airport Land Use Plan Any other special plans/standards specific to a jurisdiction	Varying and depending on jurisdiction
Air Districts	Preliminary/Final Determination of Compliance Permits to Construct/Operate	Warren-Alquist Act Clean Air Act
Regional Water Quality Control Boards	NPDES Permits 401 Certifications	Clean Water Act; Porter Cologne Water Quality Control Act; CA Water Code Section 13000
Municipal Utilities	Project Approval	Locally Elected Governing Boards
California ISO	LGIA/SGIA	FERC Order No. 2003-C

Source: Aspen Environmental Group

Table 4.2: Permitting Matrix: Projects < 50 MW on Private Lands

	CEC	CPUC or POU	LOCAL	BLM	USFWS*	CDFG**	POU or CAISO	Air District***
Wind	--	PPA Approval	CEQA/CUP	--	FESA Section 10a or Section 7	CESA ITP or NCCP/LSAA	SGIA or LGIA	
Solar PV	--	PPA Approval	CEQA/CUP	--	FESA Section 10a or Section 7	CESA ITP or NCCP/LSAA	SGIA or LGIA	
Solar Thermal	--	PPA Approval	CEQA/CUP	--	FESA Section 10a or Section 7	CESA ITP or NCCP/LSAA	SGIA or LGIA	Operating permit
Biofuels - Generation	--	PPA Approval	CEQA/CUP	--	FESA Section 10a or Section 7	CESA ITP or NCCP/LSAA	SGIA or LGIA	Operating permit
Geothermal	--	PPA Approval	CEQA/CUP	--	FESA Section 10a or Section 7	CESA ITP or NCCP/LSAA	SGIA or LGIA	Operating permit
Fossil Fuel	--	PPA Approval	CEQA/CUP	--	FESA Section 10a or Section 7	CESA ITP or NCCP/LSAA	SGIA or LGIA	Operating permit

** assumes FESA species present; ** assumes CESA species present, CESA Consistency Determination may be applicable; *** wind and solar PV would (usually) be exempt from air operating permits, unless they have a stationary source for support*
Source: Department of Fish and Game, 2009

Table 4.3: Permitting Matrix: Projects > 50 MW on Private Lands

	CEC	CPUC or POU	LOCAL	BLM	USFWS*	CDFG**	POU or CAISO	Air District***
Wind	--	PPA Approval	CEQA/CUP	--	FESA Section 10a or Section 7	CESA ITP or NCCP/LSAA	LGIA	
Solar PV	--	PPA Approval	CEQA/CUP	--	FESA Section 10a or Section 7	CESA ITP or NCCP/LSAA	LGIA	
Solar Thermal	CEQA/ License	PPA Approval	--	--	FESA Section 10a or Section 7	CEC Consultation	LGIA	Operating permit
Biofuels - Generation	CEQA/ License	PPA Approval	--	--	FESA Section 10a or Section 7	CEC Consultation	LGIA	Operating permit
Geothermal	CEQA/ License	PPA Approval	--	--	FESA Section 10a or Section 7	CEC Consultation	LGIA	Operating permit
Fossil Fuel	CEQA/ License	PPA Approval	--	--	FESA Section 10a or Section 7	CEC Consultation	LGIA	Operating permit

** assumes FESA species present; ** assumes CESA species present, CESA Consistency Determination may be applicable; *** wind and solar PV would (usually) be exempt from air operating permits, unless they have a stationary source for support*
Source: Department of Fish and Game, 2009

CEC *California Energy Commission*
CPUC *California Public Utilities Commission*
LOCAL *Local Government*
BLM *Bureau of Land Management*
USFWS *United States Fish and Wildlife Service*
CDFG *California Department of Fish and Game*
CEQA *California Environmental Quality Act*
PPA *Power Purchase Agreement*
CUP *Conditional Use Permit*
FESA *Federal Endangered Species Act*
CESA ITP *California Endangered Species Act Incidental Take Permit*
NCCP/LSAA *Natural Communities Conservation Planning/Lake and Streambed Alteration Agreement*
LGIA *Large Generator Interconnection Agreement*
SGIA *Small Generator Interconnection Agreement*

Table 4.4: Permitting Matrix: Projects < 50 MW on Public Lands

	CEC	CPUC or POU	LOCAL	BLM	USFWS*	CDFG**	POU or CAISO	Air District***
Wind	--	PPA Approval	--	NEPA/ROW	FESA Section 7	CEQA/CESA ITP or NCCP/LSAA	SGIA or LGIA	
Solar PV	--	PPA Approval	--	NEPA/ROW	FESA Section 7	CEQA/CESA ITP or NCCP/LSAA	SGIA or LGIA	
Solar Thermal	--	PPA Approval	--	NEPA/ROW	FESA Section 7	CEQA/CESA ITP or NCCP/LSAA	SGIA or LGIA	Operating permit
Biofuels - Generation	--	PPA Approval	--	NEPA/ROW	FESA Section 7	CEQA/CESA ITP or NCCP/LSAA	SGIA or LGIA	Operating permit
Geothermal	--	PPA Approval	--	NEPA/ROW	FESA Section 7	CEQA/CESA ITP or NCCP/LSAA	SGIA or LGIA	Operating permit
Fossil Fuel	--	PPA Approval	--	NEPA/ROW	FESA Section 7	CEQA/CESA ITP or NCCP/LSAA	SGIA or LGIA	Operating permit

** assumes FESA species present; ** assumes CESA species present, CESA Consistency Determination may be applicable; *** wind and solar PV would (usually) be exempt from air operating permits, unless they have a stationary source for support*

Source: Department of Fish and Game, 2009

Table 4.5: Permitting Matrix: Projects > 50 MW on Public Lands

	CEC	CPUC or POU	LOCAL	BLM	USFWS*	CDFG**	POU or CAISO	Air District***
Wind	--	PPA Approval	--	NEPA/ROW	FESA Section 7	CEQA/ CESA ITP or NCCP/LSAA	LGIA	
Solar PV	--	PPA Approval	--	NEPA/ROW	FESA Section 7	CEQA/ CESA ITP or NCCP/LSAA	LGIA	
Solar Thermal	CEQA/ License	PPA Approval	--	NEPA/ROW	FESA Section 7	CEC Consultation	LGIA	Operating permit
Biofuels - Generation	CEQA/ License	PPA Approval	--	NEPA/ROW	FESA Section 7	CEC Consultation	LGIA	Operating permit
Geothermal	CEQA/ License	PPA Approval	--	NEPA/ROW	FESA Section 7	CEC Consultation	LGIA	Operating permit
Fossil Fuel	CEQA/ License	PPA Approval	--	NEPA/ROW	FESA Section 7	CEC Consultation	LGIA	Operating permit

** assumes FESA species present; ** assumes CESA species present, CESA Consistency Determination may be applicable; *** wind and solar PV would (usually) be exempt from air operating permits, unless they have a stationary source for support*

Source: Department of Fish and Game, 2009

CEC *California Energy Commission*
CPUC *California Public Utilities Commission*
LOCAL *Local Government*
BLM *Bureau of Land Management*
USFWS *United States Fish and Wildlife Service*
CDFG *California Department of Fish and Game*
CEQA *California Environmental Quality Act*
PPA *Power Purchase Agreement*
CUP *Conditional Use Permit*
FESA *Federal Endangered Species Act*
CESA ITP *California Endangered Species Act Incidental Take Permit*
NCCP/LSAA *Natural Communities Conservation Planning/Lake and Streambed Alteration Agreement*
LGIA *Large Generator Interconnection Agreement*
SGIA *Small Generator Interconnection Agreement*

Elements of a Successful Mitigation Monitoring Program

The basic elements of a successful mitigation monitoring program include:

- Well-written conditions specifying the required actions, timing, and methods for satisfactory implementation of the mitigation measures.
- Specific reporting procedures and monitoring requirements for the project developer/operator and the responsible monitoring agency. This includes identification of those parties responsible for completion and/or verification of the required actions.
- Established methods or protocols and qualified monitors to verify compliance.

Well-Written Conditions. It is essential that conditions be "SMARTE," that is, specific, measurable, agreed upon, realistic, time certain, and enforceable. Without these elements and a follow-up program, success cannot be guaranteed, determined or measured. Vaguely worded mitigation requirements result in poor implementation and disappointing results.

Reporting and Monitoring. It is also important to identify the parties responsible for implementation of the mitigation measures, verification, and reporting. This is usually the project proponent and/or operator but may also be the lead or responsible agency or their subcontractor/consultant. Ultimately, however, it is the responsibility of the lead agency to ensure that the mitigation program is followed and the mitigations are adequately implemented. Clear, concise mitigation measures with specific implementation requirements, including reporting schedules and milestones, make it easier for all parties to comply with the project requirements. Site visits complement compliance report submittals.

SMARTE Principles for Mitigation Measures

Specific: Provide clear direction so that all parties understand what, and in some cases how, mitigation or other required activities need to be done.

Measurable: Provide an objective for measuring (determining) whether a condition has been met.

Agreed Upon: Strive for agreement with the project owner, other agencies, and interested parties on the condition requirements.

Realistic: Strive for the simplest, most direct, and least-costly condition requirements that will achieve the required or desired goal.

Time Certain: Provide clear realistic time frames for compliance with each condition.

Enforceable: Provide a practical method for verifying that the required activities have been done in the specified time frames.

Environmental Expertise. The expertise and involvement of the trustee/responsible agency (for example, CDFG, or the local air district) are an essential part of a successful mitigation monitoring program. Environmental expertise provides the means to ensure that implementation of the mitigation measures is adequate and timely. Qualifications for those monitoring mitigation activities or verifying information should be specified as part of the mitigation monitoring program. Monitoring of site activity can be accomplished using periodic reports from the developer and onsite inspections. If the responsible monitoring staff does not possess the necessary environmental expertise to evaluate the submitted reports or oversee fieldwork, the agency should hire knowledgeable consultants and include consultant charges in its fee structure.

Environmental Review Processes for New Energy Infrastructure

This section discusses the environmental permitting processes for energy infrastructure, including power plant siting, transmission corridors, and transmission line siting. It identifies where local and Tribal governments can participate in processes conducted by other agencies.

Energy Commission Power Plant Siting Process

The "siting process" is a chain of events leading to a decision by the five-member Energy Commission to approve or to disapprove construction of a thermal power plant with a capacity of at least 50 MW, and related facilities such as transmission and water lines. At the Energy Commission, the siting process is used to evaluate the proposed power plant project—the location, design and construction as well as the impact on public health, safety, the environment, and the general welfare.

The Energy Commission's siting process has the following characteristics:

- It is a certified regulatory program that is functionally equivalent to a review under CEQA.
- The Energy Commission staff is an independent, objective party to the proceeding.
- Intervenors are granted formal participation and have specific responsibilities in the siting case.
- A committee of the Commission hears evidence, the Presiding Member of the Committee puts forth a Proposed Decision, and the full Commission approves or rejects the application.
- Ex parte communication is prohibited between any party and an Energy Commission decision maker.
- A Public Adviser provides independent advice on ways to participate in the regulatory process.
- Agencies may intervene in a siting case and, although not eligible for reimbursement of such expenses, they may still be reimbursed for the costs of complying with Energy Commission requests for comments and recommendations.

Interested Parties

A number of parties can take part in the siting process including:

- The applicant seeking approval for a project through the siting case. Applicants prepare siting documents for processing and decision under these procedures and must provide sufficient evidence to prove the facts required by law for the Energy Commission to approve a certification or exemption.
- Energy Commission staff reviews the siting case as an independent, objective party to the proceeding. The staff coordinates responsibilities with other federal, state, and local agencies, and accomplishes necessary field studies.
- Intervenors (which may include local governments) are granted formal participation in a siting case. Notice of all meetings, workshops, conferences, and hearings will be sent to the intervenor, and the intervenor may attend and participate in any of these. The intervenor will also have the responsibility of answering data requests from other parties, and responding to committee orders, in addition to presenting its own testimony and expert witnesses and conduct cross examination of other parties' witnesses.
- Members of the public are encouraged to become participants in siting activities. The public can participate without having to intervene in the case. Interested persons will have an opportunity to make a presentation of

personal views, listen to, and analyze all other views. These remarks are received as "comments" and are made part of the administrative record and/or the hearing record.

- For power plant applications within the coastal zone, the Coastal Commission is to provide the Energy Commission with recommendations about how the project can meet the objectives of the Coastal Act.

The Energy Commission encourages and invites interested agencies, organizations, associations, and the public to take part in the siting process. The Energy Commission fully considers all input from other government agencies and actively solicits recommendations and can approve a local agency's request for reimbursement to participate.

The Energy Commission's Public Adviser helps the public understand the process and complexities of all Commission meetings, workshops, and hearings and makes recommendations for the best way to be involved. The Energy Commission publishes the Public Adviser Brochure and Public Participation in the Siting Process: Practice and Procedure Guide to explain the different ways the public can participate in the siting process, including information about the ways of getting notified about ongoing projects, methods of participating in projects, and the ways to become an intervenor in a siting case. The brochure also includes the Public Adviser's Office contact information for any additional questions. The Energy Commission provides an excellent interactive tool (Summary of Typical Public Involvement Opportunities in Energy Commission Siting Cases) that describes the various stages in the siting process and opportunities for public involvement.

California SB 1059 Corridor Designation Process

In recognition of the increasing difficulty in siting new transmission lines, in 2006, California lawmakers and Governor Schwarzenegger approved the implementation of SB 1059 (Escutia and Morrow, Chapter 638, Statutes of 2006). This bill recognized that there is a critical need to develop transmission infrastructure in California, as well as a need to implement an integrated, statewide approach to electric transmission planning and permitting. The intent of SB 1059 is:

> *"…to provide a bridge between the transmission planning process and the permitting process by designating transmission corridor zones (transmission corridors) on state and private lands available for future high-voltage electricity transmission projects, consistent with the state's electricity needs identified in the biennial Integrated Energy Policy Report (Energy Report) and Strategic Transmission Investment Plan (Strategic Plan)".*

For more information, see http://www.energy.ca.gov/sb1059/index.html.

The SB 1059 Corridor Designation process is defined in California Public Resources, Sections 2320 to 2340, and is also described on the Energy Commission's website. In July 2008, the Energy Commission published *Designations of Transmission Corridor Zones Regulations*. Local government's role in transmission corridor designation under SB 1059 is extensive. (See sidebar.) Because no applications for corridors have yet been filed, the process has not been tested. In general, the Energy Commission is required to take the following steps after an application is filed and found to be data adequate:

- Publish a summary of the application in a local newspaper and notify all property owners within or adjacent to the proposed transmission corridor.
- Provide a copy of the application to all affected or responsible jurisdictions, publish the application on its website, and notify the public that the application is available. Notify, solicit information from, and confer with cities, counties, state and federal agencies, and California Native American Tribes in whose jurisdiction the transmission corridor is proposed and provide ample opportunity for review of the proposed transmission corridor.

- Solicit comments from stakeholders on the suitability of the proposed transmission corridor with respect to environmental, public health and safety, land use, economic, transmission system impacts, and other factors.
- Within specified time frames, hold informational hearings and a prehearing conference, prepare an environmental report, and issue a proposed decision on designation of the transmission corridor.
- After the designation of a transmission corridor, publish the decision on its website and send notification to specified parties.

Local Government Role in SB 1059 Corridor Designation Process Steps

1. Energy Commission publishes summary of application in each county where corridor is proposed and notifies all property owners who are potentially affected.
2. Energy Commission provides copies of application to cities, counties, and state and federal agencies having an interest in proposed corridor.
3. Energy Commission invites affected cities, counties, state and federal agencies, and the California Native American Tribes to participate in review of proposed transmission corridor.
4. Cities and counties provide comments regarding environmental, public health and safety, land use, economic, transmission system impacts, and other factors.
5. Hearings held in affected county or counties and decision published on the Energy Commission's website.
6. Copy of decision sent to affected city, county, state and federal agencies, and property owners.
7. Cities and counties notify the Energy Commission within 10 days if they receive a land use development application that could impact transmission corridor.
8. Cities or counties must allow the Energy Commission up to 60 days for written comments on proposed development.
9. City or county considers the Energy Commission's comments before making a decision regarding development in question.
10. If Energy Commission objects to the project, the affected city or county must respond in writing to explain why it rejected the Energy Commission's comments and recommendations.

Utility corridors can vary greatly in size. Utility corridors located on BLM administered land can be up to two miles in width. A DOE National Interest Energy Transmission Corridor encompasses seven counties in Southern California. The Energy Commission requires that the corridor designation application include a detailed description of the proposed transmission corridor, including width (not to exceed 1,500 feet). The RETI and DRECP processes evaluate transmission lines needed to access renewable energy and could help identify transmission corridors that could be reviewed under SB 1059.

New transmission corridors or lines are often controversial, especially if they require new rights-of-way. The Energy Commission has developed an interactive Web-based application known as planning alternative corridors for transmission lines (PACT) to support more useful and informed stakeholder involvement in corridor identification and selection. PACT is described in Chapter 2.

CPUC Transmission Line Siting Process

As with the siting of power plants, the siting of transmission lines has a number of phases. To begin a transmission siting process, an IOU under the jurisdiction of the CPUC files an application with the CPUC for a certificate of public convenience and necessity (CPCN) to construct a transmission line larger than 200 kV. The CPUC has two parallel

review processes for a transmission application for a CPCN: the general proceeding and the environmental review. *The Transmission Line Application Process: A Step-by-Step Guide* describes this process.

An administrative law judge (ALJ) oversees the formal proceeding. The proceeding includes the review of the project need and costs. The need for the project may be based on economic, reliability, or renewable goals, or any combination of the three. Participation in this review is limited to official parties. To become a party, one must submit a formal protest within 30 days after the filing of the CPCN application.

A general proceeding can include pre-hearing conferences, evidentiary hearings, and public participation hearings. Stakeholders and qualified experts can offer their opinions on need and cost-benefit of the project. After giving expert testimony, the witnesses are offered for cross-examination by other participants in the proceeding.

Similar to the Energy Commission process, the CPUC carries out the environmental review/public participation process mandated under CEQA to identify, evaluate, and mitigate the possible impacts of the project on the environment. The CEQA environmental review process is administered by CPUC staff, and invites broad public participation through scoping meeting(s), public comment meeting(s), and written comment periods, as follows:

Public Scoping and Workshops - At an early point in the process, the CPUC holds a series of public scoping meetings in the project area to facilitate public input and solicit the community's comments and recommendations regarding the proposed project. The CPUC also consults with various local, State, and federal agencies to determine their concerns and encourage their involvement in the project development process.

Draft EIR - Based on the public comments and information collected from the scoping meetings and in-the-field environmental studies, the CPUC prepares a Draft Environmental Impact Report (DEIR). The DEIR will identify the "environmentally superior" alternative from the range of project alternatives previously evaluated.

Public Meetings and Comments on Draft EIR - Upon publication, the DEIR is circulated to the public for 45 days for review and comment. During this period, the CPUC once again holds several community meetings in the project area to solicit public comments with regard the adequacy of the DEIR.

Final EIR - Comments from the public are addressed and incorporated into a Final EIR (FEIR). The document is then forwarded to the CPUC ALJ who incorporates the major findings and mitigation measures identified in the FEIR along with the information generated during the process of determining need and costs into a draft CPUC decision. The draft decision is then circulated for 30 days to all parties to the proceeding. CPUC Commissioners vote on the proposed decision in a public meeting. An alternative decision which approves an alternate route evaluated in the EIR may also be prepared by a Commissioner. The CPUC may approve the utility's proposed project, an alternate project, or no project.

POU Transmission Line Siting Process

POUs typically develop annual transmission plans on a multi-year basis, as well as a 10-year basis. The POU submits its 10-year transmission plan to the Energy Commission. Transmission planning may be coordinated with other transmission providers if the line involves other jurisdictions. The POU would work with stakeholders to identify a preferred transmission line route as well as alternative routes.

The POU would serve as lead agency for the CEQA review of the project. An Initial Study/Mitigated Negative Declaration (IS/MND) or an Environmental Impact Report (EIR) would be prepared to: 1) inform decision makers and the public of the potential environmental impacts that are expected to result from the construction, operation, and maintenance of the proposed project; 2) determine ways to minimize or avoid significant effects; and 3) identify alternatives that may avoid or minimize potential significant impacts.

The draft document would be circulated for public review during which time public hearings and public workshops would be conducted. Comments received would be addressed and incorporated into the Final environmental document. Decision making would be in the hands of the POU Board, which would consider both the environmental document and all comments received during the public review period when considering approval of the project.

California ISO Interconnection Process

The California ISO is responsible for ensuring electric system reliability and for developing the standards necessary to achieve system reliability. The California ISO evaluates new transmission lines that connect a power plant to an existing transmission line to determine the reliability impacts of the proposed transmission modifications on the existing transmission. These interconnection studies determine the best way to safely and reliably interconnect new generation resources to the grid. The interconnection studies consider the collective impact to the grid of all new generation that is connecting at roughly the same time. The California ISO may identify transmission additions or upgrades downstream from the interconnection point to insure reliability of the transmission grid. These additions or upgrades may take place in different locations. As part of the review, the California ISO allocates the cost responsibility for any additions or upgrades to the owner of the proposed interconnection. The ISO ultimately executes either a Large Generator Interconnection Agreement (LGIA) or Small Generator Interconnection Agreement (SGIA) with the project owner.

The process used by the California ISO to evaluate interconnections has recently changed. The generator interconnection study process transitioned from a serial process to an interconnection window cluster study process. The California ISO has had different processes for evaluating interconnection requests from small generators (<20 MW) and large generators (>20 MW). The Small Generator Interconnection Process (SGIP) involved evaluating projects in a serial manner, which meant that a single, small generator could provide the "tipping point" for requiring a large, expensive upgrade to the transmission line and then would be responsible for the entire cost of an addition or upgrade. The California ISO recently changed from a serial process to a clustered process for large generators to, in part, address this issue. Additionally, the California ISO will combine the study process for the small and large generators. A generator facility 2 MW or less will continue to have the option to be evaluated under a fast track process.

New transmission modifications or additions may require CEQA review as part of the "whole of the action." CEQA requires the analysis of reasonably foreseeable consequences of proposed projects based on the best available information. In this case, the lead agency (e.g., the Energy Commission for a > 50 MW solar thermal plant) would use the best available information (typically a System Impact Study from the IOU or a Phase I Study from the California ISO) for the CEQA evaluation.

Table 4.6: Comparison of CEQA and NEPA Requirements

EIR Requirements (CEQA)	EIS Requirements (NEPA)
Notice of Preparation (NOP) • Must include: project description, location of project (with topographical map), a discussion of potentially significant environmental issues. • Filed with State Clearinghouse/Office of Planning and Research (OPR) and appropriate county and city clerks. • Must be sent to responsible and trustee agencies, involved federal agencies, and parties previously requesting notice in writing. • Must be sent by either certified mail or other method of transmittal that provides a record of receipt (proof of service). • May be sent to all parties who might be interested in the project, including neighboring landowners, but not required.	**Notice of Intent (NOI)** • Must include: description of the proposed action and alternatives, scoping process, and information on scoping meetings, and lead agency contact information. • Published in the Federal Register. • Published in local newspapers and sent to interested agencies and organizations. • May send NOI to the State Clearinghouse and property owners, but not required.
Scoping Process (30 days) • 30-day period that begins with issuance of the Notice of Preparation. • Formal scoping meetings optional, but not required, except for projects affecting highways (at the request of the Department of Transportation) or projects of statewide/regional/area-wide significance. • Solicits comments from public and potentially affected agencies.	**Scoping Process** • Initiation of the scoping period must occur with issuance of the NOI, but may begin earlier if there is appropriate public notice and information available. • Time limits may be set for determining the scope of the EIS, at the discretion of the federal lead agency. • Formal scoping meetings are optional under NEPA, but may be required by the individual agencies.
Draft EIR • Must include analysis of the significant environmental effects of the project, including direct, indirect, short-term, long-term, cumulative, and unavoidable impacts, as well as any impacts related to required mitigation. • Requires meaningful evaluation of alternatives that reduce significant impacts, but in less detail than the proposed project. At a minimum, the "no-project" and environmentally superior alternatives must be addressed. • Must file 1 copy of Notice of Completion (NOC) and 15 copies of DEIR with State Clearinghouse.	**Draft EIS** • Must determine if proposed action has the potential to significantly affect the quality of the human environment, including direct, indirect, cumulative, growth-inducing, and unavoidable effects. • Requires full range of alternatives to be evaluated in relatively similar level of detail as the proposed action, including the "no project" alternative. • Must file draft EIS with the U.S. Environmental Protection Agency (USEPA).
Agency/Public Review and Comment (45 days typical) • 45-day period that begins with submittal of draft EIR and NOC to State Clearinghouse. • Notice of Availability (NOA) must be issued to county clerk, responsible and trustee agencies, involved federal agencies, and parties previously requesting notice in writing. • NOA must be published in a newspaper of general circulation, posted on and off the project site, or directly mailed to neighboring landowners. • Formal public hearings to solicit comments are not required.	**Agency/Public Review and Comment (45 days)** • Minimum 45-day period that begins with publication of the Notice of Availability (NOA) in the Federal Register by USEPA. • A request to comment, or the NOA, must be sent to any federal agency which has jurisdiction by law or special expertise with respect to any environmental impact, appropriate state and local agencies, Indian tribes when appropriate, and any agency which has requested that it receive statements on the actions of the kind proposed. • Must send Draft EIS to federal agencies with jurisdiction by law or special expertise, environmental regulatory agencies, project applicant, and parties requesting copies. • Must conduct public hearings if there is substantial environmental controversy, substantial interest in a hearing, or if requested by a federal agency with jurisdiction over the action.
Recirculation • Must recirculate an EIR to responsible and trustee agencies for consultation and give new public notice whenever significant new information has been added to the EIR after the draft has been available for review, but before certification of the final EIR.	**Recirculation** • If a cooperating agency with jurisdiction by law determines that the EIS is wrong or inadequate, it must prepare a supplement to the EIS, replacing or adding any needed information, and must circulate the supplement as a draft for public and agency review and comment.

EIR Requirements (CEQA)	EIS Requirements (NEPA)
Final EIR • Contains original or revised Draft EIR; comments received, either verbatim or in summary, and list of those commenting; and lead agency's responses to significant environmental points raised in review and consultation process. • Must provide copy of lead agency's responses to any public agency that submitted comments at least 10 days prior to certifying final EIR. • Lead agency must certify final EIR before approving the project. • May file final EIR with State Clearinghouse; not required. • May provide public review period for final EIR; not required.	**Final EIS** • Contains lead agency's responses to all received comments; discusses any opposing views on issues. • Must file final EIS with USEPA and publish NOA in Federal Register. • 30-day public review of Final EIS begins with publication of NOA in Federal Register. • Must provide final EIS to federal agencies with jurisdiction by law or special expertise, environmental regulatory agencies, project applicant, parties requesting copies of EIS, and parties who submitted substantive comments. • Agency may adopt final EIS following 30-day review period.
Findings • Findings are made at the time project is approved. • Findings must explain how lead agency dealt with each significant impact in the EIR. **Mitigation** • Must include mitigation measures that reduce all significant impacts to a less than significant level, or justify why project should be approved regardless of impacts (see Statement of Overriding Consideration). Must include mitigation measures to reduce impacts to the extent feasible, even with Statement of Overriding Consideration. • Must adopt mitigation monitoring program in conjunction with project approval. • Program must ensure compliance with mitigation measures. **Statement of Overriding Consideration** • Must be prepared if approving a project with unavoidable significant impacts; • Statement must explain why lead agency is willing to approve the project, in spite of each significant effect.	**Mitigation** • EIS must suggest mitigation measures that would reduce any potentially significant effects to the extent feasible, but there is no requirement for the agency to impose them, even if feasible.
Notice of Determination (NOD) • Must file NOD with county clerk within 5 working days of project approval; • Must file NOD with State Clearinghouse if discretionary approval (e.g., permits) is required from a state agency; • Filing of the NOD begins 30-day statute of limitations on court challenges to the lead agency's decision.	**Record of Decision (ROD)** • Decision may not be made until 90 days after publication of NOI for the draft EIS or 30 days after publication of NOA for final EIS, whichever occurs last. • ROD must include explanation of the agency's decision, alternatives considered, and monitoring and enforcement program for adopted mitigation measures. • ROD must be made available to the public. • May publish ROD in Federal Register, but not required. • No statute of limitations is provided under NEPA, although the six-year federal limit generally applies.
Appeal • NOD triggers a 30-day statute of limitations for CEQA litigation. • If the notice is not filed with the County Clerk or OPR, the statute of limitations becomes 180 days from the date the decision is made to carry out or approve a project, or where no formal decision is required, 180 days from the date the project is commenced	**Appeal** • NEPA regulations provide for an administrative appeal process of the final decision. The exact process is detailed in the individual agency NEPA regulations. • Appeals process/period is usually 30 days after the draft agency ROD has been issued/published in the Federal Register
Major Differences to Be Considered	
Time Limits. NEPA documents are not subject to specific time limits. In contrast, non-agency (private) CEQA development projects are subject to the Permit Streamlining Act. Projects with federal involvement may be exempt from these requirements. **Alternatives.** NEPA requires an evaluation of all reasonable alternatives in similar detail to the proposed action/preferred alternative [40 C.F.R. 1502.14]. CEQA requires an evaluation of the comparative merits of each alternative, but in less detail than the proposed project. **Socioeconomic Impacts.** Under NEPA, economic and social effects must be discussed if they are related to a physical or human impact. Under CEQA, economic and social changes resulting from a project are not treated as significant effects on the environment. However, if a physical change in the environment will result in economic and social changes, which in turn have secondary physical effects (for example, loss of shopper's results in the physical deterioration of an area); those effects must be evaluated in an EIR. **Public Review.** NEPA requires public notice and review of the final EIS (typically 30 days), while CEQA does not require public review of the final EIR. Under CEQA, reviewing agencies must be provided with responses to their comments at least 10 days prior to certification of the final EIR. **Statute of Limitations.** NEPA contains no specific statute of limitations. CEQA provides a short statute of limitation for legal challenges (30 days from date of project approval if a NOD is filed; 180 days if no NOD).	

Source: CEQA and NEPA Documentation

Appendix A: Definitions and Glossary of Acronyms

TERM	DEFINITION
Adequacy	Having sufficient resources to provide customers with a continuous supply of electricity at the proper voltage and frequency, virtually all of the time. "Resources" refers to a combination of electricity generation and transmission facilities that produce and deliver electricity, and "demand-response" programs, which reduce customer demand for electricity.
Baseload generation	Electricity generated from a power plant that is designed and intended to provide a steady supply of electricity for many homes during the year (at least 60 percent of its annual capacity). Examples are nuclear and geothermal power plants.
Bulk power system	The part of the overall electrical system that includes the generation and transmission of electricity over high-voltage transmission lines to distribution entities.[9] The bulk power system includes electricity generation facilities, transmission lines, interconnections between neighboring transmission systems, and associated equipment. It does not include the local distribution of the electricity to homes and businesses.
Demand	The amount of electricity required at any given time to meet customer needs.
Combined Cycle	Power plant where a gas turbine generator generates electricity and the waste heat is used to make steam to generate additional electricity via a steam turbine; this last step enhances the efficiency of electricity generation. Most new gas power plants in California are of this type.
Congestion	A condition that occurs when insufficient transmission transfer capacity is available to implement all needs simultaneously.
Demand response	Changes in electric usage by end-use customers from their normal consumption patterns in response to changes in the price of electricity over time, or to incentive payments designed to induce lower electricity use at times of high wholesale market prices or when system reliability is jeopardized.
Demand-side management (DSM)	Programs that encourage customers to use less electricity, use it at different times of day, or allow system operators to interrupt their electricity supply during peak demand times.
Distribution	The local delivery of electricity to customers.
Generating facility	Power plants or other facilities where electricity is produced.
Generation	The process of creating electric energy by transforming other forms of energy into electricity.

[9] The distribution entities are generally investor owned utility companies, or publicly owned utilities and irrigation districts.

TERM	DEFINITION
Grid	The network of interconnected transmission lines that transport electricity from power plants and other generating facilities to local distribution areas.
Independent System Operator (ISO)	An independent entity that monitors and controls the electricity and transmission networks in real time, to maintain its integrity and regulate generating supplies to keep them balanced with customer demand.
Kilowatt	A unit of power equal to one thousand watts
Kilowatt-hour	A unit of power equal to one thousand watts used in an hour.
Load	The amount of electric power supplied to meet one or more end user's needs.
Megawatt	A unit of power equal to 1 million watts.
Megawatt-hour	A unit of power equal to 1 million watts used in an hour.
Peak demand	Greatest amount of kilowatts needed during a demand interval.
Peaker or peaker power plant	Generally simple cycle gas turbines (no steam turbine) that burn natural gas that can be turned on and off within minutes. They are usually used during peak demand periods for electricity, such as hot summer afternoons when air conditioners are running.
Right-of-Way	Land, property, or interest therein, usually in a strip, acquired for infrastructure such as electric power lines. The land is set aside as an easement or in fee, either by agreement or by condemnation.
Reliability	The ability to meet the electricity needs of end-use customers, even when unexpected infrastructure failures occur or other factors reduce the amount of available electricity.
Transmission	The transportation of electricity over high-voltage lines and equipment, from generating facilities or other transmission facilities, to a point where it is transformed into voltages usable by and distributed to customers.

ACRONYM	MEANING
AB	California Assembly Bill
AFC	Application for Certification
ALJ	Administrative Law Judge
AMI	Advanced metering infrastructure
APCD	Air Pollution Control District
ARB	California Air Resources Board
ARRA	American Recovery and Reinvestment Act of 2009
ATP	Annual Transmission Plan
BA	Biological Assessment
BACT	Best Available Control Technologies
BCDC	San Francisco Bay Conservation and Development Commission
BLM	Bureau of Land Management
BMP	Best management practice
C3ETP	Central California Clean Energy Transmission Project
California ISO	California Independent System Operator
CCS	Carbon capture and storage
CDCA	California Desert Conservation Act
CDFG	California Department of Fish and Game
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CH_4	Methane
CO	Carbon monoxide
CO_2	Carbon dioxide
COG	Council of Governments
CPCN	Certification of Public Convenience and Necessity
CPUC	California Public Utilities Commission
CREZ	Competitive Renewable Energy Zone
CRHR	California Register of Historical Resources
CRS	Cultural Resources Specialist

ACRONYM	MEANING
CTPG	California Transmission Planning Group
CUP	Conditional use permit
DA	Data adequacy
dB	Decibel
dBA	A-weighted sound level
DEIS	Draft environmental impact statement
DOC	Determination of Compliance
DOE	United States Department of Energy
DOGGR	California Department of Conservation, Division of Oil, Gas, and Geothermal Resources
DOI	United States Department of Interior
DRECP	Desert Renewable Energy Conservation Plan
DReq	Data request
DResp	Data response
DSM	Demand-side management
E & L	Environment and lands
EA	Environmental Assessment
EAP II	*Energy Action Plan II*
EIR	Environmental impact report
EIS	Environmental impact statement
EJ	Environmental justice
EMF	Electromagnetic field
EPAct-05	Energy Policy Act of 2005
EWG	Environmental Working Group
FAA	Federal Aviation Administration
FEIS	Final environmental impact statement
FERC	Federal Energy Regulatory Commission
FSA	Final staff assessment
GC	Government Code
GHG	Greenhouse gas

ACRONYM	MEANING
GIS	Geographic Information Systems
GO	General Order
GSC	Go Solar California
H_2S	Hydrogen sulfide
HCP	Habitat conservation plan
HERS	Home Energy Rating System
HFC	Hydrofluorocarbon
Hg	Mercury
IEPR	*Integrated Energy Policy Report*
IID	Imperial Irrigation District
IOU	Investor-owned utility
IPP	Independent power producer
ISO	Independent System Operator
KGRA	Known Geothermal Resource Area
kW	Kilowatt
LADWP	Los Angeles Department of Water and Power
LAER	Lowest Achievable Emissions Rate
LEAPS	Lake Elsinore Advanced Pumped Storage
LORS	Laws, ordinances, regulations, and standards
LTPP	Long Term Procurement Plan
MACT	Maximum Achievable Control Technologies
MEA	Master environmental assessment
MEIR	Master environmental impact report
MND	Mitigated negative declaration
MW	Megawatt
N_2O	Nitrous oxide
ND	Negative declaration
NEPA	National Environmental Policy Act
NOA	Notice of availability
NOC	Notice of completion

ACRONYM	MEANING
NOD	Notice of determination
NO_X	Nitrogen oxide
NPDES	National Pollutant Discharge Elimination System
NRC	Nuclear Regulatory Commission
NRHP	National Register of Historic Places
NSR	New Source Review
OPR	Governor's Office of Planning and Research
OTC	Once-through cooling
PACT	Planning Alternative Corridors for Transmission Lines
Pb	Lead
PD	Proposed Decision
PEA	Proponent's environmental assessment
PEIR	Program level environmental impact report
PEIS	Programmatic environmental impact statement
PFC	Perfluorocarbons
PG&E	Pacific Gas and Electric Company
PHC	Prehearing conference
PIER	Public Interest Energy Research
$PLACE^3S$	Planning for Community Energy, Environmental, and Economic Stability
PM	Particulate matter
PM	Project manager
PM_{10}	Particulate matter less than 10 microns in diameter
$PM_{2.5}$	Particulate matter less than 2.5 microns in diameter
PMPD	Presiding Member's Proposed Decision
POD	BLM Plan of Development
POU	Publicly owned utility
PPA	Power Purchase Agreement
PTC	Permit to construct
RCP	Regional comprehensive plan

ACRONYM	MEANING
REAT	Renewable Energy Action Team
RES	Renewable Electricity Standard
RES	Regional Energy Strategy
RETI	Renewable Energy Transmission Initiative
RFO	Request for offer
ROD	Record of decision
ROW	Right-of-way
RPS	Renewables Portfolio Standard
RTP	Regional Transportation Plan
RWQCB	Regional Water Quality Control Board
SA	Staff assessment
SAE	Staff assessment errata
SANDAG	San Diego Association of Governments
SARA	Superfund Amendments and Reauthorization Act 1986
SB	Senate Bill
SCAQMD	South Coast Air Quality Management District
SCE	Southern California Edison
SDG&E	San Diego Gas & Electric
SF_6	Sulfur hexafluoride
SHPO	State Historical Preservation Office
SMUD	Sacramento Municipal Utility District
Solar PEIS	Solar Energy Development Programmatic Environmental Impact Statement
SONGS	San Onofre Nuclear Generating Station
SO_X	Sulfur oxide
SSC	Stakeholder Steering Committee
STIP	Strategic Transmission Investment Plan
SWRCB	State Water Resources Control Board
TAC	Technical Advisory Committee
TBACT	Best Available Control Technologies for Toxics

ACRONYM	MEANING
USACE	U.S. Army Corps of Engineers
USC	United States Code
USFWS	United States Fish and Wildlife Service
VOC	Volatile organic compound
WAPA	Western Area Power Administration
WECC	Western Electricity Coordinating Council
WEMO	West Mojave Plan
WGA	Western Governors' Association
WREZ	Western Renewable Energy Zone
ZITA	Zone Identification and Technical Analysis

Appendix B: Generation and Transmission Development—State and Federal Regulatory Framework

This section identifies how future generation and transmission in California is determined and the process for implementing generation and transmission infrastructure. The following information helps local governments better understand the planning, permitting, and development of generation and transmission facilities.

Identifying Future Generation and Transmission Need

Various plans and processes are used by the state and utility providers to identify the need for energy generation and transmission.

Planning Documents

A number of state planning documents are used to identify California's energy requirements for future years.

Integrated Energy Policy Report. The Energy Commission is California's primary energy policy and planning agency. SB 1389 (Bowen, Chapter 568, Statutes of 2002) requires that the Energy Commission adopt a report of findings, the *Integrated Energy Policy Report* (*IEPR*), which must incorporate "assessments and forecasts of all aspects of energy industry supply, production, transportation, delivery and distribution, demand, and prices." The Energy Commission must use this information to develop energy policies that conserve resources, protect the environment, ensure energy reliability, enhance the state's economy, and protect public health and safety. The Energy Commission prepares these assessments and associated policy recommendations every two years with updates in alternate years. As part of the *IEPR*, the Energy Commission forecasts electricity demand biennially in a *California Energy Demand* document. Additionally, the Energy Commission annually prepares a summer peak demand forecast. The 2011 IEPR will include a renewable energy strategic plan.

California ISO Annual Transmission Plan. The California ISO directs delivery of energy across the transmission grid for the IOUs and any POUs that use the California ISO for their central area operator. As part of this process, it annually assesses the reliability of the transmission network under its control. The California ISO planning process spans 15 months and is a collaboration of different stakeholders, including developers. It publishes the *California ISO Transmission Plan* (2010-2011 plan approved May 25, 2011), which identifies and incorporates transmission capacity additions needed to serve load and meet North American Electric Reliability Corporation (NERC) federal reliability requirements as well as state policy initiatives. The report recommends transmission projects needed for improved reliability or better economics. The California ISO uses the CTPG planning work (described in Chapter 3 and Appendix D) when developing its plans.

Strategic Transmission Investment Plan. SB 1565 (2004) requires that the Energy Commission, in consultation with the CPUC and the California ISO, adopt a strategic plan for the state's electric transmission grid. This plan must also be included in the IEPR and acknowledges the state's role in the transmission planning process and the need to balance reliability, cost, and environmental criteria. The *Strategic Transmission Investment Plan* (*STIP-2009*) describes actions that California can take to plan, permit, construct, operate, and maintain a cost-effective and reliable transmission system. The STIP considers California and western states initiatives, trends, and drivers that affect the integration of state policies, such as the RPS, into the transmission planning process.

Energy Action Plan. The *Energy Action Plan I* and *Energy Action Plan II* (EAP II) were adopted in 2003 and 2005, respectively, by the Energy Commission and the CPUC with the goals of:

- Meeting California's energy growth needs including optimizing and increasing the role of energy conservation and efficiency.
- Ensuring a reliable, affordable, and high-quality power supply.
- Accelerating the state's goals for renewable energy and aggressively developing renewable energy resources.
- Ensuring electricity adequacy, reliability, and infrastructure, in coordination with the Western electrical system to foster sound energy market rules.
- Promoting distributed generation.
- Incorporating demand response into the utility distribution network including modern information and control systems technologies.
- Ensuring reasonably priced supplies of natural gas, gasoline, and diesel while working toward an efficient, multi-fuel transportation market.

Utility Procurement Plans

In addition to energy generation and transmission planning, utility companies have long-term (10-year) procurement plans that serve as the bases for the type and amount of electricity utilities will purchase to meet customer needs. Every two years, the CPUC holds a Long Term Procurement Plan (LTPP) proceeding to review and approve IOU procurement plans. The LTPP proceeding evaluates the IOUs' needs for new generation resources and establishes rules for rate recovery of energy procurement. The LTPP ensures that the IOUs each maintain a set amount of energy above what they estimate they will need to serve their customers (called a *reserve margin*), and implement long-term energy planning process. The LTPP also serves as the "umbrella" proceeding to consider, in an integrated fashion, the *Energy Action Plan* loading order resource policies and programs, including IOU compliance with the RPS.

POUs are required to each submit an integrated resource plan to the Western Area Power Administration (WAPA) as required by the federal Energy Policy Act of 1992. WAPA markets and delivers hydroelectric power within a 15-state region of the central and western United States. Requirements for the integrated resource plan include identifying resource options and the timeframe the utility needs to implement specific actions defined in the plan. The POUs must discuss their efforts to minimize adverse environmental effects of the resource procurement options and allow for full public involvement in the preparation and development of their integrated resources plans. Additionally, each POU must conduct a load forecast for the plan and measure how the objectives set out in the plan are met. A POU must submit to the Energy Commission information on its resource mix, status in implementing the RPS, and renewable energy resource programs.

Generation Facility Implementation Process

The construction of new generation facilities involves a number of processes. As stated above, the utilities develop long-term plans identifying the need for new natural gas and renewable resources.

The CPUC requires that IOUs issue annual solicitations for energy. Energy generators file notices to bid on the solicitation and submit these bids to the IOUs. (IOUs may also propose and own generation.) The IOUs evaluate the bids based on a "least-cost, best-fit" evaluation process and submit a list of bids to the CPUC. (See sidebar.) The IOUs and bidders negotiate a power purchase agreement (PPA), or contract between an electricity generator and a purchaser of capacity or energy, and execute contracts that are reviewed and approved or rejected by the CPUC. Capacity is electricity that is available for use in any hour of the year but is only requested when a need arises, and energy is a KWh of energy that is purchased for use during a particular hour. Capacity factor is the percentage that tells how much of a power plant's capacity is used over time. For example, a geothermal plant capacity could be as high as 90 percent. Intermittent resources, such as solar and wind, are not available to produce energy consistently throughout the day and their capacity factors are much lower (25 percent to 40 percent).

The POUs similarly identify their energy needs and solicit bids from generators. However, decisions on energy procurement are overseen by the POUs' boards of directors rather than the CPUC.

Least-Cost, Best-Fit Criteria

Market Valuation: Such as energy prices, production costs to serve customer demand and transmission costs.

Portfolio Fit: Such as total energy produced and time of delivery.

Credit and Collateral: Such as demonstrating financial strength and creditworthiness.

Project Viability: Such as participant experience and the likelihood of obtaining required permits.

Other Qualitative Factors: Such as location, renewable portfolio standards, water quality impacts, and benefits to minority and low-income areas.

Source: California State Auditor, 2008

A proposed generation facility in California must go through an environmental review and permitting process subject to the California Environmental Quality Act (CEQA) (see Chapter 4). The environmental review process may also be subject to the National Environmental Policy Act (NEPA), the federal environmental review process. As many of the utility-scale renewable energy generation facilities are proposed on federally owned land in California, both CEQA and NEPA reviews are required.

Before 1975, utilities were required to go through a multi-year process to obtain permits from numerous federal, state, and local agencies before constructing new power plants. The Warren-Alquist Act established the California Energy Commission in 1975 and mandated a comprehensive siting process for new power plants. (See Appendix C for more details on the Warren-Alquist Act.) The Legislature gave the Energy Commission the statutory authority to license thermal power plants of 50 MW or greater along with the transmission lines, fuel supply lines, and related facilities to serve them.

Applicants for generation facilities that fall in this category submit engineering designs and detailed environmental information on the impacts of the projects in their applications for certification (AFC). Energy Commission staff then conduct an independent assessment of each proposed energy facility. The staff must review the information provided by the applicant, coordinate with federal, state, and local agencies and Tribal governments, perform necessary field and technical studies, and prepare expert witness testimony regarding the project. A staff assessment (SA) is prepared that is the functional equivalent of a draft environmental impact report (EIR). The SA information, testimony provided by intervenors, and public comments from other interested parties are considered by an Energy Commission committee chaired by two Commissioners during an evidentiary hearing. The committee prepares a proposed decision for a vote by the full Commission. The process generally takes between 12 and 18 months.

Local governments, primarily counties, review and permit some electricity-generating projects (solar photovoltaic, wind energy, and thermal projects smaller than 50 MW). The permits typically require similar analyses under CEQA (and NEPA, if applicable) and other applicable state laws and ordinances. Some counties have established specific county ordinances for permitting generation facilities and designation of areas suited for transmission lines corridors.

The Federal Energy Regulatory Commission (FERC) licenses and inspects private, municipal, and state hydropower projects. The licensing process includes overseeing environmental matters and issuing an environmental assessment (EA) or environmental impact statement (EIS) as required.

After the approval of any generation facility, construction financing must be put in place. Construction of the facility may begin subject to certain conditions (conditions of certification or mitigation measures) established by the need to reduce the health, safety and environmental impacts of the project. Appendix E describes the environmental issues associated with generation facilities and transmission lines.

Transmission Infrastructure Implementation Process

Utilities review their anticipated electricity needs and determine whether new transmission lines are needed to access future sources of electricity or to address other transmission issues such as congestion. The generation and transmission facilities need to be balanced and synchronized to provide a reliable electricity system serving all of California. As mentioned earlier in this section, the IOUs, POUs, and the California ISO are working within the CTPG to develop a statewide transmission plan. The IOUs present their transmission plans for review and approval to the California ISO, which decides what electrical upgrades are needed to add lines to the California grid. California ISO also performs an economic and reliability analysis to determine the value of a line to the California electricity system. Power plant generators requesting interconnection with the grid sign either large generator (>20 MW) interconnection agreements (LGIA) or small generator interconnection agreements (SGIA) with the California ISO to determine their shares of costs associated with any needed upgrades.

Next an IOU is required to obtain a permit from the CPUC for construction of certain transmission infrastructures. The CPUC Transmission Siting and Environmental Permitting Section conducts and manages environmental reviews for consideration by the CPUC Commissioners. The IOU prepares a proponent's environmental assessment (PEA) and preliminary engineering for the project and also files an application for a certification of public convenience and necessity (CPCN) for transmission lines greater than 200 kV or a Permit to Construct (PTC) for lines 50 kV to 200 kV. (Projects below 50 kV are considered to be distribution projects, rather than transmission projects, and in general do not require Commission approval.) The CPUC takes approximately 12 to 18 months to process the application and complete the CEQA process. The CPUC staff manages preparation of an EIR or a joint EIR/EIS if the project crosses federal lands and is also subject to NEPA.

If the transmission project is approved, additional state resource agency permits, issued by the State Water Resources Control Board (SWRCB), California Department of Fish and Game (CDFG), and permits from counties, may be required. Federal permits may also be required, such as those issued by the U.S. Army Corps of Engineers (USACE) and U.S. Fish and Wildlife Service (USFWS).

Some POUs, including the Sacramento Municipal Utility District (SMUD), Los Angeles Department of Water and Power (LADWP), and Imperial Irrigation District (IID), control and operate transmission and distribution systems. As with the IOUs, the POUs plan and build large-scale transmission systems. POU transmission plans must be approved by the utility's board and adhere to applicable laws, rules, and regulations, including CEQA. The public agencies evaluate if there is a possibility the project may have a significant effect on the environment, and if more than one public agency is involved, a lead agency is designated. The lead agency performs an initial study, determines if the transmission

project significantly impacts the environment, and prepares the appropriate environmental review. If the POU determines that the project will have a significant impact on the environment, it prepares an EIR. The final EIR must be considered and certified by the decision-making body of the POU. As with the IOUs, if a project is approved, additional local, state, or federal permits may be required.

Appendix C: Key Existing and New Laws/Policies Shaping Generation and Transmission

This section identifies the key existing and new laws and policies that shape electricity generation and transmission in California. This information helps local governments better understand why certain generation and transmission projects are proposed and permitted.

New Laws/Policies Promoting Renewable Resources

The following describes recent laws and policies that require more electricity be generated from renewable resources.

California Laws/Policies

In 2002, the California Legislature approved SB 1078 (Sher, Chapter 516, Statutes of 2002) which created California's Renewables Portfolio Standard (RPS). The RPS required IOUs to increase renewable energy as a percentage of their retail sales by at least 1 percent annually until they reached 20 percent by 2010. POUs are not required to meet the same RPS as IOUs but still have to implement and enforce their own RPS programs. The Energy Commission and the CPUC were directed to work collaboratively to implement the RPS, and specific roles were assigned to each agency. As of April 2010, the three large IOUs collectively served 15 percent of their 2009 retail sales with renewable power.

In 2006, the California Legislature passed Assembly Bill 32, the Global Warming Solutions Act of 2006. This established the goal of reducing greenhouse gas (GHG) emissions to 1990 levels by 2020. AB 32 includes the use of regulatory market mechanisms to achieve real and measurable GHG reduction targets. The California Air Resources Board (ARB) is the lead agency for implementing AB 32. The California ARB published the *Climate Change Scoping Plan* in December 2008. This document outlines strategies for meeting AB 32 goals and contains a range of GHG reduction actions that must be adopted by the ARB and other state agencies by the start of 2011.

The *Climate Change Scoping Plan* identifies recommended actions to reduce greenhouse gas emissions from key sources. For the electricity sector, the primary recommendations are to:

- Implement a broad-based California cap-and-trade program to provide a limit on emissions.[10]
- Maximize energy efficiency in building and appliance standards, pursue new energy efficiency efforts including technologies, and pursue investment in energy efficiency from all providers of electricity in California.
- Achieve a 33 percent renewable energy mix statewide by 2020.
- Install 3,000 MW of solar electric capacity under California's existing solar programs (Million Solar Roofs).
- Expand the use of green building practices including maximizing energy and resource efficiency.

Executive Order S-06-06 (2006) established a target to increase the use of biomass for electricity to 20 percent of the established state goals for renewable generation by 2010 and to maintain this level through 2020. The state's *Bioenergy Action Plan* requires the Energy Commission to prepare *A Roadmap for the Development of Biomass in California* to focus public input and discussion on actions needed to achieve the targets set by the executive order. In 2008, the Energy Commission's Public Interest Energy Research (PIER) Division published *An Assessment of Biomass Resources in California, 2007*, which describes its study of the potential for biomass both statewide and at the county

[10] In a cap-and-trade program, a limit, or cap is put on the amount of GHGs that can be emitted. Allowances equal to the cap set for cumulative emissions from all the covered sectors may be auctioned and/or freely given to companies or other groups. If a company comes in below its cap, it has extra credits which it may trade with other companies.

level. The principal sources of biomass in California include residues from forestry/forest products, agriculture and urban sources (for example, municipal wastes). State biomass resources are sufficient to supply a substantially larger amount of renewable electricity than is presently generated. However, air quality issues make permitting a biomass facility difficult. (See Appendix E)

In October 2008, the CPUC adopted the Long Term Energy Efficiency Strategic Plan. Under this plan:

- All new residential construction in California will be zero net energy[11] by 2020;
- All new commercial construction in California will be zero net energy by 2030;
- The heating, ventilation, and air conditioning (HVAC) industry will be reshaped to ensure optimal equipment performance; and
- All eligible low-income homes will be energy efficient by 2020.

In addition to "zero net energy" construction, the CPUC is discussing "zero peak energy use" (buildings that do not require additional energy during peak energy use times,), and "net zero carbon" (buildings that generate more clean energy onsite than they use from the grid in an average year) policies.

Permitting "zero net energy" buildings requires collaboration among the Energy Commission, CPUC, ARB, and local governments due to shared authority over land use development and planning. The Energy Commission has adopted strategies to meet the "zero net energy" goal, including: additional standards for consumer electronics, water efficiency, improved education about energy efficiency, and green building standards. The Home Energy Rating System (HERS) Phase II program, effective September 2009, adopted a home energy rating scale. The Energy Commission's *2007 IEPR* recommends additional programs targeting heating and cooling technologies. The "zero net energy" policy and additional policies such as the "net zero carbon" will likely increase roof-top solar and other small-scale renewable facilities on both the customer and utility sides of meters.

Executive Order S-14-08 (2008) established accelerated RPS targets (33 percent by 2020) as recommended in the *Energy Action Plan II*. The executive order directs the state government agencies to implement the 33 percent RPS target in regulatory proceedings, including siting, permitting, and procurement for renewable power plants and transmission lines. The order required formation of the Renewable Energy Action Team (REAT), composed of the Energy Commission, California Department of Fish and Game, U.S. Department of the Interior Bureau of Land Management (BLM), and U.S. Fish and Wildlife Service. These organizations signed a memorandum of understanding in November of 2008. The team's primary goal is to streamline and expedite the permitting processes for renewable energy projects while conserving endangered species and natural communities at the ecosystem scale. More information regarding the 33 percent RPS can be found at Renewables Energy Portfolio Standards Proceeding - Docket # 03-RPS-1078.

The executive order also directs the REAT to develop a Desert Renewable Energy Conservation Plan (DRECP) for the Mojave and Colorado Deserts regions. The DRECP will identify areas suitable for renewable energy project development and areas that will contribute to the conservation of sensitive species and natural communities. Please see Chapter 3 for further discussion of the DRECP. Related to the DRECP, the executive order also directs the REAT to develop and publish a Best Management Practices (BMPs) manual and other interim guidance for assisting project developers in designing projects to emphasize siting considerations and minimize environmental impacts for RPS desert projects. The *Best Management Practices and Guidance Manual* was published in December 2010.

[11] A zero net energy building is one that implements a combination of building energy efficiency design features and onsite clean distributed generation that results in no net purchases from the electricity or gas grid.

Executive Order S-21-09 (2009) directed the ARB to adopt regulations consistent with the 33 percent renewable energy target by July 31, 2010. The ARB worked with the CPUC and Energy Commission to ensure the adopted regulations encourage the creation and use of renewable energy sources. ARB held three workshops (October and December 2009, February 2010) to discuss a proposed Renewable Electricity Standard (RES) regulation designed to implement EO S-21-09. The proposed regulation and staff report was issued in June 2010.

In April 2011, Governor Brown signed SB2, which codified the 33 percent renewable energy target.

Governor Brown's Clean Energy Jobs Plan builds upon many of the initiatives identified above. It specifically calls for building 12,000 MW of localized electricity generation by 2020 and 8,000 MW of large scale renewables and necessary transmission lines by 2020.

Smart Grid

In October 2009, SB 17 (Padilla, Chapter 326, Statutes of 2009) was signed into law and required the CPUC, Energy Commission, California ISO, and other stakeholders to determine the requirements for a smart grid deployment plan to improve overall efficiency, reliability, and cost-effectiveness of electrical system operations, planning, and maintenance by July 2010. See sidebar for a description of smart grid.

Smart Grid

A smart grid delivers electricity from suppliers to consumers using digital technology. The CPUC defines a smart grid as "an electric grid that is enhanced through the use of digital communication technologies and allows customers, utilities, and society to make better choices in how energy is produced, delivered, and consumed." In practical terms, the smart grid can include an Advanced Metering Infrastructure (AMI) (including home area networks of smart appliances), dynamic pricing (pricing that changes in response to grid and supply conditions), energy efficiency mechanisms (home displays), distributed generation, energy storage, and networked plug-in vehicles.

The CPUC has initiated a rulemaking (R.08.-12-009) to consider policies for California investor-owned electric utilities to develop a smarter electric grid in the state. The proceeding will consider setting policies, standards, and protocols to guide the development of a smart grid system and promote integration of new technologies such as distributed generation, storage, demand-side technologies, and electric vehicles.

The ARRA allocates $4.5 billion to the Department of Energy's Office of Electricity Delivery and Energy Reliability. These "smart grid" funds are to be used to demonstrate smart grid technologies, develop a nationwide plan to modernize the electric grid, enhance security of U.S. energy infrastructure, and ensure reliable electricity delivery to meet growing demand. Title XIII of the Federal Energy Act of 2007 and SB 17 both require the State to define California's smart grid by July 2010 and are described in Chapter 3.

CPUC Decision 10-06-047 provides Pacific Gas & Electric, San Diego Gas & Electric, and Southern California Edison companies with the guidance needed to file smart grid deployment plans with this Commission by July 1, 2011.

Under SB 17, this CPUC proceeding, after consultation with the Energy Commission, the ISO and other key stakeholders, sets the requirements for smart grid deployment plans. The decision requires that utilities follow a common outline in preparing their smart grid deployment plans. Utilities must file annual reports on their smart grid activities, with the first annual reports due on October 1, 2012.

Federal Laws/Policies

Executive Order 13212, dated May 18, 2001, mandated that Department of Interior (DOI) agencies act expediently and in a manner consistent with applicable laws to accelerate the completion of projects that increase the "production, transmission, or conservation of energy."

The Energy Policy Act of 2005 (EPAct-05) Sec. 211 requires the DOI to approve at least 10,000 MW of non-hydropower renewable energy projects on public lands by 2015. Title XVII of EPAct-05 authorizes the Secretary of Energy to make loan guarantees for a variety of projects, including those that "avoid, reduce, or sequester air pollutants or anthropogenic emissions of greenhouse gases and employ new or significantly improved technologies as compared to commercial technologies in service in the United States at the time the guarantee is issued." The two principal goals of the loan guarantee program are to encourage commercial use in the United States of new or significantly improved energy-related technologies and to achieve substantial environmental benefits. Renewable energy systems, efficient electrical generation, transmission, and distribution technologies, and efficient end-use energy technologies are eligible for a guarantee under Title XIII of the Energy Independence and Security Act of 2007.

Title XIII established a federal policy to modernize the electric utility transmission and distribution system to maintain reliability and infrastructure protection. Additionally, Title XIII requires the DOE to report to Congress any barriers to the deployment of smart grid technologies, conduct research and development strategies to assess energy savings and other aspects of implementation, and reimburse 20 percent of qualifying smart grid investments and allow utilities to recover smart grid investments through rates.

Secretarial Order 3283 *Enhancing Renewable Development on the Public Lands* (January 2009) facilitated the DOI's efforts to achieve the goals established in EPAct-05 Sec. 211. The Secretarial Order goals include designating Renewable Energy Coordination offices, improving efficiencies when processing renewable energy applications, developing Best Management Practices for renewable energy projects on public lands, and improving interagency coordination with other federal agencies.

The Bureau of Land Management (BLM) manages 15.2 million acres in California. In October 2009, the BLM opened a Renewable Energy Coordination Office in California to support the permitting of power and transmission projects on public lands; reduce BLM's existing pending applications; and use new procedures to expedite the leasing, production, and delivery of renewable energy to consumers. BLM is currently processing 40 applications for development of solar (utility scale solar thermal and photovoltaic) projects for use of approximately 264,000 acres of BLM-administered land in California and has authorized the development of 6 solar projects using approximately 21,000 acres. It is processing 30 applications for development of wind projects (approximately 166,000 acres, April 2011). The BLM California Energy website provides information regarding renewable and fossil fuel energy projects on BLM-administered lands in California.

Secretarial Order 3285 *Renewable Energy Development by the Department of Interior* (March 2009) established the development of renewable energy as a priority for DOI and established a Departmental Task Force on Energy and Climate Change. The Departmental Task Force identifies specific zones on U.S. public lands where the DOI can facilitate a rapid and responsible move to large-scale production of solar, wind, geothermal, and biomass energy. The task force prioritizes the permitting and environmental review of transmission rights-of-way applications that are necessary to deliver renewable energy generation to consumers. The secretarial order directs all DOI agencies and departments (including the BLM and U.S. Fish and Wildlife Service) to encourage the timely and responsible development of renewable resources, while protecting and enhancing the nation's water, wildlife, and other natural resources.

The BLM and U.S. Department of Energy (DOE) are considering agency programs that would facilitate utility-scale solar energy development in a Solar Energy Development Programmatic Environmental Impact Statement (Solar PEIS) in response to Executive Order 13212 and Secretarial Order 3285.

The American Recovery and Reinvestment Act of 2009 (ARRA) provides incentives to developers of renewable energy facilities and transmission lines. The ARRA includes approximately $6 billion in loan guarantees for renewable energy power generation and transmission projects and provides grants in lieu of tax credits of up to 30 percent of the cost of building a new renewable energy facility. In June 2009, DOI Secretary Ken Salazar and Senator Harry Reid (D-NV) announced that federal agencies will work with western leaders to designate tracts of U.S. public lands in the West as prime zones for utility-scale solar energy development, fund environmental studies, open new solar energy permitting offices and speed reviews of industry proposals.

In October 2009, the State of California and the DOI signed a Renewable Energy MOU . The MOU directs California and DOI agencies to further the Governor's Executive Order S-14-08 and the Secretary's Order 3285 cooperatively, collaboratively, and timely. Among its major provisions, the MOU:

- Establishes a Renewable Energy Policy Group of senior policy representatives to guide the cooperative work.
- Develops a strategy to identify areas suitable and acceptable for renewable energy development.
- Identifies renewable energy zones based on renewable energy development potential and environmental, wildlife and conservation criteria.
- Prioritizes application processing for solar development in renewable energy zones.
- Requires that federal and state agencies coordinate to identify energy and transmission needs and opportunities, and designate transmission needs and corridors.

In December 2009, nine federal agencies issued a memorandum of understanding (MOU) to speed the siting of electric transmission lines on federal land. The goal was to create a single point of contact to coordinate all of the necessary federal approvals and create deadlines for project approval.

In May 2010, the REAT agencies signed a memorandum of agreement (MOA) to enable renewable energy projects proposed in the California desert to address mitigation requirements through the use of a deposit account rather than individually undertaking mitigation for each project. In 2011, REAT and other agencies are reviewing over 26,000 MW of utility-scale power facility proposals.

Laws Affecting Permitting and Types of Electricity Infrastructure

Energy generation facilities in California must comply with a number of laws, ordinances, regulations, and standards. Some laws relate to how electricity infrastructure is permitted, and some laws specifically prohibit certain types of electricity infrastructure.

The primary state laws governing permitting for the Energy Commission are the Warren-Alquist Act, CEQA, California Endangered Species Act, Porter-Cologne Water Quality Control Act, and Section 1600 of the Fish and Game code pertaining to streambed alterations. These laws, in addition to the federal Endangered Species Act, Clean Air Act, and Clean Water Act, as well as other California laws are discussed below. The full list of the laws, ordinances, regulations, and standards used in permitting energy facilities can be found in the *Energy Facility Licensing Process: Developers Guide of Practices and Procedures*.

Warren-Alquist Act

The Warren-Alquist State Energy Resources Conservation and Development Act, commonly called the Warren-Alquist Act, created and gives statutory authority to the California Energy Commission to certify the construction, modification, and operation of thermal electric power plants 50 MW or larger. The Energy Commission certification is in lieu of any permit required by state, regional, or local agencies and by federal agencies to the extent permitted by federal law. The Energy Commission must review power plant applications to assess potential environmental impacts including potential impacts to public health and safety, potential measures to reduce those impacts, and compliance with applicable governmental laws or standards. The Energy Commission can also review small thermal power plants between 50 MW and 100 MW, and exempt the plants from detailed review.

California Coastal Management

The purpose of the California Coastal Act is to protect, conserve, restore, and enhance the resources of the California coast and ocean for sustainable and prudent use by current and future generations. The Coastal Act created and provides statutory authority to the Coastal Commission, which, in partnership with coastal cities and counties, plans and regulates the use of land and water in the coastal zone (excluding San Francisco Bay). The state's coastal zone varies in width, but extends the entire length of the California's coastline. Development activities, which are broadly defined by the Coastal Act to include (among others) construction of buildings, divisions of land, and activities that change the intensity of use of land or public access to coastal waters, generally require a coastal permit from either the Coastal Commission or the local government.

For power plant projects within the coastal zone that are reviewed under the Energy Commission's certification process (i.e., those involving 50 MW of generating capacity or greater), the Coastal Commission is to provide the Energy Commission with formal recommendations about how the project can meet the objectives of the Coastal Act. The Coastal Act includes a number of specific policies regarding issues such as public access to the shoreline, protection of marine habitat and wildlife, allowance for "coastal-dependent" facilities, and others. In its recommendations, the Coastal Commission must report on the suitability of the proposed expansion site, identify potential conflicts between the proposed project and Coastal Act policies, and identify ways to minimize and mitigate those conflicts.

Within San Francisco Bay and Suisun Marsh the San Francisco Bay Conservation and Development Commission (BCDC) partners with Bay Area cities/counties to regulate land and water uses. The Bay's coastal zone generally encompasses open water areas, land areas within 100 feet of the shoreline, marshes, mudflats, and portions of area rivers and streams. The McAteer-Petris and Suisun Marsh Preservation Acts grant BCDC the general authority to protect and enhance the Bay and Marsh and encourage responsible use. BCDC's role in permitting power plants is similar to the Coastal Commission's role.

The Coastal Commission and BCDC administer their respective federally-approved Coastal Zone Management Plans, authorized by the Coastal Zone Management Act. Both federally-designated coastal management agencies are to ensure that federal activities and actions (including issuance of licenses/permits) are consistent with the commissions' respective plans, policies, and laws.

Garamendi Principles

In 1988, in recognition of the value of the transmission system and need for effective long term transmission corridor planning, SB 2431 (Garamendi, Chapter 1457, Statutes of 1988) declared that it is in the best interests of the state to accomplish the following (Garamendi Principles):

- Encourage the use of existing rights-of-way by upgrading existing transmission facilities where technically and economically justifiable.
- When construction of new transmission lines is required, encourage expansion of existing rights-of-way, when technically and economically feasible.
- Provide for the creation of new rights-of-way when justified by environmental, technical, or economic reasons, as determined by the appropriate licensing agency.
- Where there is a need to construct additional transmission, seek agreement among all interested utilities on the efficient use of that capacity.

California Environmental Quality Act

CEQA was enacted in 1970 and requires state and local agencies to identify the significant environmental impacts of their actions and to avoid or reduce those impacts, if feasible. The environmental review process is also designed to ensure informed decisions and provide for citizen involvement. When considering a power generating project for licensing, the Energy Commission is the lead state agency under CEQA, and the Energy Commission's process is functionally equivalent to the preparation of an environmental impact report.

California Endangered Species Act

The California Endangered Species Act of 1984 protects rare, threatened, and endangered plants and animals at a power plant site. The Department of Fish and Game (CDFG) works with interested persons, organizations and local, state and federal agencies, to protect and preserve such sensitive resources and their habitats. "Take" of a state-listed species is prohibited without an Incidental Take Permit. *Take* is defined in Section 86 of the Fish and Game Code as "hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill." The California Endangered Species Act allows for take incidental to otherwise lawful development projects. Incidental Take Permits are issued by the CDFG for projects impacting state listed species even if the projects are under the exclusive permitting authority of the Energy Commission.

Section 1600 of the Fish and Game Code

Waterways affected by a power plant are regulated by Lake or Streambed Alteration Agreements (LSAAs). These agreements regulate activities that may divert, obstruct, or change the natural flow or CDFG designated bed, channel, or bank of any river, stream, or lake in California. Impacts to vegetation and wildlife resulting from disturbances to waterways are also reviewed and regulated during the permitting process. Depending on the power plant size and type, either CDFG or the Energy Commission issues LSAAs (see Tables 4.2 through 4.5, Chapter 4).

National Environmental Policy Act

Congress enacted NEPA in 1969 and it was signed into law in 1970. NEPA requires federal agencies to undertake an assessment of the environmental effects of their proposed actions prior to making decisions. The environmental review process is designed to ensure better informed decisions and provide for citizen involvement.

Every federal agency has a responsibility to implement NEPA. NEPA's procedural requirements apply to a federal agency's decisions for an action, including financing, assisting, conducting, or approving projects or programs. Agency rules, regulations, plans, policies, or procedures and legislative proposals are also subject to a NEPA review.

Federal Endangered Species Act

The Federal Endangered Species Act (FESA) of 1973 requires that federal agencies seek to conserve threatened and endangered species through their actions. Section 9 of FESA prohibits the "take" of any fish or wildlife species listed

under FESA as endangered. Section 9 applies not only to federal agencies but also to any local or state agency, and to any individual. If "take" of a listed species is necessary to complete an otherwise lawful activity, consultation under Section 7 of FESA (for federal agencies) is triggered, or preparation of a habitat conservation plan (HCP) under Section 10 of FESA (for state and local agencies, or individuals) is required.

Under Section 7 of FESA, federal agencies must, in consultation with the U.S. Fish and Wildlife Service (USFWS) or NOAA Fisheries[12], ensure that their actions do not jeopardize the continued existence of listed species or destroy or adversely change critical habitat. Under Section 10 of FESA, the applicant for an "incidental take permit" is required to submit a "conservation plan" to USFWS or NOAA Fisheries that specifies, among other things, the impacts that are likely to result from the taking, the measures the permit applicant will undertake to minimize and mitigate such impacts, and the funding that will be available to implement those steps.

Federal Clean Air Act

The Federal Clean Air Act requires any new major stationary sources of air pollution (such as a thermal power plant) and any major changes to major stationary sources to obtain a permit before beginning construction. This process is known as New Source Review (NSR). Its requirements differ depending on the air quality attainment status of the area where the facility is to be located. Each geographic area is designated by either the U.S. Environmental Protection Agency (USEPA) or the ARB as a nonattainment or attainment area, depending on whether federal ambient air quality standards are violated. The state Clean Air Act also requires ARB to establish ambient air quality standards.

Responsibility for pollution from stationary sources lies with local air districts. County air pollution control districts and regional air quality management districts develop local attainment plans and issue permits to regulate stationary sources. The districts' rules and regulations specify the emissions control and offset requirements for new emissions sources such as power plants. These requirements are included in the determination of compliance (DOC) report for thermal power plants prepared by local districts and provided to the Energy Commission. The DOC for thermal power plants is prepared under the Energy Commission's jurisdiction in lieu of issuing a local air quality permit.

Emission Reduction Credits

The South Coast Air Quality Management District (SCAQMD) amended its rules in 2007 to require power plant developers to have a one-year power sales contract and license from the Energy Commission before the SCAQMD board would release emission reduction credits. Municipal utilities were allowed only enough credits to build projects to serve their native loads. This rule, the Priority Reserve Rule, was challenged, and the 2008 court decision found the air district's CEQA analysis inadequate. The 2008 decision resulted in a one-year moratorium on the SCAQMD issuing permits to power plants.

Assembly Bill 1318 (V. Manuel Perez, Chapter 285, Statutes of 2009) and Senate Bill 827 (Wright, Chapter 206, Statutes of 2009) addressed the issue of credits. AB 1318 authorized the issuance of air credits to specific power plants satisfying eligibility criteria.

Similarly, SB 827 authorized the SCAQMD to issue needed air credits for a limited number of specific plants meeting eligibility criteria. Environmental groups filed a lawsuit in December 2009 to block these actions. A state superior court judge ruled in favor of the SCAQMD in July 2010.

Emission reduction credits are limited in certain areas (for example, the South Coast Air Quality Management District – SCAQMD) and power plants have had difficulty obtaining sufficient credits to offset pollution from the plants. (See sidebar.)

[12] National Oceanic and Atmospheric Administration, National Marine Fisheries Service

Clean Water Act

Power plants must comply with Clean Water Act (33 USC § 1257 et seq.) requirements set by states to protect, maintain, and restore water quality. Although water quality standards are to be met through the regulation of point source discharges to surface water, Section 307 of the Act and Code of Federal Regulations 403 requires that all power plant discharges to wastewater treatment plants receive a pretreatment permit. This includes regulation of storm water discharges during construction and operation of a facility, normally addressed through attaining a general National Pollutant Discharge Elimination System (NPDES) permit.

The Clean Water Act protects navigable waters through Section 401. Section 401 certification by the Army Corps of Engineers and Regional Water Quality Control Boards (RWQCB) is required if there are potential impacts to surface waters of the State and/or waters of the United States, such as perennial and ephemeral drainages, streams, washes, ponds, pools, and wetlands. Section 401 requires impacts to these waters to be quantified and mitigated.

Porter-Cologne Water Quality Control Act of 1967

Power plants have typically used large amounts of water to cool waste heat; this takes place in cooling towers. The quantity and source of the water is controversial. The state Porter-Cologne Water Quality Control Act prohibits the use of water from any source of potable water for non-potable uses, including industrial uses, if recycled water is available. State agencies are working closely together to phase out the use of ocean or bay water by power plants in California.

The state Water Code (Section 13552.6) considers using potable domestic water for cooling towers an unreasonable use of water, if suitable recycled water is available. The availability of recycled water is based upon criteria stipulating that the quality and quantity of the reclaimed water are suitable for the use; the cost is reasonable; and the use is not detrimental to public health, will not impact downstream users or biological resources, and will not degrade water quality.

The Water Code states that any public agency may require the use of recycled water in cooling towers if certain criteria are met. These criteria include that recycled water is available and meets the requirements set forth in Section 13550; the use does not adversely affect any existing water right; and if there is public exposure to cooling tower mist using recycled water, appropriate mitigation or control is necessary.

Williamson Act

The California Land Conservation Act (Williamson Act) Program was enacted in 1965 to ensure sufficient food supplies, discourage unnecessary conversion of agricultural lands, discourage leap-frog development, and to preserve open space. Williamson Act contracts currently cover one-third (16.6 million acres) of private land in California. The contracts are principally with counties, with only a few cities participating. Landowners with contracts realize lower property tax payments.

Solar (and wind) facilities may be located on land subject to the Williamson Act if one or more of the following conditions are met: the use is compatible with the agricultural operation; the contract is not renewed; the contract is cancelled; or the land is acquired through eminent domain. Determinations are very site/fact specific and require consultation with Department of Conservation (DOC) and local governments. More detail is provided in DOC's *Solar Power and the Williamson Act*.

Coal Importation Limits

In September 2006, Governor Arnold Schwarzenegger signed into law Senate Bill 1368 (Perata, Chapter 598, Statutes of 2006), which prohibits California utilities from entering into new long-term contracts for coal-generated electricity.

In 2006, approximately 15.7 percent of the energy used in California came from coal fired sources; 38 percent of this was generated in state and 62 percent was imported. The in-state coal-fired generation includes electricity generated from out-of-state, coal-fired power plants owned by California utilities.

SB 1368 precludes utilities from signing new long-term contracts for power that exceeds the rate of greenhouse gases emitted per megawatt-hour for combined cycle, gas turbine base-load generation. However, existing contracts with power plants were not regulated by SB 1368. As such, utility providers have continued to rely on coal-fired power plants and can do so until these contracts expire. An example of this is the LADWP, which contracts with two large coal plants whose contracts do not expire until 2019 and 2027.

Nuclear Power Plant Prohibitions and Relicensing

The fate of nuclear power plants in California is uncertain. New nuclear facilities are prohibited by law and California's two operating nuclear plants must undergo relicensing in the next 15 years. These plants (Diablo Canyon Power Plant and the San Onofre Nuclear Generating Station-SONGS) provide about 14 percent of the State's electricity.

In 1976, California enacted legislation directing the Energy Commission to perform an independent investigation of the nuclear fuel cycle. This investigation was to assess whether the technology to reprocess nuclear fuel rods or to dispose of permanently high-level nuclear waste had been demonstrated and approved, and was operational. After extensive public hearings, the Energy Commission determined it could not make the requisite affirmative findings concerning either reprocessing of nuclear fuel or disposal of high-level waste. This information was published in a 1978 report: *Status of Nuclear Fuel Reprocessing, Spent Fuel Storage and High-Level Waste Disposal*. As a result, the development of new nuclear energy facilities in California is prohibited by law until the Energy Commission finds that the federal government has approved and there exists a demonstrated technology for the permanent disposal of spent fuel from these facilities.

The Energy Commission reviewed this issue again in 2007 (*Nuclear Power in California: 2007 Status Report*) and concluded that because no repository for spent fuel is likely to be built in the immediate future, California utilities should continue to plan for indefinite storage for spent fuel at their power plant sites. Until progress is made in disposing of or reprocessing spent fuel, the Energy Commission cannot approve land-use permits or certification for a new nuclear plant. In 2008, the Energy Commission concluded that the two nuclear power plant facilities would benefit from up-to-date seismic risk assessments due to new earthquake fault and tsunami information, and potential threats. Chapter 4 in the 2008 IEPR update provides the detailed issues and recommendations.

The Nuclear Regulatory Commission (NRC) operating licenses for California's nuclear plants expire in 2022 (SONGS Units 2 and 3), and 2024 and 2025 (Diablo Canyon Units 1 and 2, respectively). SCE plans to file a SONGS license renewal application in late 2012. In November 2009, PG&E applied to the NRC to extend the operating licenses for the Diablo Canyon plants by 20 years; in April 2011, PG&E requested that the NRC delay final processing until after PG&E has completed certain seismic studies and reported the results. The NRC has never denied an application and has issued license renewals for 54 of the nation's 104 nuclear power reactors.

The NRC license renewal application process determines whether a plant meets the NRC renewal criteria. After an operating license is renewed, state regulatory agencies and owners of the plant decide whether to continue operating the plant based on factors such as need. The NRC license renewal proceeding focuses on plant aging issues, such as metal fatigue or the degradation of plant components, as well as environmental impacts related to an additional 20 years of plant operation. The NRC has consistently excluded from its proceedings issues raised by states and public interest groups including seismic concerns that are not directly related to plant aging or to deficiencies in the environmental impact assessment.

SCE and PG&E must obtain CPUC approval to pursue license renewal before receiving California ratepayer funding to cover the costs of the NRC license renewal process. The CPUC proceedings determine whether it is in the best interest of ratepayers for the nuclear plants to continue operating for an additional 20 years. The purpose of the CPUC license renewal review is to consider matters within the state's jurisdiction, including the economic, reliability, and environmental implications of relicensing. If the state's two nuclear facilities are not relicensed, additional sources of electricity will be needed. Because the two nuclear plants emit very low levels of carbon in comparison to other sources of electricity, additional carbon reductions will be required to meet AB 32 goals.

License renewal for each plant will also require a coastal development permit and federal consistency review from the Coastal Commission. The Commission will review the proposed extension of plant operations for compliance with relevant Coastal Act policies.

Policies Affecting Siting and Permitting of Electricity Infrastructure

The following policies impact the siting and permitting of electricity infrastructure.

Limitations on Use of Fresh Water for Turbine Cooling

Fresh water supplies are limited in Southern California (most of it being an arid to semi-arid desert). Most of Northern California receives sufficient precipitation to meet its water needs. The State Water Project was built to convey water from Northern to Southern California to serve the needs of agriculture and the growing populations of Los Angeles and San Diego. The Water Quality Control Policy on the Use and Disposal of Inland Waters used for Power Plant Cooling (i.e. Resolution 75-58), passed by the State Water Resource Control Board (SWRCB) in 1975, sets the State's priorities/preference for water usage for power plant cooling water:

1. Ocean discharge wastewater,

2. Ocean water,

3. Brackish waters,

4. Low TDS inland wastewaters, and lastly,

5. Other inland waters.

The *2003 Integrated Energy Policy Report* included the recommendation to establish a policy on the use of fresh water for power plant cooling. California's population, businesses, and industries continue to use increasing quantities of fresh water at rates that cannot be sustained. Imbalances in available fresh water supply result in "average year" shortages projected in nearly every region. Energy facilities are among the state's many water users and have the potential to affect fresh water supply and water quality. Although water use for power plant cooling is relatively small statewide, it can cause significant impacts on local water supplies.

As stated in the 2003 report, degraded surface and groundwater can be used for power plant cooling. When sufficient quantities are available, reclaimed water is a commercially viable cooling medium. Alternative cooling options, such as dry cooling, are also available and commercially viable, and can reduce or eliminate the need for fresh water.

State water policy regarding power plants is specified in Resolution 75-58 adopted by the SWRCB. This policy encourages the use of wastewater for power plant cooling where it is appropriate and limits the discharge of blowdown or waste waters from cooling facilities to maintain existing water quality and aquatic environments. The SWRCB further states that where it has jurisdiction, the use of fresh inland waters for power plant cooling will be approved only once it is demonstrated that the use of other water supply sources or methods of cooling are environmentally undesirable or economically unsound. The Warren-Alquist Act reiterates state water policy in terms of conserving water and using alternative sources of water supply: "It is further the policy of the state and the intent of the Legislature to promote all feasible means of energy and water conservation and all feasible uses of alternative energy and water supply sources."

Consistent with the SWRCB policy and the Warren-Alquist Act, the Energy Commission policy is to approve the use of fresh water for cooling purposes by power plants that it licenses only where alternative water supply sources and alternative cooling technologies are shown to be environmentally undesirable or economically unsound. Additionally, as a way to reduce the use of fresh water and avoid discharges in keeping with the Board's policy, the Energy Commission will require zero-liquid discharge technologies, meaning that the cooling water is continually reclaimed and reused, unless such technologies are shown to be environmentally undesirable or economically unsound.

Power Plant Cooling

Thermal power plants convert natural gas, geothermal fluid, coal, fuel oil, solar heat, nuclear or biomass energy to electric energy and waste heat. These power plants require a cooling process to remove heat from the power production cycle. Water and air are traditionally used for cooling power plant steam condensers and turbines. There are several types of cooling:

Once-through cooling. Water is withdrawn from the environment, passed through a steam condenser, heated and returned to the source. No water is consumed or evaporated within the cooling system. However, small aquatic organisms carried by the cooling water are killed by heat, turbulence, and/or chemicals and larger organisms are trapped against the cooling water intake screens.

Recirculating wet systems. Smaller amounts of water (typically 2 to 3 percent of that used in once-through cooling) are taken into the power plant and circulated continuously through cooling towers. The cooling system must be replenished with make-up water to replace water lost through evaporation.

Dry cooling. Air-cooled systems dissipate waste heat by convection, condensing the steam by circulating air with large fans. Power plants using air cooling systems for steam condensation still water to replenish the steam cycle and for cooling the air flowing through the gas turbines.

Hybrid cooling. In wet/dry systems, both wet and dry components are used in the system either separately or simultaneously depending on ambient conditions.

Limitations on Use of Ocean Water for Turbine Cooling

Similar to policies that eliminate the use of fresh water to cool the waste heat generated by new power plants, recent policies are phasing out the use of ocean or bay water for power plant cooling. These plants are shown in Figure 3.1. In the *2005 Integrated Energy Policy Report*, the Energy Commission called for retirement, replacing, and/or repowering aging power plants (typically over 30 years old), which included plants using once-through cooling (OTC). The aging plants operate at high heat rates when compared with new technologies, resulting in less efficient use of natural gas and higher levels of pollutants, including GHG emissions.

Figure C.1: California's Coastal Power Plants That Use Once-Through Cooling[13]

Source: Tetra Tech, 2008. CALIFORNIA'S COASTAL POWER PLANTS: Alternative Cooling System Analysis, February 2008.

[13] Please note that South Bay permanently closed at the end of December 2010 and Encina and El Segundo are either fully or partially switching from once-through cooling to other cooling methods.

The State Water Board approved the policy on May 4, 2010, and it took effect on October 1, 2010 after the Office of Administrative Law completed its review. The policy established closed cycle wet cooling as the Best Available Control Technology (BACT) and proposes a compliance schedule. (See sidebar for a description of cooling options) This schedule is based on a proposal by the Energy Commission, the CPUC, and the California ISO on how to address reliability concerns given the proposed timeline for OTC mitigation compliance. The three energy agencies agreed that a fixed-year outer bound on OTC mitigation compliance can be established, provided it allows for the orderly development of necessary replacement infrastructure and can be amended if delays indicate this is needed to ensure reliability.

Based on the proposal, SWRCB established the Statewide Advisory Committee on Cooling Water Ubtaje Structures. The Committee first met in April 2011 and will review power plant operator implementation plans and schedules. The SWRCB also established the Review Committee for Nuclear Fueled Power plants to oversee the ability of Diablo Canyon and San Onofre power plants to meet the cooling water policy. Information updates on implementing the Board's policy are available at: http://www.swrcb.ca.gov/water_issues/programs/ocean/cwa316/.

The Energy Commission through its participation in the committees, the policy making, and power plant certification processes is encouraging project proponents to design plants that use recirculation, dry-cooling, or hybrid-cooling technologies.

The Energy Commission is already discouraging power plant applications that use once-through ocean water or fresh water-cooling technologies. Therefore, the general concept being applied by the SWRCB regarding OTC is already accepted practice for new power plants.

The proposed compliance schedule for each OTC plant is based on the timeline required to create replacement infrastructure. The state will have to make significant planning decisions, procurement authorization, and permitting of specific energy infrastructure projects to accomplish the retrofitting, repowering, or retirement of about 30 percent of the power generation capacity in California. Phasing out OTC at power plants could affect proposed desalination facilities. (See sidebar.)

Desalination Facilities at Coastal Power Plants

As California's water supply demand grows and supplies tighten or decline, the value of water increases along with the prospect for seawater desalination. Electricity costs are the most significant component of desalination plant operation costs. Most desalination plants operate continuously, so their electricity demand is consistent during the year and times of the day. A desalination plant located adjacent to a coastal power plant could take electricity directly from the power plant and eliminate the costs associated with transmission fees. Energy use can be substantially reduced by brackish water desalination.

In some cases, co-located desalination plants would use less ocean water than OTC plants, although because many OTC plants have operated at relatively low levels over the past several years, proposed seawater withdrawals for desalination use would be higher. For example, the Encina power plant in Carlsbad has a maximum allowable seawater use of about 850 million gallons per day; however, it has operated at less than 20% capacity over the past several years and has proposed switching over entirely to dry cooling. The co-located Carlsbad Desalination Project, which will use just over 300 million gallons per day, represents an overall increase in water withdrawal and the associated impacts.

Transmission Line Locations

Transmission lines traverse the state. New transmission lines may be proposed on land under local government jurisdictions. As noted previously, the Garamendi Principles identify the state's preference for locating new transmission lines. Laws and standards that provide for a reliable electricity grid also affect where transmission lines can be placed.

The North American Electric Reliability Corporation (NERC) and the FERC have standards to ensure a reliable source of energy. NERC develops and enforces reliability standards, assesses reliability annually, monitors the bulk power system, and educates, trains, and certifies industry personnel. FERC regulates electricity, natural gas, and oil interstate transmission. EPAct-05 gave FERC additional responsibilities that include protecting the reliability of the high-voltage interstate transmission system through mandatory reliability standards. The Western Electricity Coordinating Council (WECC) is the regional entity responsible for overseeing mandatory system reliability standards implementation under NERC and FERC authority specified in the EPAct-05.

WECC reliability requirements for transmission corridors can conflict with the Garamendi Principles. Although FERC has not established regulatory requirements for separation distance between parallel transmission lines, the WECC's performance requirements for multiple transmission lines (circuits) in one corridor are more stringent than those required by NERC. This issue is increasingly important because of the public's desire to place new transmission lines in existing corridors and limit new transmission corridors.

The Southwest Area Transmission Common Corridor Task Force addresses concerns regarding the effect of WECC's more stringent criteria on the use of transmission corridors in a May 2009 white paper. The white paper discusses the tension between the reliability benefits of increasing the separation of circuits in a common corridor versus the increased cost of the extra land needed and the creation of additional land use conflicts and environmental impacts. The additional requirements could also result in reduced path ratings and make projects in corridors with existing lines, or proposed double-circuit projects in new corridors, uneconomical.

Given the conflict between placing transmission lines in common corridors and WECC reliability criteria, the 2009 Strategic Transmission Investment Plan recommends Energy Commission staff work with FERC and WECC regarding reliability criteria and the separation of adjacent transmission lines in a corridor. Local governments may want to track these developments by consulting with or participating in the processes of the Energy Commission (http://www.energy.ca.gov/transmission/index.html), CPUC (http://www.cpuc.ca.gov/PUC/energy/electric), California ISO (http://www.caiso.com/1f42/1f42d6e628ce0.html) and/or federal agencies. Links to the federal entities are found on the Energy Commission link.

Transmission Corridor Designation

Section 368 of the Energy Policy Act of 2005 required the federal government to designate energy transport corridors on federal lands that would foster delivery of electricity, oil, natural gas, and hydrogen to markets and users in the 11 western states. The corridors must take into account the need for upgraded and new electricity transmission and distribution facilities to improve reliability, relieve congestion, and enhance the capability of the national grid to deliver electricity. DOE released its *West Wide Energy Corridor Final PEIS: Proposed Corridors Located Along Existing Rights of Way* in November 2008. Figure C.2 shows the federal transmission line corridors in California (as well as the rest of the West). (http://corridoreis.anl.gov/documents/fpeis/maps/part_4/WWEC_State_ROW_03_CA.pdf)

Section 1221(a) of the Energy Policy Act authorizes DOE to designate "national interest electric transmission corridors" (NIETC) to relieve congestion revealed in a separate congestion study. DOE designated National Interest

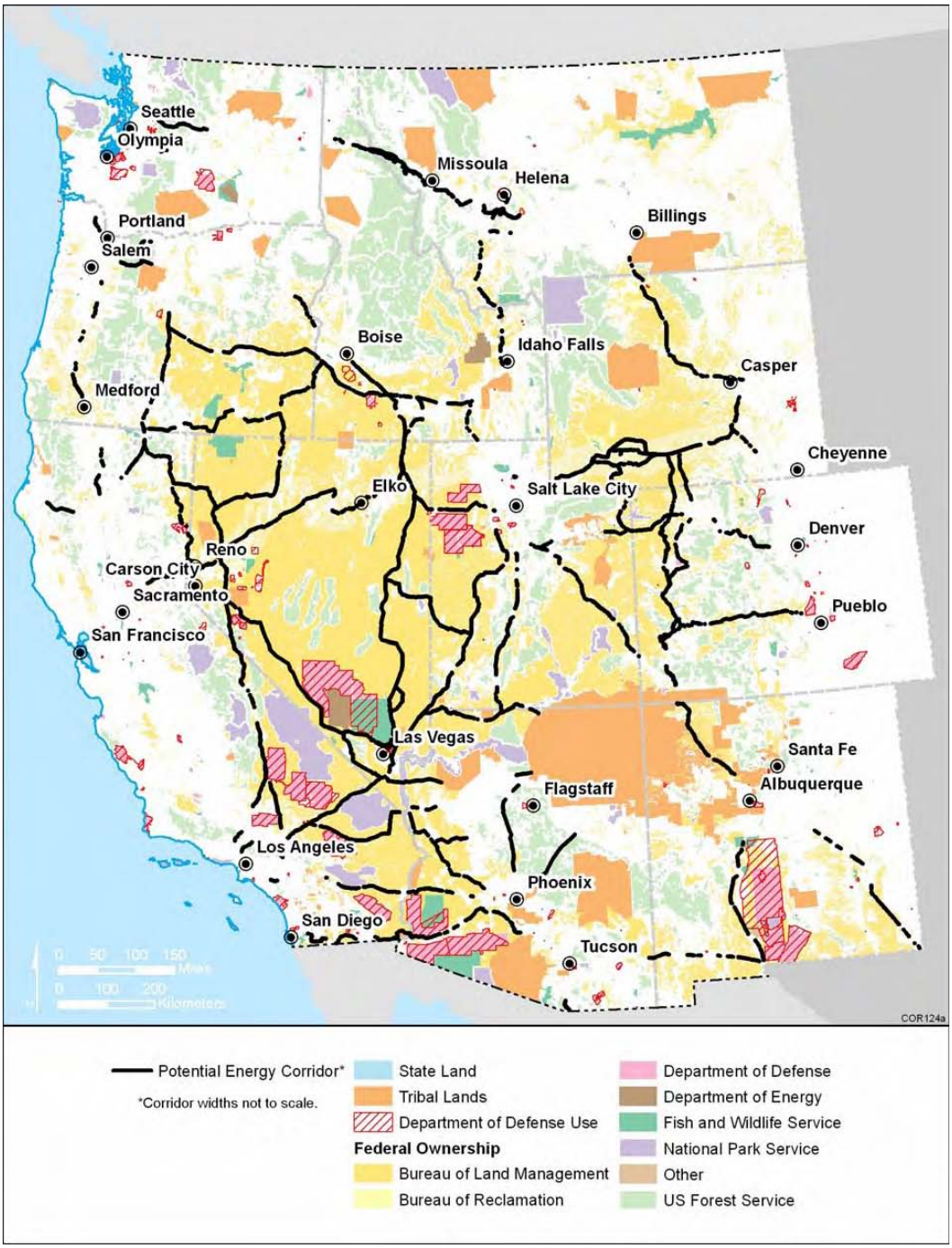
Corridors through a process separate and independent of the West Wide Energy corridor PEIS. The BLM and the Forest Service are not involved in the designation of national interest corridors under Section 1221(a).

National interest corridor designations involve county-specific geographic areas in the mid-Atlantic and Southwestern United States rather than the narrow, linear areas proposed in the PEIS. California counties within the southwest corridor include Imperial, Kern, Los Angeles, Orange, Riverside, San Bernardino and San Diego. A map of the Southwest NIETC can be found at http://nietc.anl.gov/nationalcorridor/index.cfm.

Numerous lawsuits challenging DOE's corridor designations were filed in May 2008; all cases have been consolidated for hearing in the Ninth Circuit. In February, 2011, the Ninth Circuit Court of Appeals ruled against DOE, vacating the designation of transmission corridors in the Southwest and also the Mid-Atlantic.

In California, SB 1059 (Escutia and Morrow, Chapter 638, Statutes of 2006) authorizes the Energy Commission to designate transmission corridor zones on non-federal lands to make them available in the future for high-voltage transmission projects. A transmission corridor zone can be proposed by any person or entity, including the Energy Commission, planning to build an electric transmission line in the state. Through this process, the Energy Commission works closely with state and local agencies and the public to determine if it should designate corridors in the state for future use.

Figure C.2: Proposed Section 368 Energy Corridor Rights-of-Way Western Interconnection Area



Source: California Energy Commission, http://corridoreis.anl.gov/eis/fmap/rowsbm/index.cfm

Appendix D: New Renewable Energy Infrastructure Development Details

This appendix identifies what and where new utility-scale generation and transmission development is likely to occur over the next 20 years. Since future infrastructure is being studied by various groups, the study processes and results summarized in Chapter 3 are described in more detail here. Locations and descriptions of proposed generation and transmission infrastructure are provided, although these reflect only a point in time, and new legislation, policy, and study may result in changes.

Developing Renewable Energy Generation to Meet the 33 Percent RPS

A number of state and federal agencies, nonprofits and other stakeholders are studying the viability and permitting support required to deliver large-scale renewable energy to distant load centers. The following initiatives affect the location and timing of renewable energy development.

CPUC 33 Percent Study

The CPUC undertook a study in 2009 to determine the cost, risk, and timing to meet a 33 percent RPS. The analysis looked at four renewable resource cases, each representing a different strategy to reach the 33 percent RPS. The four cases included:

- A 33 percent reference case (uses California's current renewable procurement path and dependency on new technologies).
- A high wind case.
- A high out-of-state delivered case (relies on new, long multi-state transmission).
- A high distributed generation case (assumes a high amount of smaller-scale, renewable generation).

To provide reference points, the study developed a 20 percent RPS case, an all-gas scenario, and a 2008 costs scenario. The key findings of the *33% Renewables Portfolio Standard Implementation Analysis Preliminary Results* are:

- The 2020 timeline for achieving a 33 percent RPS is ambitious given the infrastructure requirements.
- To meet a 20 percent RPS by 2020, four new transmission projects are needed, three of which have undergone environmental review. To meet a 33 percent RPS by 2020, seven additional new transmission lines would be required along with a nearly tripling of renewable energy production compared with the 20 percent RPS.
- Electricity is estimated to be more expensive in 2020 regardless of RPS requirements. However, a 33 percent RPS would result in an estimated 7.1 percent higher total statewide electricity expenditure, compared with a 20 percent RPS and a 10.2 percent higher expenditure compared with an all-gas scenario.
- Achieving a 33 percent RPS would require tradeoffs among policies and objectives. The state may want to adopt strategies such as planning for more transmission and generation than needed to reach 33 percent RPS; procuring generation that is not dependent on large scale transmission (e.g. distributed solar PV); and concentrating renewable development on pre-permitted land.

One of the outcomes of the 33 percent study was an RPS "calculator." The calculator was updated in February 2011 and may be used by the California ISO to model the amount, location and cost of renewables.

California's Renewable Energy Transmission Initiative (RETI)

RETI, a stakeholder collaborative process, was organized to develop a plan for expanding the electric transmission grid to provide access and connections to renewable energy resource areas. The locations assessed in the RETI process include counties throughout California. All RETI activities are undertaken at the direction of the 30-member Stakeholder Steering Committee (SSC). The SSC is composed of representatives of environmental groups; renewable developers; public and investor-owned utilities; state, federal, and local governments; Native American tribes; and consumers. The California State Association of Counties (CSAC) and Regional Council of Rural Counties (RCRC) represent local governments on the SSC. RETI is currently inactive.

RETI's work focused on:

- **Phase 1**: Identification, characterization and ranking of Competitive Renewable Energy Zones (CREZs) specified for solar, wind, geothermal, or biomass energy facilities in California and neighboring states.
- **Phase 2**: Development of a statewide conceptual transmission plan to access priority CREZ, based on more detailed analyses.

The *Phase 1A Final Report* and *Phase 1B Final Report* were published in April 2008 and January 2009, respectively. The *Phase 1A Final Report* defines the renewable resource assessment method, details study assumptions, and identifies renewable resources to be considered in the project-level analysis. It includes an overview of each renewable technology used in the RETI model and evaluates the availability of the resource for each technology. Potential renewable energy projects comprise CREZs, based on geographical proximity, development time frame, shared transmission constraints, and economic benefits. The report ranks the CREZs based on cost-effectiveness, environmental concerns, development and scheduling certainty, and other factors to provide a renewable resource base case for California.

To rank the environmental concerns for each of the CREZs, the RETI Environmental Working Group (EWG) produced an environmental screen (criteria) identifying circumstances where renewable development would be prohibited or restricted by law or policy. The RETI EWG environmental screen identified Category 1 Lands, where development would be precluded, and Category 2 Lands as areas with significant restrictions, but no outright prohibitions. Examples of Category 1 Lands include federal and state wilderness areas, federal and state parks, and lands precluded from development under habitat conservation plans and natural community conservation plans.

Examples of Category 2 Lands include BLM Areas of Critical Environmental Concern and USFWS designated critical habitat for federally listed endangered and threatened species. Resource conservation lands purchased by private funds and donated to BLM and lands specified in Proposed Wilderness Bills (S. 493 and H.R. 3682), as of May 1, 2008, were also included as Category 2 Lands.

The *Phase 2A Final Report* was published in September of 2009. The report re-ranks the CREZs preliminarily described in Phase 1 and provides a statewide conceptual transmission expansion plan to access the CREZs. The report recommends which potential transmission projects should be considered priorities for future study. RETI also recommended locations for building and emphasized use of undisturbed land. The RETI stakeholders recommend that the California Department of Conservation expand and expedite its efforts to define, identify, and map vacant and disturbed lands throughout California, focusing first on counties that RETI identified as having large renewable energy and transmission development potential. They also recommended that an action plan be developed to consolidate disturbed or degraded lands so that renewable energy development could occur expeditiously. The Department has since published a guide on solar energy and the Williamson Act (see *Solar Power and the Williamson Act*).

The Phase 2B Draft Report was published in April 2010. The Phase 2B report documents key changes made in the economic model, technology assumptions, CREZ, and out of- state (OOS) resources. The overall California CREZ capacity increased by about 3,000 MW compared to Phase 2A. This is primarily due to the addition of the new Westlands CREZ and the expansion of the Owens Valley CREZ.

The initial plan presented in the RETI Phase 2A report represents the consensus recommendation on major upgrades to the California grid. The proposed line segments are grouped into three categories of facilities: Renewable Foundation lines, Renewable Delivery lines, and Renewable Collector lines. (See Figure D.1)

- **Renewable Foundation Lines** would increase the capacity of the California transmission network between Palm Springs and Sacramento, allowing energy to flow north or south as needed. Although 14 recommended key line segments would deliver renewable energy from any CREZ to consumers throughout the state, they could meet growing energy demand regardless of generation source.
- **Renewable Delivery Lines** would move energy from Foundation lines to major load centers. Thirteen major line segments are recommended.
- **Renewable Collector Lines** are recommended to carry power from CREZ to Foundation and Delivery lines. There are 12 groupings of proposed collector lines. Several of these lines form portions of, or connect to, major intertie lines connecting California to the western regional grid, and therefore would provide access to out-of-state energy resources.

RETI encouraged continuing public outreach to agencies and stakeholders for follow-on processes such as corridor designation proceedings.

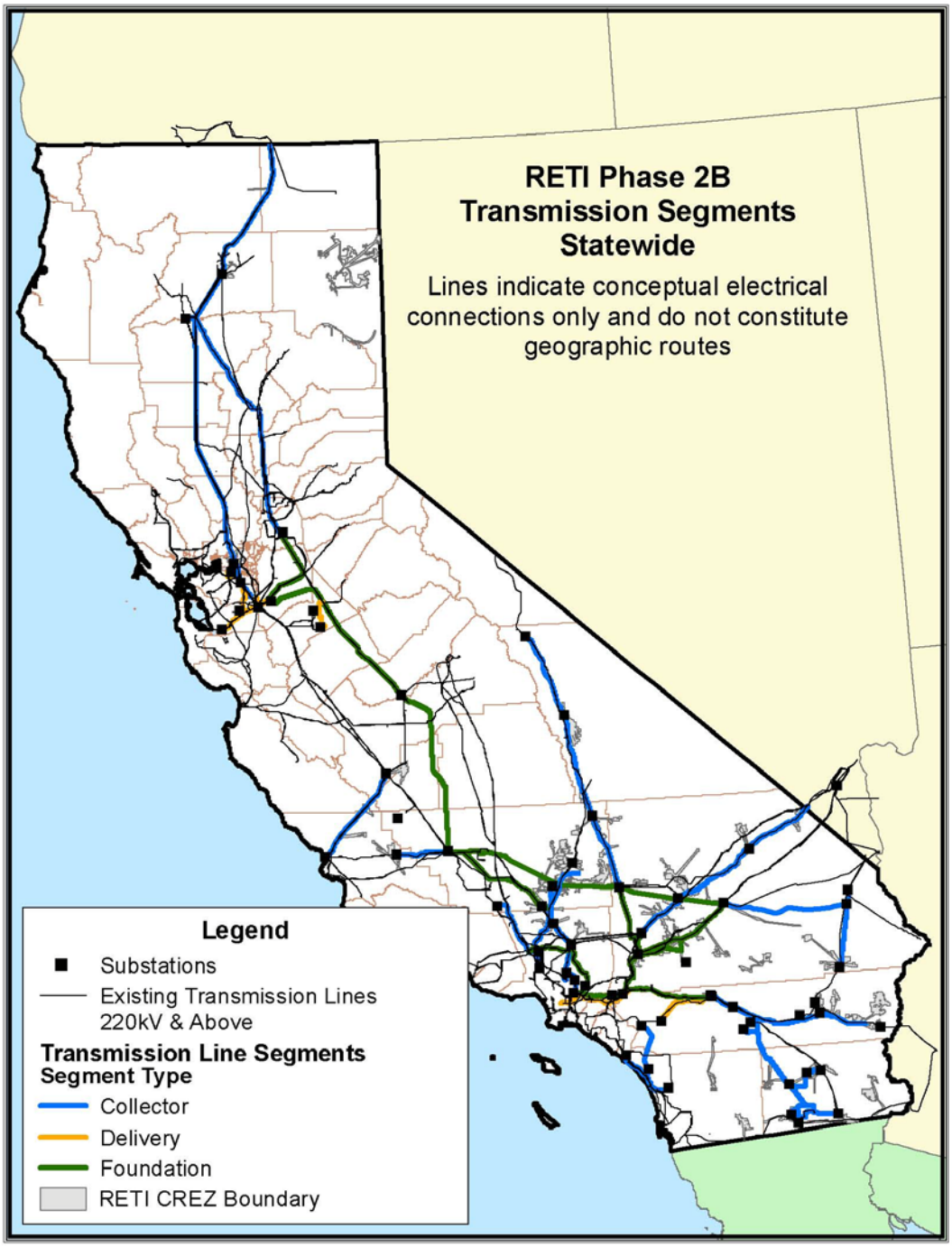
California Transmission Planning Group

The California Transmission Planning Group (CTPG) was formed in 2009 and is using much of the information developed through the RETI process. CTPG members are transmission owners and operators. CTPG used RETI data in developing a statewide transmission plan that identifies the transmission infrastructure needed to reliably and efficiently meet a 33 percent RPS by year 2020. CTPG released the *2010 Statewide Transmission Plan* in February 2011. The Plan identifies high and medium potential transmission upgrades and corridors. These are identified in Figure 4 of the Statewide Transmission Plan and more fully described in the Plan. Local governments should review these transmission lines to determine whether activity would occur in their jurisdictions. For 2011, CTPG will build upon the 2010 plan; a Work Plan defining the 2011 effort can be found at http://www.ctpg.us/public/images/stories/downloads/CTPG_2011_Phase1_Study_Process_Assumptions_v4_4_27_2011.pdf.

Desert Renewable Energy Conservation Plan

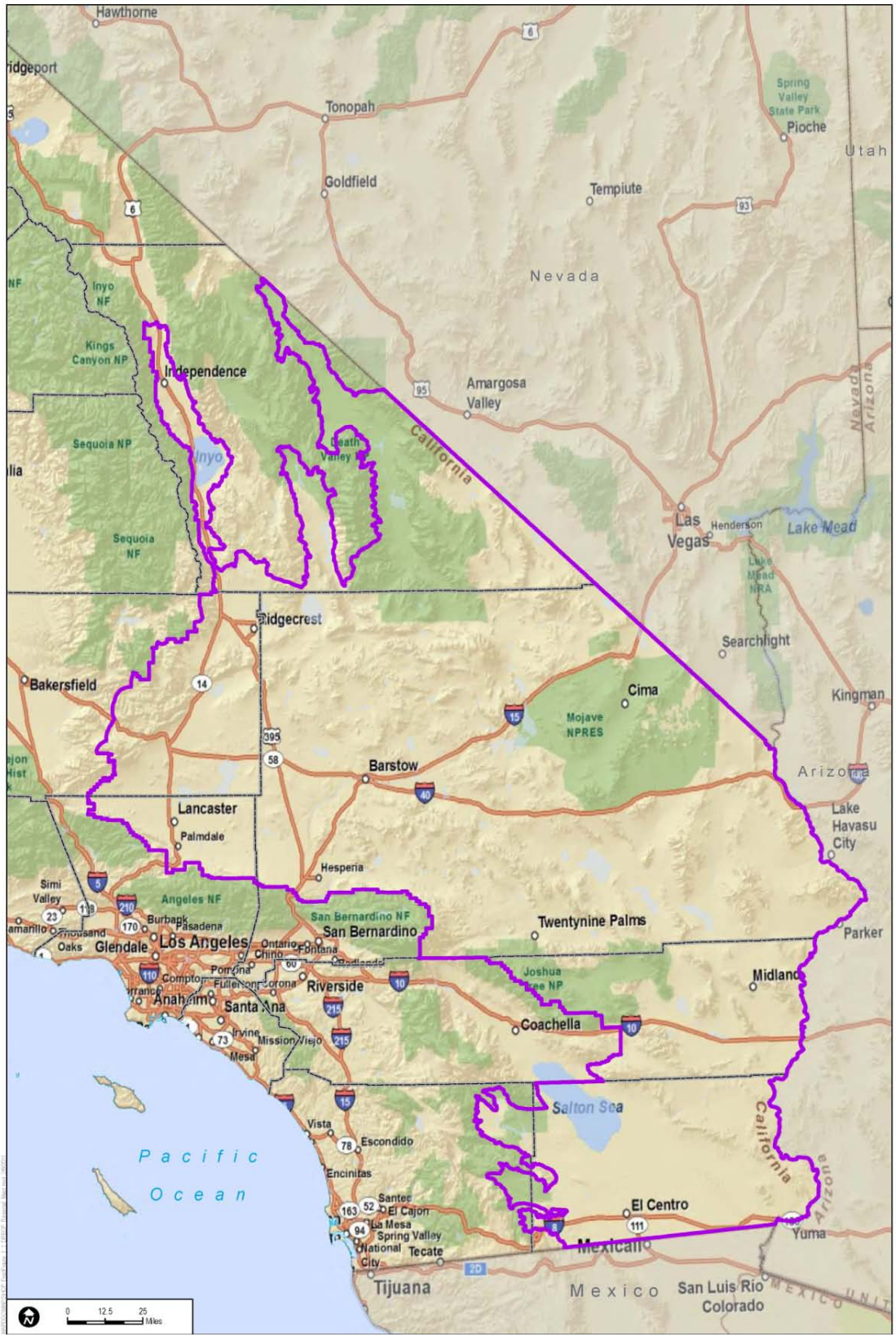
Because many of the renewable projects are proposed for remote desert regions (due to strong solar intensity, relatively flat land and few homes – see Figure D.2), Executive Order S-14-08 requires the Renewable Energy Action Team (REAT) to establish a Desert Renewable Energy Conservation Plan (DRECP) for the California Mojave and Colorado Desert regions. The REAT (Energy Commission, CDFG, BLM, and USFWS) is identifying areas suitable for renewable energy project development and areas that would contribute to the conservation of sensitive species and natural communities. The final DRECP is expected in June 2012.

Figure D.1: Foundation Lines, Delivery Lines and Renewable Collector Lines



Source: California Energy Commission

Figure D.2: DRECP Boundary Map



Source: California Energy Commission, USGS

The DRECP provides an opportunity for key stakeholder (local government, utilities, energy developers, environmental groups) input.

The REAT is developing the DRECP in conjunction with local governments and is exploring with them the feasibility of integrating existing Natural Community Conservation Plans, Habitat Conservation Plans, and other relevant plans. CDFG, as a member of REAT, attends meetings with local partners and agencies to help incorporate the agreements between the CDFG and local governments into the DRECP. Additionally, the DRECP planning process provides for public review and comment, and the Energy Commission, in collaboration with the other parties, conducts regular workshops to provide an opportunity for public participation and input.

The draft DRECP Framework Conservation Strategy (May 2011), schedule, local government comments, and other information are available at http://drecp.org/documents/index.html.

REAT Best Management Practices Manual

The REAT team held meetings in 2009 with county supervisors and planning staff in the six California desert counties to obtain local agency input on the Manual. The REAT adopted the *Best Management Practices & Guidance Manual: Desert Renewable Energy Projects* in 2010, culminating in the Energy Commission's approval on December 15, 2010. The manual recommends strategic actions, pre-application permitting guidance, and best management practices for designing, authorizing, operating and maintaining utility-scale renewable and hybrid energy power plants. The recommendations are geared toward renewable energy developers, and federal, state, local, and Tribal governments for improving the efficiency of California's regulatory process and protecting environmental and cultural resources, (buildings and artifacts) and human health and safety.

Western Governors' Association Western Renewable Energy Zones (WREZ)

The Western Governors' Association (WGA) is an independent, nonprofit organization representing the governors of 19 states and three U.S. Flag islands in the Pacific.

What is the Western Interconnection?

The Western Interconnection is the electricity grid that includes the states of Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming; part of Texas near El Paso; the Canadian provinces of Alberta and British Columbia; and a small portion of northern Mexico in Baja California.(Figure C.2)

In May 2008, the WGA embarked on the WREZ initiative to identify renewable energy zones within the Western Interconnection and facilitate the development of high-voltage transmission systems to those areas with the potential for abundant renewable resources and low or easily mitigated environmental impacts.

Guiding the initiative is the WREZ Steering Committee, composed of governors, premiers, and public utility commissioners. Officials from the Departments of Energy, the Interior, and Agriculture, and the Federal Energy Regulatory Commission participate as ex-officio members. Because the WREZ Initiative emphasizes stakeholder involvement, public outreach, and transparency, participating stakeholders have included: public service commissioners; state, local, and provincial officials; load-serving entities; transmission owners; renewable energy developers; environmental organizations; Native American tribes; federal land use agencies; and other interested individuals and organizations.

Beginning with detailed mapping of renewable energy resources, compiled by the National Renewable Energy Laboratory, the WREZ Zone Identification and Technical Analysis working group screened the data for the most concentrated and highest value energy resource areas. These candidate study areas were then screened further for

regulatory and physical limitations and reduced to a smaller number of qualified resource areas, which were used to identify potential renewable energy zones.

Similar to the RETI process, the WREZ established the Environment and Lands (E&L) working group to categorize the resource potential of the zones, based on land use, wildlife, and other environmental considerations. This group developed a list of "exclusion" or "avoidance" areas. (The categories do not apply to transmission infrastructure at this time.) "Exclusion" lands were areas where development is precluded by federal, state, or local statute or regulation and by certain resources areas (wetlands/water bodies, surface mines, urban areas, military land [except for airspace and operational areas], and excessively sloped areas). "Avoidance" lands were areas that were extended some degree of special protection because of established purpose, policy, or restrictions but are not absolutely precluded from future development. The *Environment & Lands Working Group – Phase 1 Report* gives more details regarding the criteria used.

In June 2009, the Western governors adopted the WREZ *Phase 1 Report*. This report focuses on identifying the concentrated, high-quality renewable energy supplies necessary to meet demand in the Western Interconnection markets. It contains the WREZ Initiative Hub Map which identifies the WREZ's area-specific "hubs" and provides graphical representations of regional utility-scale renewable resource potential. These hubs will provide a basis for evaluation of interstate transmission lines in future WREZ phases. The hubs represent energy generation potential far greater than currently required to meet Western Interconnection RPS. Additionally the overall renewable energy economic resource potential is significantly larger than policy scenarios identified to date. The West can therefore consider what types and locations of resource development would be most productive, rather than having insufficient options to meet requirements and goals.

Since the publication of the Phase I Report, WGA has focused on determining which of the high-quality areas are of greatest interest to electric service providers; deciding how their renewable resources can best be developed; and planning for a transmission network that will bring those resources to market. Using $26.5 million of federal stimulus funds awarded in December 2009, WGA and its affiliate, the Western Interstate Energy Board, are continuing activities initiated under the WREZ project and developing alternative energy futures that can be modeled into transmission plans to open up high-quality renewable resource areas.

Under the auspices of the Western Electricity Coordinating Council, a Scenario Planning Steering Group and an Environmental Data Task Force are using WREZ data to help develop recommendations on the type, quality, and sources of data on wild lands, wildlife, and potential water resources that can immediately be used in developing scenarios and transmission study cases to guide transmission path development in the west for 10-Year and 20-Year Transmission Plans.

These west-wide efforts may identify generation and transmission opportunities in other states or principalities that would benefit California. If California prefers to procure more resources locally, as would be consistent with RETI, conflict among jurisdictions seeking to export energy and in-state development interests may emerge. (See sidebar on in-state versus out-of-state development)

In-State versus Out-of-State Development of Renewable Resources

Debate continues on whether it is better for California to import renewable energy generated out-of-state or to prioritize building renewable energy facilities on California land. The Center for Energy Efficiency and Renewable Technology published the report *Harvesting California's Renewable Energy Resources: A Green Job Business Plan* in February 2009. It compiled results from a series of studies that conclude that California could add hundreds of thousands of jobs throughout the state through an increase in use of renewable energy. The report concludes the following:

- Building renewable power plants and infrastructure required to meet a 33 percent RPS by 2020 could result in the investment of up to $60 billion in the state's economy.
- Achieving a 33 percent RPS by 2020 would likely create between 100,000 and 235,000 new jobs (manufacturing, operations, and maintenance).

The report further states that new renewable energy projects generate more jobs than equivalent investments in fossil fuels. Large scale solar projects have local and statewide economic developmental benefits because long-term fuel costs associated with conventional electricity generation (for example, natural gas) are replaced with operations and maintenance costs (for example, labor).. However, Section 73 of the California Revenue and Taxation Code allows property tax exclusion for certain types of solar energy systems installed between January 1, 1999, and December 31, 2016. This loss of tax revenue may dampen the local economic developmental benefits of renewable energy projects.

BLM Renewable Energy Zones

One of the President's goals in implementing the American Recovery and Reinvestment Act of 2009 (ARRA) is supporting the renewable energy industry and providing capital over the next three years to eventually double domestic renewable energy capacity.

The BLM is expediting the processing and permitting of environmentally responsible renewable energy development on BLM-administered multi-use public lands. BLM will spend $41 million to facilitate a rapid and responsible move to large-scale production of solar, wind, and geothermal energy.

DOE and the BLM are preparing a Solar Programmatic Environmental Impact Statement (PEIS) to evaluate utility-scale solar energy development in six Western states: Arizona, California, Colorado, Nevada, New Mexico, and Utah. A Wind Energy PEIS was published in December 2005. The Geothermal PEIS was published on December 17, 2008.

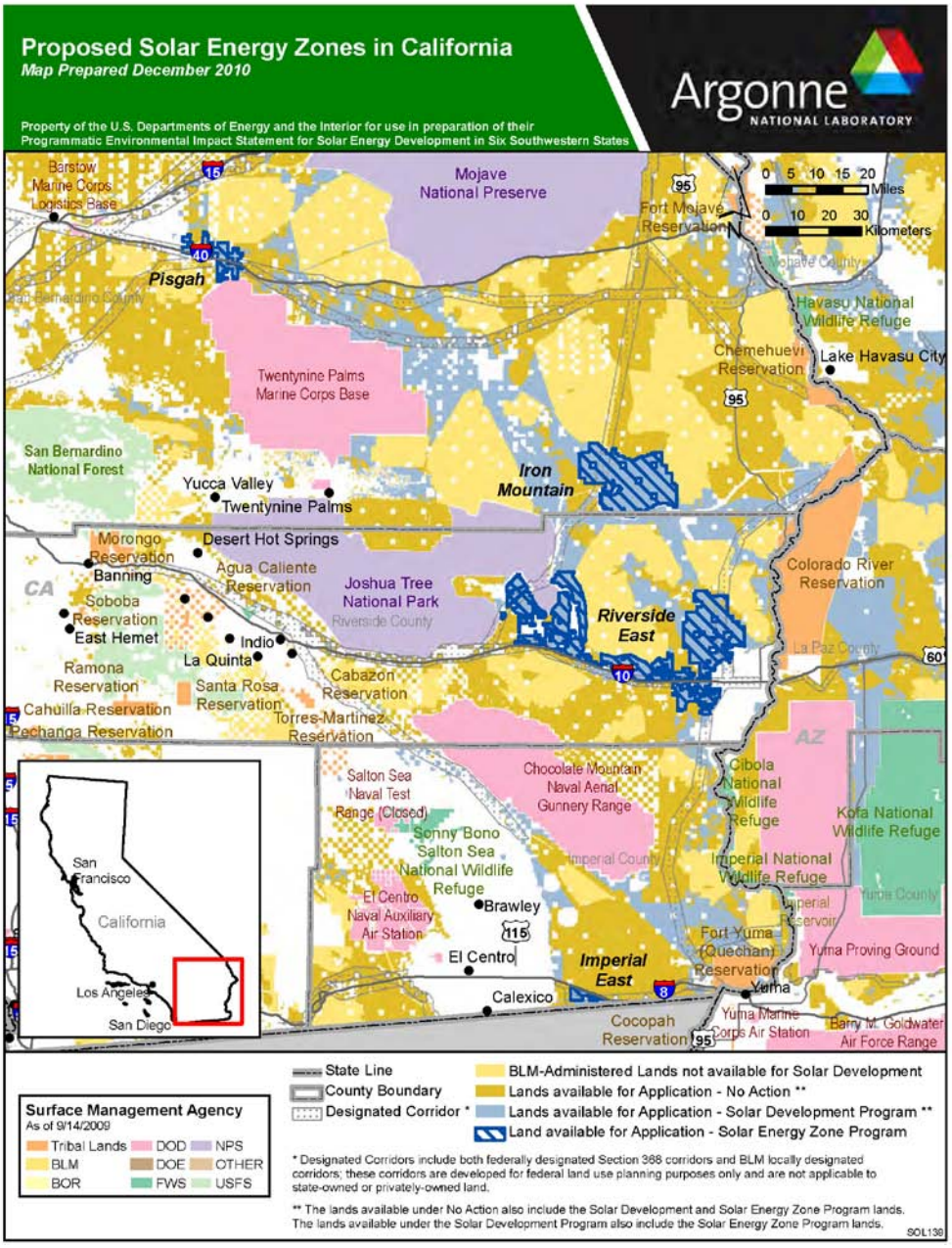
The BLM received ARRA funding to enhance the Solar PEIS through an in-depth study of 24 specific tracts on public lands with excellent solar development potential and limited resource conflicts. Criteria used to identify the study areas include: a minimum size of 2,000 acres, close proximity to existing roads and existing or designated transmission line routes, and a slope of less than 5 percent. Sensitive resource areas were also removed from consideration. The BLM and DOE are conducting environmental analysis to determine if the areas should be designated as Solar Energy Zones and to complete the studies and data collection necessary to address the siting of projects and energy transmission capabilities.

The draft Solar PEIS was released in December 2010. The PEIS analyzes a no action alternative and two action alternatives—the solar energy development program alternative and the solar energy zone (SEZ) program alternative. The BLM defines SEZs as areas with few impediments to utility-scale production of solar energy where the BLM would prioritize solar energy and associated transmission infrastructure development under the two action alternatives. In California, approximately 11,067,366 acres of land would be available for a right-of-way (ROW) application under the no action alternative, and 1,766,543 acres of land would be available under the solar energy

development program alternative. Four SEZs would be identified: Imperial East (5,722 acres), Iron Mountain (106,522 acres), Pisgah (23,950 acres), and Riverside East (202,896 acres). BLM and DOE are designating the California SEZs and indentifying environmental issues and mitigation in coordination with the REAT, DRECP process, and Best Management Practices manual. The agencies are currently considering public comments and expect to publish a supplement during Fall 2011.

Figure D.3 shows the locations of BLM-administered lands in California that (1) are not available for solar energy development currently (i.e., are currently off limits), (2) would continue to be available under the no action alternative, and (3) would be available for ROW application under the solar energy development program alternative. The map also shows the locations of the four proposed SEZs in California.

Figure D.3: Solar Energy Zones in California



Source: U.S. Department of Energy

Remote Renewable Projects Currently Under Review

A number of renewable projects are currently under environmental review on BLM-managed, state-owned, and private land in California. Table D.1 lists some of the remote renewable energy projects recently reviewed or under current environmental review by the BLM, Energy Commission, and counties as of May 2011. Many more renewable projects are proposed to be developed; the Energy Commission identifies nearly 300 renewable energy projects on its website.

Not all of the projects listed in Table D.1 or on the Energy Commission's website will complete the environmental review, nor is it likely that all projects will be funded and constructed. However, the list is indicative of the large and varied number and types of remote renewable projects being considered in California. Additionally, Table D.1 shows the counties within which the projects are located.

Table D.1: Examples of Remote Renewable Projects Under Review or Permitted*

Project Name	Location (County)	Status
Solar Photovoltaic		
NRG Alpine Solar Project (66 MW)	Los Angeles	Under environmental review
Panoche Solar Valley Farm (420 MW)	San Benito	Approved
Blythe Airport Solar 1 Project (100 MW)	Riverside	Approved
NRG Solar Blythe (21 MW)	Riverside	Operational
California Valley Solar Ranch (250 MW)	San Luis Obispo	Approved
Lucerne Valley Solar Project (62 MW)	San Bernardino	Approved
Element Power, Atwell (150 MW)	Tulare	Under environmental review
First Solar, Topaz Solar Farm (550 MW)	San Luis Obispo	Final EIR published
Antelope Valley Solar Ranch One (230 MW)	Los Angeles	Approved
SGS Rosamond Solar Project (120 MW)	Kern	Approved
Maricopa Sun Solar Complex Project (700 MW)	Kern	Approved
Willow Springs Solar Array (160 MW)	Kern	Under environmental review
Monte Vista Solar Array (126 MW)	Kern	Under environmental review
Antelope Valley Solar Project (650 MW)	Kern	Draft EIR published
Nextlight Lost Hills Solar Project (32.5 MW)	Kern	Draft EIR published
Solar Thermal		
Ivanpah Solar Energy Generating System (400 MW)	San Bernardino	Approved
Beacon Solar Energy Project (250 MW)	Kern	Approved
Imperial Valley Solar (formerly Stirling Solar Two) (750 MW)	Imperial	Approved
City of Palmdale Hybrid Gas-Solar (555 MW natural gas, 62 MW solar thermal)	Los Angeles	Approved
Calico Solar (formerly Stirling Solar One) (850 MW)	San Bernardino	Approved
Abengoa Mojave Solar Project (250 MW)	San Bernardino	Approved
Solar Millennium Palen Solar Power Project (484 MW)	Riverside	Approved
Solar Millennium Blythe Solar Power Project (1,000 MW)	Riverside	Approved
Genesis Solar Energy Project (250 MW)	Riverside	Approved
Rice Solar Energy Project (150 MW)	Riverside	Approved
Wind		
Bear River Ridge (50-75 MW)	Humboldt	EIR/EIS published
Granite Mountain Wind Energy Project (73 MW)	San Bernardino	Draft EIS/EIR published
West Fry Wind Energy Project	San Bernardino	Under environmental review
Alta-Oak Creek Mojave Project (up to 800 MW)	Kern	Final EIR published

Project Name	Location (County)	Status
Manzana Wind Project (246 MW)	Kern	Approved
Shiloh III (200 MW)	Solano	Final EIR published
Lompoc Wind Energy Project	Santa Barbara	Approved
Pacific Wind (Iberdrola) (200 MW)	San Diego	Under environmental review
AltaGas/GreenWing Energy, Walker Ridge Wind Farm (up to 70 MW)	Colusa	Under environmental review
Geothermal		
West Chocolate Mountain (640 acres)	Imperial	Under environmental review
Hudson Ranch (49 MW)	Imperial	Under construction
Black Rock (159 MW)	Imperial	Under environmental review

***The full list of renewable projects proposed to be built in California as of April 2011 can be found at the Energy Commission website: http://www.energy.ca.gov/33by2020/documents/index.html. It should be noted that this list is likely to change and be updated periodically. Additional projects were identified from Kern County's website:* http://www.co.kern.ca.us/planning/pdfs/renewable/solar_projects.pdf**

Appendix E: Environmental Impacts of New Landside Utility-Scale Facilities

Introduction to Environmental Impacts

Development and operation of landside utility-scale energy facilities can have a significant impact on the local, regional, and global environment. Most facilities require approval from various federal, state, and local agencies that seek to limit these environmental impacts. Environmental documentation prepared to comply with CEQA and NEPA often involves lengthy studies that affect time frames for permitting new energy facilities. This documentation identifies the potential impacts and the recommended mitigation measures to reduce the impacts as much as possible. Public hearings are routinely held to receive agency and community input on mitigation alternatives under consideration. Local governments can play a significant role in the environmental review and permitting process, either directly or indirectly. This section provides local governments with information on energy infrastructure environmental issues to support their own energy planning and permitting efforts, as well as ways to respond effectively to planning and regulatory actions undertaken by others. Information resources are provided on mitigation measures or best practices that seek to limit impacts.

Each type of energy facility has its own project-specific environmental impacts, but there are some impacts that are common to the construction and operation of most facilities.

Appendix E provides background on the common environmental impacts of energy facilities, as well as additional impacts associated with specific types of projects. Many potential environmental impacts can be categorized into the following general impact areas and are discussed in the first part of this section:

- Air Quality (including Greenhouse Gas Emissions)
- Water Use and Quality
- Land Use
- Biological Resources
- Cultural Resources
- Hazardous and Waste Materials
- Traffic and Transportation
- Visual
- Noise
- Health/Safety and Public Services

The latter part of this section discusses environmental impacts specific to energy infrastructure type, including:

- Transmission
- Natural Gas
- Nuclear
- Biomass
- Geothermal
- Solar Thermal and Solar Photovoltaic

- Wind
- Small Hydro
- Carbon Capture and Storage

The Energy Commission, CDFG, BLM, and USFWS have prepared a *Best Management Practices and Guidance Manual: Desert Renewable Energy Projects* for renewable energy developers, and federal, state, local, and Tribal governments. Many recommendations are applicable to projects located outside the desert, as well. This BMP Manual is an excellent resource and complements information in the following sections with its suggested measures for addressing or mitigating impacts.

Air Quality

Energy facilities produce air pollutant emissions during both construction and operational phases. For all new energy facilities, the construction phase produces fugitive dust particles from the movement of earth and emissions from diesel-fueled construction equipment. For fossil fuel and other thermal plant facilities, including solar facilities[14], the combustion of fuels and the use of chemicals are major sources of air pollutants. These air pollutant emissions contribute variably to local air quality, global climate change, adverse health impacts, property damage and public nuisance, and damage to agriculture and the environment. Tables E.1 and E.2 provide a description of air quality impacts and the regulatory environment for air quality in California.

Emissions

Emissions from power plants that burn fossil fuel and related facilities usually include carbon dioxide (CO_2), nitrogen oxides (NOx), sulfur compounds (SOx, H_2S), volatile organic compounds (VOCs), dust particles 10 microns or less in diameter (PM_{10}), particles 2.5 microns or less in diameter ($PM_{2.5}$), carbon monoxide (CO), and heavy metals. Many of these pollutants are criteria air pollutants, for which the USEPA and/or the ARB have set standards, based on public health, environment, and material damage criteria.

CO_2 is of particular concern due to its effects on climate change and there is great pressure to limit this greenhouse gas (GHG) from fossil fuels, such as natural gas and coal. In December 2009, the U.S. EPA determined that GHGs also threaten the public health and welfare of current and future generations.

Regulatory Environment for Air Quality

The Federal Clean Air Act (1970, amended 1977, 1990) required the adoption of national ambient air quality standards for all areas of the United States. California has enacted its own, more restrictive, Clean Air Act (1988, amended 1992). In California, the USEPA delegated the authority to implement portions of the Federal Clean Air Act to the ARB, which has authorized local air districts to implement rules for attaining the national and state air quality standards.

The air districts control all non-mobile air pollution sources. (The ARB regulates air pollutants from mobile sources.) Local air districts have responsibility for adopting and enforcing rules and regulations to ensure that they meet state and federal ambient air quality standards. The districts are free to enact stricter rules and regulations than the state or federal rules and regulations.

[14] Many solar thermal plants generate fossil fuel emissions during construction and operations.

Table E.1: Air Quality Impacts

Air Pollutant	Resources (from primary use)	Environmental Impact
Carbon Dioxide (CO_2)	Natural gas, biomass, geothermal, coal	GHG, leading cause for global climate change
Nitrogen Oxide NOx (NO, NO_2)	Natural gas, biomass, coal	GHG, ground-level ozone (smog), fine particle pollution, respiratory effects
Sulfur Dioxide SOx (SO2)	(mostly from coal) Natural gas, biomass, geothermal	Respiratory effects, acid rain, smog, plant & water damage
Hydrogen Sulfide (H_2S)	Biomass, geothermal, coal	Toxic and may cause asphyxiation at high concentration. Foul odor & irritant
Volatile Organic Compounds VOCs (CH_4, CFCs, others)	Natural gas, biomass, geothermal, coal	GHG (methane, CH_4), ozone depletion, smog, irritant, dizziness, respiratory effects
Carbon Monoxide (CO)	Natural gas, biomass, coal	Toxic gas, smog, inhibits oxygen in blood, respiratory & cardiovascular effects
Heavy Metals Mercury (Hg), Lead (Pb)	Natural gas, biomass, geothermal, coal	Toxic, numerous health effects (respiratory, organs, nervous system), human and animal poisoning
Fugitive Dust and Particulate Matter (PM_{10} and $PM_{2.5}$)	All resources, including solar/wind (construction and operation)	Respiratory effects, Valley Fever, reduced visibility

Source: Aspen Environmental Group

The agencies with permit responsibility for energy facilities typically impose mitigation that can include emission controls, dust suppression, and use of cleaner fuels for construction vehicles and equipment. For operation of natural gas facilities, the mitigation may include best available control technologies (BACT) and the use of emission reduction credits to offset emissions of nonattainment criteria pollutants and their precursors.

While local agencies, other than air districts, do not regulate the emissions from energy facilities, they can take steps to avoid or minimize air quality impacts on surrounding areas. Through their zoning laws, cities and counties can influence policy preferences and use permit processes, where energy facilities are located, and how they will operate. (See Chula Vista example presented in Chapter 2.)

Water Use and Water Quality

A significant environmental issue for new energy facilities is water use and water quality. During construction, sediment or contaminated run-off waste can leave the project site or enter surrounding water bodies. Thermal plants may use water to create and cool the turbine steam cycles. The water subsequently needs to be replaced as it is lost through evaporation during that use. Solar thermal power plants consume additional water to clean the solar reflective surfaces, for example.

Power plant water consumption can exacerbate California's already strained water supply, especially in dry inland areas. Appendix C addresses current state laws and policies regarding use of potable water for power plant cooling. Finding non-potable sources of cooling water may be difficult. Local governments should evaluate whether local sources of reclaimed water used for power plant cooling would conflict with future community needs.

Table E.2: Air Quality Laws and Regulations

Federal	
US EPA sets national ambient air quality standards and hazardous air pollutant emission standards; identifies Best Available Control Technologies (BACT) for criteria pollutants, Maximum Achievable Control Technologies (MACT) for hazardous air emissions, Lowest Achievable Emissions Rates (LAER), and oversees State programs (Clean Air Act)	Title 42, United States Code, section 7401 et seq.
State	
Global Warming Solutions Act of 2006 requires California to reduce statewide GHG emissions below 1990 levels by 2020.	Health & Safety Code Section 38500-99 (Assembly Bill 32)
New energy facilities in California may not generate more emissions, proportionally, than a standard natural gas-fired power plant.	Division 4.1, Public Utilities Code, Chapter 3, Section 8340 (Senate Bill 1368)
CEQA guidelines for significant impacts: Violation of any ambient air quality standard, contributes substantially to existing or projected air quality standard violation, or exposes sensitive receptors to substantial pollutant concentrations	Title 14, California Code of Regulations, section 15064 Appendix G (x)
ARB sets ambient air quality standards	Health & Safety Code Section 39606
ARB (with Dept. of Health Services) sets safe exposure limits for toxic air pollutants and identifies Best Available Control Technologies for Toxics (TBACT)	Health & Safety Code Sections 39650-74
California Energy Commission requires identification of offsets in permits	Public Resources Code Section 25523 (d)(2)
Local air district issues Determination of Compliance for projects subject to Energy Commission siting process; issues Authority to Construct/Operate for other projects	Title 20, California Code of Regulations, Section 1744.5
Permits prohibited for facilities that prevent or interfere with attainment or maintenance of any applicable air quality standard	Health & Safety Code Sections 42300 & 42301
No net increase in non-attainment pollutants for districts with moderate, serious or severe air pollution, BACT trigger levels for each category	Health & Safety Code Sections 40918, 40919 & 40920
Local	
Nuisance action to abate damages; public nuisance	Civil Procedure Code Section 731
Local air districts have the primary responsibility for control of air pollution from all sources other than emissions from motor vehicles	Health & Safety Code Section 40000
Full disclosure by facilities to local air district of hazardous emissions	Health & Safety Code Section 44340 et seq.

Source: Aspen Environmental Group

Thermal Pollution

Thermal pollution develops when water used in power plant cooling processes absorbs heat and is released to the atmosphere (closed-cycle cooling) or a water body (open-cycle cooling or once-through cooling). The once-through cooling process is efficient and relatively inexpensive but has the most significant environmental impact. The released water is often as much as 20 degrees F warmer than the receiving body. The warmer temperature negatively affects native organisms that are adapted to the ambient receiving water. Wastewater from energy facilities can also contaminate shared water resources. Management of this wastewater (containment, disposal, treatment) must be accomplished to avoid adverse affects on the natural habitat and the water supply.

California's two nuclear facilities and many of the state's older natural gas-fired facilities use once-through cooling. These facilities can draw up to 17 billion gallons of water per day from the ocean or bays, resulting in significant impacts from entrainment (drawing marine life through the power plant) and impingement (pinning marine life against the intake screen).

Once-through cooling systems are currently being phased out by U.S. EPA and California state policies and are not allowed for new facilities. A more detailed discussion of current state plans to reduce once-through cooling is provided in Appendix C, and impacts are summarized in the sidebar in this section. Table E.3 shows energy facilities with potential water impacts.

Table E.3: Facilities With Potential Water Impacts

Energy Facility Type	Potential Impact
Facilities using water in cooling process	Thermal impact of receiving waters, impacts on air quality, local water supply
Facilities that handle and store chemicals	Surface and groundwater contamination
Facilities with holding ponds for water treatment	Groundwater and wildlife impacts
Hydroelectric dams	Change in volume, temperature, velocity and turbidity of rivers, and groundwater recharge
Geothermal facilities	Surface and groundwater contamination from arsenic, vanadium, sulfur, heavy metals, and salts in drilling sludge
Solar facilities that clean reflective surfaces	Impact on local water supplies, drainage impacts

Source: Aspen Environmental Group

Regulatory Environment for Water Use and Quality

Water Use

In California, water supply and use are controlled and managed by an intricate system of federal and state laws. Common law principles, constitutional provisions, state and federal statutes, court decisions, and contracts or agreements all govern how water will be allocated, developed, and used within the state.

Federal water jurisdiction generally applies to projects on federal land or where water flows across state lines. Appropriative rights to surface waters within the state are administered by the State Water Resources Control Board (SWRCB) per Resolution No. 2009-0011. Groundwater management in certain areas of the state is administered either by judicial adjudication or an agency with statutory powers. In general, the California Water Code requires the

maximum use of wastewater. The Water Code prohibits use of potable water for non-potable uses, including evaporative cooling and other industrial uses, if reclaimed water or other lower quality water supplies are available.

California Water Code Section 10753 (AB 3030 passed in 1992) authorizes local governments to adopt groundwater management plans. More recent groundwater legislation (SBX7, Pavley and Steinberg, Chapter 1, Statutes of 2009-2010; SBX7, Steinberg, Chapter 4, Statutes of 2009-2010) requires that water agencies statewide monitor the elevation of underground basins and publicly report their findings and that the State achieve a 20 percent reduction in urban per capita water use.

Water Quality

The Federal Water Pollution Control Act, or Clean Water Act, provides for the restoration and maintenance of the nation's water quality. It also provides for the elimination of the discharge of pollutants and prohibits the discharge of pollutants in toxic amounts. The act sets forth the National Pollutant Discharge Elimination System Permit Program (NPDES). The Clean Water Act, Sections 307(b) and 307(c) set forth treatment requirements for discharges from publicly owned wastewater treatment plants.

California's Porter-Cologne Water Quality Control Act and the Safe Drinking Water and Toxic Enforcement Act established agencies and standards for controlling the water quality in the state. The federal government has delegated the authority to issue NPDES permits to the state. These are issued by Regional Water Quality Control Boards (RWQCB). The RWQCBs also regulate water quality in the state by issuing discharge requirements for publicly owned wastewater treatment plants, discharges to land, and storm water discharges. These permits ensure that water quality and the environment are protected.

Impacts of Once-Through Cooling

In 2005, the Energy Commission published the *Issues and Environmental Impacts Associated With Once-Through Cooling at California's Coastal Power Plants*. This technology passes up to 17 billion gallons of coastal and estuarine water per day through a heat exchanger to cool the power plant water before returning it to the ocean. Recent studies required by the Energy Commission and other state agencies have shown that coastal power plants that use seawater for once-through cooling are contributing to declining fisheries and the degradation of estuaries, bays, and coastal waters.

Impacts are classified as "entrainment," where small organisms (for example, eggs, larvae) are drawn through cooling water intakes and killed as they are cycled through the plant; "impingement," where larger organisms such as fish and marine mammals are pinned against the intake screens and killed; and "thermal impacts," which describes impacts to ecosystems when the warmed water is discharged back to the cooler source water.

Near-shore marine and estuarine waters are nutrient rich, highly productive ecosystems. These waters provide habitat for innumerable phytoplankton, zooplankton, and invertebrates, as well as the eggs and larval stages for near-shore and off-shore fish, shellfish, crabs and lobsters, and the spores for critical marine plant species like kelp. These ecosystems form a critical part of the marine food web for the larger fish and marine mammal species. When near-shore waters are cycled through power plants for cooling, significant numbers of marine organisms are killed.

Some of the methods that can be used to mitigate water quality impacts include:

- **A storm water management plan to contain sediment and runoff during project construction and operation**. This is required by the RWQCBs, but local governments may require that these plans be submitted to them for their review and approval.

- **Reuse water**. However, mitigation may include wastewater discharge constraints.
- **Recycled wastewater or lower quality water**. Reclaimed water from wastewater treatment plants is often available. The reclaimed water can have high mineralization and nutrient enrichment, which require high costs for treatment. Local governments should consider future uses for reclaimed water.
- **Alternative technology including dry cooling or a combination of wet and dry cooling**. However, these methods can be less efficient and more expensive.

Land Use

Land use environmental impacts are caused by conversion of land for energy development. This includes the area for the facility itself, storage of fuels and waste, pipelines, and transmission. Each energy facility type has varying degrees of land use impacts, footprints, and effects on the surrounding environment. From the perspective of local governments, the effect of a project on local and regional land use policies, development patterns and future land policies is of major importance.

As shown in Figure E.1, energy facilities may require large tracts of land. Construction of any facility and its supporting infrastructure can physically divide communities, displace agriculture, interfere with existing recreational uses, and influence the direction of future development in the surrounding areas.

Land in California is owned by a number of different entities, both public and private. Jurisdiction over the development of those lands varies according to location, ownership, and type of existing or proposed use. A single agency may have exclusive authority over specific lands or projects, or various federal, state, and local jurisdictions may share oversight and develop different management plans for part or all of the land and its resources.

General plans and zoning codes identify uses and constraints to the land under the jurisdiction of local governments. These lands may also be subject to state or federal permitting requirements or, due to the type of use, may be exempt from those local regulations. Likewise, federal lands may need to take local restrictions into consideration or cooperate with other state or federal agencies. Many renewable energy facilities are proposed to be sited on federally controlled lands but would be supported by county, city, state, or private service providers from outside the federal jurisdiction. Providing services to these facilities may result in greater costs than revenues received from the federal government.

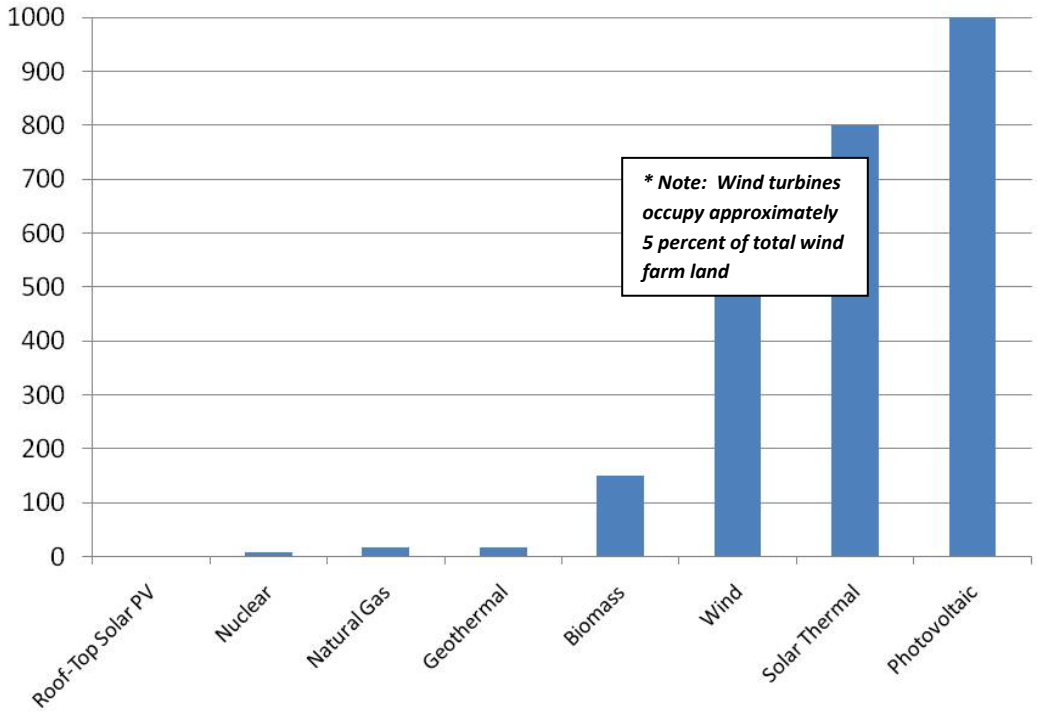
Impacts resulting from a change in land use or effects on local communities or property owners are difficult to mitigate, short of moving the project to a different location.

An energy facility is a long-term project, with a projected operational life, in most cases, of at least 30 years. Therefore, conversion of land from its existing use must be considered permanent and unavoidable if the project is approved. Even if the closure plan for the facility requires the land to be returned to its pre-development conditions, the need for that use in that location may have dramatically changed over 30-50 years. In fact, development of the energy facility may have caused or contributed to that change. Other changes, such as population growth, due to the availability of jobs, expansion of services, or improved access, also must be considered permanent and unavoidable.

Local governments may consider off-site replacement or set-asides of land for similar uses (for example, agricultural conservation easements, parks); rerouting or developing new recreational trails or roads to replace loss of existing access; and in-lieu fees for the development of alternative recreational facilities or improvements to existing ones to help mitigate impacts to land use.

A link to land jurisdiction maps (as well as many other types of maps) is found at: http://library.humboldt.edu/~rls/geospatial/calmaps.htm#land.

Figure E.1: Average Amount of Land (in Acres) Used to Produce 100 MW for California Power Plants



Source: Adapted from Energy Commission 2007 Environmental Performance Report

Biological Resources

Energy facilities and related facilities, such as service roads, may impact biological resources during construction and operation. (See Table E.4) These include temporary and permanent effects to animals, plants, and the local habitat.

Table E.4: Potential Biological Resource Impacts From Landside Energy Facilities

Energy Facility	Potential Biological Resource Impacts
Wind Turbine Farms	Bird and bat collisions and death, noise and vibration disruption to species, loss of habitat
Large Solar	Loss of habitat, removal of migration corridors, avian impacts
Geothermal	
Forest Waste Biomass	Emissions from trucks, loss of habitat for some species, additional road kills on forest roads
Large Hydroelectric*	Habitat loss and barrier to migration for land and water species, effects of dams on fish migration, fish survival
Transmission	Bird collisions and electrocution of large bird species, loss of habitat

*There are generally fewer or no significant impacts from small hydro (less than 30 MW)

Source: Aspen Environmental Group

Construction activities may directly eliminate habitat or individuals of a species, or degrade important habitat as a result of additional noise, soil erosion, and human activity. Bright lights and loud noises can disrupt the habits of animals and interfere with mating and other essential activities. The project site and access roads may block migration corridors or permanently displace local species and natural vegetation.

Facility operational impacts result from air emissions, groundwater drawdown and competing water availability, elimination of habitat, and waste water discharges. Thermal facilities can draw billions of gallons of water for their cooling systems and return warmer water (if using once-through cooling) that decreases the level of oxygen available for aquatic life. As discussed previously, aquatic life can be killed directly by being pinned to the inlet or by going through the system itself. Impacts associated with combustion can injure vegetation, damage freshwater lake and stream ecosystems, decrease species diversity and abundance, and create air quality conditions that affect plants and animals.

An example of an impacted sensitive species is the desert tortoise, a state and federally listed threatened species found in the Mojave Desert area of California. Utility-scale solar and wind facilities, both of which require large tracts of land, are increasingly proposed in California desert areas. The very large acreages may not directly threaten the survival of the desert tortoise on an individual project basis, but could pose significant indirect and cumulative impacts to the species when all the projects are viewed together. As described in Appendix C, the DRECP will reduce the cumulative impacts of renewable energy development in the desert.

Some land is deemed extremely sensitive to disruptors, such as energy infrastructure. Examples of areas of critical environmental concern include:

- Vernal pools, riparian areas, and coastal estuaries because many of these natural communities have already been lost, and they often harbor state and federally listed species.
- Wildlife refuges, ecological reserves, and unique or irreplaceable habitats of scientific or educational value.

Biological Resources Analysis

A biological resources analysis includes an inventory of plant and wildlife species and habitat types at the site, at associated facilities and in the surrounding vicinity. It also includes a description of how an area will be altered, for how long, and its potential effects.

The three primary mitigation choices are avoidance by alternative site selection, on-site mitigation, and off-site mitigation.

Avoidance or alternative site selection usually means locating the energy facility to a location that does not include areas of critical environmental concern or sensitive species habitat, but can also mean changing the facility footprint.

On-site mitigation may include employee environmental awareness training, construction monitoring, protection of on-site habitats, revegetation with native species, and relocation of sensitive species.

Off-site mitigation usually entails purchase of replacement habitat, when avoidance and/or onsite mitigation is not sufficient. When off-site habitat is directly purchased, an adequate endowment is required to properly manage the replacement habitat in perpetuity. The amount of replacement habitat and the size of the endowment required will vary, depending on the species affected and the specific habitat lost. Compensation ratios depend on the level and severity of environmental impact and can range from a 1 to 1 mitigation to a 5 to 1 mitigation. The latter could require that a 1,000-acre facility obtain and set aside 5,000 acres of land to compensate for its impacts.

Regulatory Environment for Biological Resources

Important federal laws pertinent to the protection of biological resources include the Fish and Wildlife Coordination Act, the Migratory Bird Act and the Federal Endangered Species Act. Important state laws include the California Native Plant Protection Act, the California Fish and Game Code, California Coastal Act, and the California Endangered Species Act. Impacts to biological resources must be analyzed under CEQA (and NEPA, if appropriate). Local governments,

through policies and ordinances, may also designate local biological resources of concern if they meet the criteria for "rare," "threatened," or "endangered" under CEQA, even though they are not recognized as such on the state or federal lists. Species of local concern must then be addressed in the CEQA review for a project. Pertinent laws and regulations are listed in Table E.5 below.

Table E.5: Biological Resources Laws and Regulations

Federal	
U.S. Fish & Wildlife Service (USFWS) designates and provides protection for species and habitat (Endangered Species Act)	Title 50, Code of Federal Regulations, Section 17.1
Consultation with USFWS is required when listed species may be jeopardized (Fish & Wildlife Coordination Act)	Title 50, Code of Federal Regulations, Section 17
Under the Migratory Bird Treaty Act, taking, killing or possessing migratory birds is unlawful. The Migratory Bird Treaty Reform Act excludes those species considered to be not native to the U.S.	Title 16, Code of Federal Regulations, Section 7
Bald and Golden Eagle Protection Act prohibits the take, possession, and commerce of bald and golden eagles	Title 16, Code of Federal Regulations, Section 668
State	
California's Endangered Species Act protects the state's rare, threatened, and endangered species	Fish & Game Code Sections 2050-2098
Native Plant Protection Act designates rare, threatened, and endangered plants and prohibits the taking of listed plants	Fish and Game Code Section 1900
Natural Communities Conservation Planning Act of 2002 provides an ecosystem approach for protection multiple habitats and species	Fish and Game Code Section 2800-2835
Siting energy facilities in state or local parks, estuaries or areas of critical environmental concern for biological resources is prohibited unless stringent criteria are met	Public Resources Code Section 25527
Protects species that meet the CEQA Guideline definition of "rare" or "endangered," but are not listed as such by the state or federal government.	Title 14, California Code of Regulations, Section 15380
Local	
County or city general plan must include an open space element for the preservation of natural resources.	Government Code Section 65560

Source: Aspen Environmental Group

Cultural Resources

Cultural resources are those parts of the physical environment, either natural or built, that have cultural value of some kind to a particular group. There are many kinds of cultural resources, but in general they include: objects such as fountains or mileposts; sites, such as battlefields or burial mounds; buildings, including houses and churches; structures, such as bridges or railroad tunnels; and districts which are a collection of any of the previous things which share a unifying theme.

When professionals conduct surveys to identify cultural resources they find that California, including the southern desert, has a high density of these resources. Unfortunately, much of the state has not been professionally surveyed and so the locations and types of resources present is unknown in many places. The information that has been collected is stored by the California Office of Historical Preservation (OHP) in one of 11 regional Information Centers. Although not in digital form and available only to qualified cultural resources professionals, this information is an invaluable tool for planning large projects.

Cultural resources are non-renewable and can be damaged beyond repair by activities of all sorts. The role of cultural resource managers, at the federal, state and local levels, is to find a balance between competing needs –the desire for the preservation of particular resources and the benefits of a new project. Unlike biological resources, damage to a cultural resource cannot be repaired. Instead, the "mitigation" of some of these impacts involves the collection of information or "data recovery."

Cultural resources can be impacted directly, indirectly, and cumulatively. Direct impacts are the most common during construction of energy facilities, especially those that require ground disturbance over large areas. Earth moving as part of construction, maintenance, and decommissioning such as grading and trench excavation can destroy resources both on the surface and those buried deep within the project area landforms.

Indirect effects to cultural resources sites in the energy facility area can also occur. Some of these effects include: increased erosion associated with project area grading; vandalism, theft, and the desecration of human remains as a result of increased access to the site; or damage to the sacred qualities of a spiritually important place.

Cumulatively, the destruction of cultural resources adds up. Since they are non-renewable, at some point certain kinds of cultural resources will be gone forever. Rather than just thinking about each resource individually, cultural resources professionals evaluate a project's overall effect for the cultural resources of a region.

Cultural resources are protected by a variety of federal, state and local laws and regulations. The first step is to determine which laws apply to the project. If a federal agency has supplied funding, a permit, or access to federal land, then federal cultural resources laws apply, in addition to state and local laws.

The next phase is to determine the appropriate geographic extent or area of potential effect of the analysis for the energy facility. Impacts to cultural resources often extend well beyond the footprint of the facility and associated linear alignments, and so the area of analysis should be defined accordingly. In addition, different kinds of resources may have different areas of analysis, resulting in multiple, overlapping study areas for the project.

The third phase is to produce an inventory of the cultural resources within the areas of analysis. This will involve research at the OHP Information Centers and possibly a pedestrian survey. Unless resources can be avoided by construction, the fourth phase is to evaluate the significance of the resources present. Resources that are listed or are eligible for listing on the National Register of Historic Places (NRHP) and/or the California Register of Historical Resources (CRHR) are accorded certain kinds of protection under federal and state law. In this process, the Cultural Resources Specialist examines each resource and provides a recommendation to the lead agencies. Representatives of these agencies then make a final determination of how each resource present will be treated under the applicable law.

In the fifth phase cultural resources specialists and the agency representatives assess the character and the severity of the effects of the facility on the cultural resources that cannot be avoided. Finally, measures that would mitigate significant effects are proposed by the state and/or federal agencies. This mitigation often takes the form of "data recovery." Other kinds of mitigation are possible, and depend on the type of resource impacted.

Throughout the entire process communication among all of the interested parties is essential. Parties with decision making roles have their responsibilities legally defined. This includes Native American tribes, who have special legal relationships with both state and federal agencies. Native Americans should be contacted and consulted early and often.

Agreements with all interested parties regarding the importance of specific resources, the character and severity of effects, and the appropriate mitigation are often formalized in agreement documents. These documents may also be

used for the resolution of adverse effects for complex project situations and when effects on cultural resources cannot be fully determined prior to approval of an undertaking.

Regulatory Environment for Cultural Resources

A number of federal, state, and local laws and regulations have been enacted to protect cultural resources. Key Federal laws include the National Environmental Policy Act (NEPA) and Section 106 of the National Historic Preservation Act of 1966, as amended. 16 USC 470(f) requires federal agencies to take into account the effects of a proposed action on cultural resources (historic properties), and affords the Advisory Council on Historic Preservation the opportunity to comment.

The California Office of Historic Preservation refers to the Secretary of Interior's Standards and Guidelines for Archaeological and Historic Preservation in its requirements for selection of qualified personnel and in the mitigation of potential project impacts to cultural resources on public and private lands in California.

The American Indian Religious Freedom Act; Title 42, USC, Section 1996, protects Native American religious practices, ethnic heritage sites, and land uses. The Native American Graves Protection and Repatriation Act (1990) and implementing regulations (43 CFR 10) govern human remains found on Federal and Tribal lands. Title 25, USC Section 3001, et seq., defines "cultural items," "sacred objects," and "objects of cultural patrimony"; establishes an ownership hierarchy; provides for review; allows excavation of human remains, but stipulates return of the remains according to ownership; sets penalties; calls for inventories; and provides for the return of specified cultural items. The California Public Resources Code (PRC) § 5097.98 and 5097.99, HSC § 7050.5 *et seq.*, and PC § 622.5 and 642 has provisions for Native American remains found on other lands.

Local governments, through policies, goals, and programs, may also preserve prehistoric and historic resources. Pertinent laws and regulations are listed in Table E.6.

Table E.6: Cultural Resources Laws and Regulations

Federal	
Section 106 of the Act requires federal agencies to take into account the effects of a proposed action on cultural resources	National Historic Preservation Act of 1966, as amended 16 United States Code 431-433
Criteria to evaluate properties for the National Register	Title 36, Code of Federal Regulations, Part 60.4 – National Register of Historic Places, Criteria for Evaluation
Implementing procedures for Section 106 of the National Historic Preservation Act	Title 36, Code of Federal Regulations, Part 800 – Protection of Historic Places
Regulations to carry out provisions of the Native American Graves Protection and Repatriation Act of 1990 on Federal and tribal lands.	Title 43, Code of Federal Regulations, Part 10 – Native American Graves and Repatriation Information
NEPA requires federal agencies to consider potential environmental impacts of the project	Title 42, United States Code Sections 4321 to 4332
Federal Land Policy and Management Act of 1976	Title 43, United States Code, Section 1701 et seq.
Federal Guidelines for Historic Preservation Projects, Standards and Guidelines for Archaeology and Historic Preservation	Federal Register 44739-44738, 190
State	
CEQA defines significance and includes cultural resources	Public Resources Code Section 15382
Native American Heritage Commission acts as the primary government agency responsible for identifying and cataloging Native American cultural resources	AB 4239, 1976
Regulations on the treatment of Native American remains and artifacts.	Public Resources Code 5097.98 and 5097.99
Regulations for discovery of Native American remains outside a cemetery	California Health and Safety Code 7050.5
Rules pertaining to protection of sites on private property	California Penal Code § 622.5
Rules pertaining to theft of articles from dead bodies.	California Penal Code § 642
Local	
Consult with California Native American Tribes about proposed local land use planning decisions	Civil Code Section 815.3; Government Code Sections 65352.3 – 65352.5 (SB 18)

Source: Aspen Environmental Group

Hazardous Materials

Accidental release of hazardous materials may occur during the construction, operation, and closure of many types of energy facilities. Routine emissions from operations may also be considered hazardous (e.g., diesel emissions, GHG emissions); these are discussed in the Air Quality section. Although many of the laws regarding management of hazardous materials were promulgated at the federal or state government levels, it is often local governments that are ultimately responsible for implementing and enforcing such laws. Local governments should be familiar with policies and procedures that ensure proper hazardous materials handling at facilities under their jurisdiction.

Materials are hazardous if they have the potential to cause injury to life and/or damage to property and the environment. Acutely hazardous materials (also called extremely hazardous in federal legislation) can cause serious toxic effects as a result of short exposure periods. Hazardous and acutely hazardous materials possess at least one of the following properties: toxicity, flammability, corrosivity, or reactivity.

- Toxic materials have harmful effects on human health or the environment.
- Flammable materials are those that are easily combustible, with a flashpoint equal to or less than 140°F.

- Corrosive materials have a pH less than or equal to 2 or greater than 12.5. They dissolve some materials or burn skin and are toxic if vaporized.
- Reactive materials are those that are unstable or undergo rapid or violent chemical reaction with water or other materials.

Common uses of hazardous materials include fuel burning, emissions control, water treatment, generator cooling, heat transfer, and boiler cleaning. Both the state and federal government have created various lists of hazardous and acutely (or extremely) hazardous materials that define the substances subject to various regulations. The state list of acutely hazardous materials and the federal list of extremely hazardous materials are identical. (See Code of Federal Regulations, Vol 40, Part 355; California Code of Regulations, Title 22, Article 9)

Hazardous materials can be released through a variety of means such as those defined below.

Equipment failure refers to a spontaneous failure without an external event, negligent maintenance, or operation outside designed limits. Equipment failure is rare for new equipment that is designed and maintained to current standards.

External forces that can cause the accidental release of hazardous materials include fires, earthquakes, explosions, and collisions. Facility design and strategic location of hazardous materials can reduce the risk of accidental release due to these causes.

Sabotage can cause the intentional release of hazardous materials. Security measures are incorporated to protect infrastructure from malicious mischief, vandalism, or domestic/foreign terrorist attacks

Human error is the most common cause of accidental release of hazardous materials. Human error may be involved in the design, operation, or management of a facility. The most important factors affecting the potential for human errors are the safety culture and effectiveness of safety management practices at the facility. A safety management plan for hazardous materials should be required of every facility using hazardous materials. Elements of a safety plan can include:

- Process safety information
- Process hazard analysis
- Operating procedures
- Training
- Pre-start-up safety reviews
- Mechanical integrity
- Hot work permit (such as welding or cutting)
- Incident investigation
- Emergency planning and response
- Injury and illness prevention
- Employee participation

Regulatory Environment for Hazardous Materials

A number of federal, state, and local laws and regulations have been enacted to regulate hazardous materials. Table E.7 identifies the primary laws that address energy infrastructure construction and operation. Counties may also include additional guidance in their general plans regarding hazardous materials and on the appropriate locations for projects requiring large amounts of hazardous materials.

Table E.7: Hazardous Materials Laws and Regulations

Federal	
Superfund Amendments and Reauthorization Act contains the Emergency Planning and Community Right to Know Act	Title 42, U.S.C., §9601, et seq.
Clean Air Act includes a nationwide emergency planning and response program and reporting requirements for extremely hazardous materials	Title 42, U.S.C., Section 7401 et seq.
Contains U.S. Department of Transportation (DOT) regulations for transport of hazardous materials.	Title 49, Code of Federal Regulations, 100-185
Outlines gas pipeline safety program; transportation of natural gas by pipeline; minimum safety requirements	Title 49, Code of Federal Regulations, Parts 190; 191; 192
Contains U.S. EPA provisions for chemical accident prevention, including a list of regulated substances and thresholds.	Title 40, Code of Federal Regulations, Section 68
State	
Sets forth requirements for ammonia handling; describes process safety management of acutely hazardous materials.	Title 8, California Code of Regulations Section 458 and 500-515; 5189
Prohibits discharge of air contaminants/materials which may endanger the public; requires spill prevention plans and reporting; requires preparation of risk management plans and off-site consequence analysis	California Health and Safety Code, Sections 41700; 25270.13; 25531 – 25543.4
Safe Drinking Water and Toxic Enforcement Act prevents discharge of chemicals that cause cancer or reproductive toxicity into drinking water	Title 27, California Code of Regulations, Chapter 1
Local	
Requires a description of equipment, an inventory of hazardous materials, and location and use of all hazardous materials at the facility.	California Health and Safety Code, Chapter 6.95, Sections 25500-20 (Hazardous Materials Business Plan)

Source: Aspen Environmental Group

Traffic and Transportation

Similar to other infrastructure, energy facilities may impact traffic and transportation. Typically, the major transportation impacts from an energy facility occur during construction, as the number of trips associated with operation of the plant is usually minimal.

Types of impacts would be generally similar across all facility types. Level of Service (LOS) is a qualitative measure describing operational conditions within a traffic stream. It is used to describe and quantify the congestion level on a particular roadway or intersection and generally describes these conditions in terms of such factors as speed or vehicle movement. Congestion can range from LOS A (least congested) to LOS F (most congested). Construction vehicles could exacerbate congestion on California highways if they are operating below LOS C.

At LOS C most experienced drivers are comfortable, roads remain safely below but efficiently close to capacity, and posted speed is maintained. Construction trucks may not be able to safely travel on winding roads or roads that are

too narrow, and alternate routes may be required. Construction and commute traffic for projects in sensitive biological areas could increase mortality of protected species through road kills.

Mitigation measures might include physical improvements (for example, roadway widening, intersection improvements, new transportation signal), trip reduction measures (for example, incentives for employees to carpool or use public transit), or operational changes (for example, schedule changes). Applicants may be required to pay for or restore pavement to its original condition to account for any impacts from truck traffic during construction.

Aviation impacts can occur if a power plant is sited within proximity of an airport facility. Both facility height and emitted plumes could affect airspace and aircraft over-flights. Cooling tower thermal plumes and solar thermal "power towers" can be several hundred feet in height. Mitigation may be in the form of Notice to Airmen (Notams) and updating all airspace charts to indicate any plume hazards to aircraft. Solar thermal mirrors may create glint and glare hazards to pilots (and drivers in vehicles).

Information that can be used to determine impacts includes:

- Transportation counts.
- Collision data for study roadways.
- Roadway physical characteristics (for example, number of lanes, median islands, transportation control devices, designation on general plan).
- Parking supply and occupancy.
- Public transit, school buses, and pedestrian and bicycle facilities.
- Airport and site airspace flight data.
- OPR military lands mapping tool.
- Air plume technical studies.
- Consultation with the Department of Defense

Major regulations affecting traffic and transportation are provided in Table E.8. Cities and counties provide relevant standards and guidelines regarding transportation, parking, public transit access, and bicycle/pedestrian facilities through general plan circulation elements, city transportation impact assessment guidelines, and county congestion management programs.

Table E.8: Traffic and Transportation Laws and Regulations

Federal	
Establishes standards for determining physical obstructions to navigable airspace and provides for aeronautical studies to determine the effect of physical obstructions to the safe and efficient use of airspace.	Title 14,Code of Federal Regulations , part 77 Objects Affecting Navigable Airspace
State	
Includes procedures and regulations pertaining to interstate and intrastate transport and provides safety measures for motor carriers and motor vehicles that operate on public highways.	CFR, Title 49, Subtitle B (49 CFR Subtitle B)
Includes laws pertaining to licensing, size, weight, and load of vehicles operated on highways; safe operation of vehicles; and the transportation of hazardous materials.	California Vehicle Code (various sections)
Includes laws for the care and protection of state and county highways and provisions for the issuance of written encroachment permits.	California Streets and Highway Code (various sections)
Encroachment Permits	California Streets and Highways Code, Sections 660-674
Local	
Can require maintenance of specified level of service or better on Congestion Management Plan segments.	California Constitution Article XII B, as amended (Proposition 111 - Traffic Congestion Relief And Spending Limitation Act Of 1990)
May identify permitting requirements for oversize/overweight vehicles and need for encroachment permits.	County Codes (various)
Allows counties to issue Encroachment Permits in any county highway.	Streets and Highways Code Chapter 5.5, Section 1460

Source: Aspen Environmental Group

Visual

Visual impacts depend on the size and location of the generation facility or transmission line. For energy projects located on remote, undisturbed land, visual impacts may be particularly significant. Attributes affecting visual impacts are as follows:

- **Visual Quality** is the value of visual resources. In general, human changes to the view in natural areas lower visual quality.
- **Viewer Exposure** depends upon viewer distance from the feature or view, the number of viewers who will see the view, and the length of time the view will be seen.
- **Visibility** describes how easily something can be seen.
- **Viewer Sensitivity** describes the level of interest or concern of potential viewers. Similar existing buildings would lower the viewer sensitivity to new developments.

A project can adversely affect visual character or visual quality by creating contrast with the form, line, color, texture, or spatial arrangement of the existing setting; by introducing a dominant element to a view; by blocking a scenic view; or by causing light or glare. Energy facilities can produce glare (if reflective materials like solar panels or mirrors are used) that can shine on surrounding areas. Nighttime lighting can be directly visible or can illuminate the sky. Utility-scale renewable energy facilities can occupy very large tracts of land and may be inconsistent with the existing scenic qualities of the landscape. A summary of visual impacts by facility is shown below.

- **Wind.** Large tracts of land; highly visible locations (ridges); change from rural to industrial
- **Solar.** Large tracts of land; concentration of sunlight; change from rural to industrial; vegetation removal; scarring; glare
- **Large Hydroelectric.** Change in river from free-flowing to industrial use; dams are often large; vegetation removal; scarring
- **Geothermal.** Large industrial plants; cooling tower plumes; drilling equipment; pipelines; cooling towers; change from rural to industrial; vegetation removal; scarring
- **Natural Gas.** Combustion facilities visible; high exhaust stacks; emission plumes; visible cooling tower plumes
- **Transmission Lines.** Introduction of industrial element; long, linear facilities with many viewers; impacts to ridge-top skyline

Laws pertinent to determining visual impacts are shown in Table E.9.

Table E.9: Visual Resource Laws and Regulations

Federal	
Wild and Scenic Rivers Act protects the visual quality of designated rivers	Title 16, United States Code Section 1271 et seq.
NEPA established the federal basis for addressing aesthetics	Title 42, United States Code Sections 4321 to 4332
BLM Visual Resource Management	Federal Land Policy and Management Act of 1976 Section 102, 103, 201, 505 and 42 U.S. Code 4331[b][2] (NEPA)
USFS Scenery Management System	16 U.S. Code 529-31 (Multiple Use-Sustained Yield Act of 1960)
State	
CEQA defines significance and includes aesthetics	Public Resources Code Section 15382
California Coastal Act protects the scenic and visual qualities of coastal areas as a resource of public importance	Public Resources Code Section 30251
California Scenic Highway System	Streets and Highways Code Section 260 et seq.
Local	
Open Space Element in General Plans	Government Code Section 65302
Zoning and design guideline authority	Government Code Section 65800 et seq.

Source: Aspen Environmental Group

Noise

Noise may be associated with the construction and operation of energy facilities. Potential community impacts during energy facility construction include speech interference and disruption of daytime activities and nighttime sleep. While construction noise impacts are temporary, operational noise impacts potentially last for the life of the facility.

Operational noise levels are rarely allowed to exceed local limits since they could continue day and night for many years. The effects of noise on people can be classified as follows:

- Subjective effects of annoyance, nuisance, and dissatisfaction.
- Interference with activities such as speech, sleep, and learning.
- Physiological effects such as anxiety or hearing loss.

Community noise impacts are almost always in the first two categories, while workers in industrial plants can experience the more physically damaging effects of the last category.

Decibel (dB) is a unit of measurement that describes the magnitude (loudness) of a particular quantity of sound (sound level) with respect to a standard reference value. A-Weighted Sound Level (dBA) is a number representing the sound level that contains a wide range of frequencies weighted in a manner representative of the human ear's response. In general:

- Outside of a laboratory, a 3 dBA change is considered a barely noticeable difference.
- A change in sound level of at least 5 dBA is required before any noticeable change in community response would be expected.
- A 10 dBA change is subjectively heard as an approximate doubling in loudness and almost always causes an adverse community response.

Table E.10 shows noise impacts that can emanate from energy facility operation.

Table E.10: Potential Noise Impacts From Energy Facilities

Facility Types	Potential Noise Impacts
Most facilities during construction	Equipment and delivery noises, pile driving
Facilities with solid fuel delivery (Biomass)	Delivery equipment noises
Biomass	Fuel chipping/grinding
Facilities with pressure release valves (Biomass, Natural Gas, Solar Thermal, Geothermal)	High pitched steam release
Wind	Turbine noises and vibration
Hydroelectric	Turbine noises

Source: Aspen Environmental Group

Noise impacts can be reduced by muffling equipment, limiting construction and operation times, and relocating project components to increase the distance to receptors. Local government (city and county) environmental and community noise regulations and policies are provided through the General Plan - Noise Element, and the Municipal Code - Noise Section. The noise standards and policies outlined in these documents vary by city and county. The Noise Element addresses primarily land-use/noise compatibility for stationary noise sources, meeting or exceeding California State land-use/noise compatibility criteria. Criteria in the Noise Element are usually not applicable to the stationary noise sources associated with construction sites, power plants, substations, transformers, transmission lines, etc. Noise and time limit criteria in the Municipal Code are usually applicable to these stationary noise sources.

Local governments can require the project developer to design, implement, and maintain an effective noise-complaint resolution program during construction and subsequent operation of the energy facility. The city/county can also require an ambient noise survey and analysis prior to construction and can require noise surveys of the facility and of the surroundings (worker protection and ambient surveys) after the energy facility is operational. If the surveys

indicate that either the workers or the community has been significantly impacted, further mitigation can be required. Pertinent laws and regulations related to noise impacts are listed in Table E.11.

Table E.11: Noise Laws and Regulations

Federal	
Occupational Safety and Health Act stipulates maximum worker noise exposure levels	Title 29, Code of Federal Regulations, Section 1910 et seq.
State	
California Occupational Safety and Health Administration sets employee noise exposure limits	Title 8, California Code of Regulations, Sections 5096-5098
CEQA guidelines state a project's impacts are significant if it increases substantially ambient noise levels for adjoining areas, or exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.	Title 14, California Code of Regulations, Sections 15064, Appendix G (p)
Local	
A noise element is required in each local general plan to establish acceptable noise limits for various land uses, usually used to enable policing of annoying noise	Government Code Section 65302
Municipal Code/Noise Ordinance	
The Municipal Code usually includes noise standards and time limits for stationary noise sources and construction activities.	Municipal Code/Noise Ordinance

Source: Aspen Environmental Group

Health/Safety and Public Services

Health/safety and public service impacts include elements such as the following, many of which are addressed in information previously presented:

- Air emissions from both the construction and operation power plants.
- Accidental releases of hazardous materials.
- Land activities that contaminate soil and water resources, exacerbate flooding, or affect water supply.
- Operations impacts to community services including law enforcement, hospitals, emergency medical services and fire protection.
- Electric and magnetic field (EMF) exposure.
- Transmission line effects on aviation safety, audible noise, fire hazards.

Pertinent laws related to health and safety impacts that are not addressed in previous tables are listed in Table E.12.

Table E.12: Health and Safety Laws and Regulations

Federal	
Requires Maximum Achievable Control Technology for certain levels of Hazardous Air Pollutants (HAPs).	Clean Air Act Section 112 (Title 42, U.S. Code Section 7412)
State	
Establishes thresholds of exposure to carcinogenic substances above which Prop 65 exposure warnings are required.	California Health and Safety Code Section 25249.5 et seq. (Proposition 65)
Prohibits discharges that cause injury, nuisance or endanger the health or safety of the public, or cause injury or damage to business or property.	California Health and Safety Code Section 41700
Air Toxics Hot Spots Program requires inventory and reporting, limits levels of toxic air contaminants	California Health and Safety Code Sections 44300
Requires a quantitative health risk assessment	California Public Resource Code Section 25523(a)

Source: Aspen Environmental Group

New Energy Facilities

This section covers specific environmental impacts of new potential energy facilities in California and is organized by technology type. Relevant regulatory and permitting issues are also discussed. Technologies included range from conventional energy resources to renewables, each with varying degrees of potential environmental impacts.

Transmission

Transmission lines are high capacity power lines that bring electricity from energy facilities to load centers (cities) (Figure E.2). Transmission is a critical link for new facilities, especially for renewable facilities, because these sources are often in remote locations, as dictated by quality and availability of the renewable resource and land sufficient to support the generating facility. The availability of existing transmission infrastructure and the feasibility of expanding transmission capacity, including economic viability and environmental impacts, can determine whether an energy project can be developed. There are real and perceived environmental issues that include bird and bat collisions and electrocutions, aesthetics, land use compatibility, fire risk, and electromagnetic field (EMF) effects that may be magnified by the length of the transmission corridor.

Figure E.2: Transmission Lines

Source: Aspen Environmental Group

Design, construction, and operation of electrical transmission facilities in California are generally outside the regulatory authority of local governments. Depending on the particular facility, this authority may rest with the CPUC, the Energy Commission, or a POU. (See Appendix B for more information on the planning and permitting of transmission lines.)

Previous sections have discussed the process for identifying needed transmission capacity, designating transmission line corridors, and permitting individual transmission lines. Local governments can develop an order of preference for

how and where new transmission corridors are developed, which would then be considered by other agencies responsible for these processes. Preferences might include use of existing lines, upgrade existing lines to meet increased demand, build new lines parallel and adjacent to existing lines, or build new lines requiring new corridors.

Transmission line design characteristics vary depending on the type of structure. Table E.13 provides an example for one project.

Table E.13: Transmission Line Design Example

	500 kV	230 kV
Minimum corridor (ft.)	200	150
Single circuit structure height (ft.)	100-150	100-150
Structure base (sq. ft.)	1225-2000	400
Span length (ft.)	1200-1400	700-900
Structure/mile	4-5	7-9

Source: http://www.wapa.gov/transmission/pdf/electricsystemposter_1.pdf

Transmission lines under 100 kV would require a minimum 68-foot ROW.

Air Quality

Operational impacts of transmission on air quality are not significant and occur primarily during maintenance. However, construction activities would cause emissions of criteria pollutants, odors, toxic air contaminants, and GHGs but would consist primarily of exhaust emissions from heavy-duty diesel and gasoline-powered construction equipment, and fugitive particulate matter (dust) from grading activities and travel on often unpaved surfaces. Exhaust emissions would also occur due to workers commuting to and from project sites and from trucks hauling equipment to the project locations. Because transmission lines often traverse many miles, construction activities may occur at numerous locations at one time.

Water Use and Quality

Transmission does not have significant impacts on water use and quality. Water use is generally limited to dust control during construction. However, the grading and clearing of vegetation during construction can lead to erosion and sedimentation, and water quality can be adversely affected. Best management practices, such as minimizing disturbance to drainage channels, avoiding or spanning watercourses with project structures, and using erosion control methods can minimize impacts to water quality.

Land Use

The land set aside to contain a transmission line is referred to as its "right-of-way." Right-of-way (ROW) corridors for transmission can cover hundreds of miles and traverse many different land areas and uses. In remote areas, the public may be concerned that a new transmission line will affect pristine and undeveloped lands. Transmission lines may be sited on and impact prime agricultural lands. In residential land use areas, public concerns tend to focus on the fear of loss of property values due to the proximity of new transmission lines, safety, and limits to future land uses within and adjacent to the transmission lines. An additional land use issue involves the potential loss of housing as a result of acquisition and removal of residences within the proposed transmission line ROW. Public input and receptivity influences the transmission line development process. Early coordination and planning is paramount to identify the best locations for a transmission line and reduce conflicts.

Biological Resources

Impacts to biological resources from transmission lines occur primarily during construction, but some losses continue once the facilities are operational. Line construction may result in permanent loss of individual listed or sensitive status plant and wildlife species or permanent loss of their habitat. Construction activities may also result in the temporary degradation of wildlife habitat due to increased noise, human presence, and vehicle traffic; increase the potential for take; and, depending on timing and location, result in the disruption of terrestrial and riparian wildlife corridors. Construction of transmission projects may also introduce non-native plants to the area, which may then threaten native species in the surrounding ecosystem.

During operation, electric transmission lines less than 115 kV present an electrocution risk to large aerial perching birds, such as raptors, including those accorded state and/or federal protection. The majority of avian electrocutions are caused by low-voltage transmission lines that are energized at voltage levels between 1- and 60 -kV, which are typically closer to urbanized areas. Collisions generally occur when a transmission line transects a daily or migratory flight path used by a concentration of birds traveling at reduced altitudes. Structures required to span large distances can be 200 feet tall and present a greater risk to migratory birds than shorter structures; bird mortality is significantly lower at towers shorter than 350 feet. To minimize bird electrocutions, incorporating the "raptor-friendly" construction design guidelines provided in *Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 2006* is recommended.

Additional concerns regarding transmission lines, especially in the California desert, include increased predation of listed and wildlife species by ravens. Common ravens are known to nest on transmission towers, are opportunistic, and will prey on wildlife species in the vicinity of perching or nesting sites. The slow-moving desert tortoise is particularly at risk.

Hazardous Materials

There are generally no hazardous materials associated with transmission lines, other than a limited quantity of oils and other lubricants and solvents used during construction and maintenance of the line. Implementation of an environmental monitoring program and maintaining emergency spill supplies and equipment minimize risks. Construction of a line may disturb contaminated soils. Agencies overseeing transmission construction stipulate requirements for investigating, containing, and remediating any contamination that is encountered.

Visual

The public generally considers transmission lines in the landscape to be an aesthetic adverse impact, especially when they are prominent in the views from private residences, public recreational facilities, or major roadways. The facilities are especially controversial where similar features are not already present or where they interfere with scenic vistas. Mitigation measures can include:

- Bury lower-voltage transmission lines.
- Parallel existing lines along an existing right-of-way.
- Avoid ridge tops and upper slopes.
- Locate transmission lines adjacent to the slope in valleys.
- Use existing vegetation to screen or disrupt view of transmission lines.
- Use a curving right-of-way in forested areas to reduce line of sight.

- Follow natural contours.
- Use dull, non-reflective finishes.
- Vary the width of the right-of-way; remove vegetation in an irregular pattern.
- Use transmission structures that minimize visibility.

Noise

Public concerns exist regarding noise. Audible power line noise would be generated from corona discharge, which is usually experienced as a random crackling or hissing sound. The potential for noise is greatest with high-voltage lines during wet weather or near inconsistencies or cuts in the metal surface of the line itself. The precise location of such noise cannot be known until after commencing operation. This is because conductor surface defects, damage, and inconsistencies influence the noise levels. While maintenance of the line can minimize the corona noise, this impact is unavoidable.

Health/Safety and Public Services

Fire Risk

Transmission lines can increase fire risk, particularly in areas where non-native, invasive grasses have replaced natural vegetation. Southern California drought-adapted shrub lands are highly flammable, especially in the fall as fuel moistures reach very low levels. Winds originating from the Great Basin, locally known as Santa Ana Winds, create extreme fire weather conditions characterized by low humidity, sustained high-speed winds, and extremely strong gusts.

Fires can be started by transmission lines in the following ways:

- Vegetation contact with conductors
- Exploding hardware such as transformers and capacitors
- Floating or wind-blown debris contact with conductors or insulators
- Conductor-to-conductor contact
- Wood support poles being blown down in high winds
- Dust or dirt on insulators
- Bullet, airplane, and helicopter contact with conductors or support structures
- Other third-party contact, such as Mylar balloons, kites, and wildlife.

Measures to reduce fire risk include preparation and implementation of a weed control plan, development and implementation of a construction fire prevention plan, vegetation management and coordination for emergency fire suppression.

Electromagnetic Field

Both electric and magnetic fields occur naturally and are present around electrical equipment, appliances, and power lines. Electromagnetic field (EMF) has become a very frequently discussed concern, but the human health risks of EMF are still disputed and uncertain.

There are reports of a possible link with cancer in humans exposed to magnetic fields for long periods. Although there is general agreement among scientists that the cancer or other disease-causing potential of magnetic fields has not been established from the available evidence, it is also true that the possibility of such health effects cannot be dismissed by scientists, based on the same evidence.

The challenge for local governments is how to respond reasonably to the concerns of local citizens in the face of scientific uncertainty. Generally, utilities have taken the initiative to inform citizens about the current state of the knowledge on magnetic field issues. Typical magnetic field measurements for appliances and transmission lines are shown in Table E.14 and Figure E.3, respectively.

Table E.14: Typical 60-Hz Magnetic Fields Measured at Various Distances From Some Electrical Appliances- mG

	1 inch	12 inches	36 inches
Microwave Oven	140	65	10
Refrigerator	6	4	1.2
Electric Range	250	25	2
Electric Shaver	500	-	-
Hair Dryer	100	30	-
Electric Can Opener	5000	470	24
Computer Terminal/TV	26	3.4	1.2
Electric Clock	130	15.5	2.5

Source: http://www.dukenergy.com/pdfs/emf_brochure.pdf

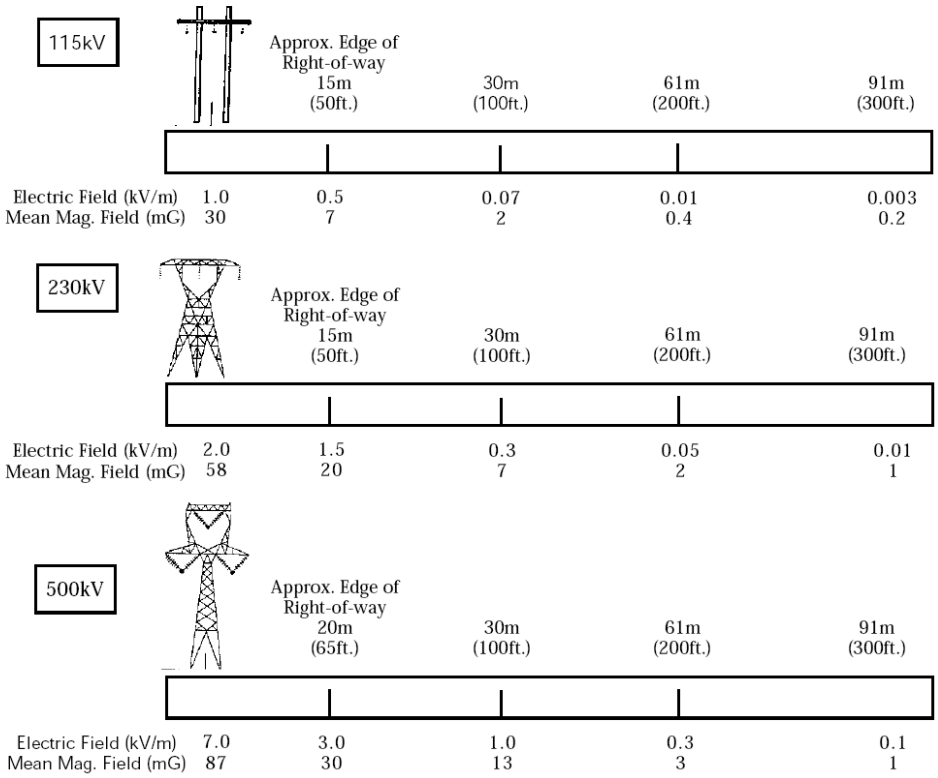
There are actions that can be taken in transmission facility and switchyard locations and designs that can reduce potential electric and magnetic fields. Design considerations include changing the structure height, altering the conductor configuration and spacing, and reordering the phase sequence. Early communication and factual treatment of EMF issues can help the public better understand how and whether EMF would affect their community.

The CPUC has implemented a decision (D.93-11-013) that requires that IOUs use "low-cost or no-cost" mitigation measures for facilities requiring certification under General Order 131-D.4 The decision directed the utilities to use a 4 percent benchmark on the low-cost mitigation for EMFs. Although POUs are not under the jurisdiction of the CPUC, these utilities are voluntarily complying with the requirements. The CPUC issued Decision D.06-01-042 in January 2006, affirming the low-cost/no-cost policy to mitigate EMF exposure from new utility transmission and substation projects. This decision also adopted rules and policies to improve utility design guidelines for reducing EMF. Examples of "low-cost or no-cost" mitigation include:

- Locating lines closer to the centerline of the utility corridors.
- Combining existing transmission circuits onto the same structure.
- Arranging phases of different circuits to reduce magnetic fields when multiple circuits are located on the same structure or in the same underground ductbank.

- Keeping electrical equipment as compact as possible, locating high current devices such as transformers, capacitors and reactors away from fence lines.
- Restricting public access to area around transmission lines or substations.

Figure E.3: Typical Transmission Line Electric and Magnetic Field Strengths



Source: DOE/BP-2081, Electric Power Lines, November 1993.

Natural Gas Power Plants

Natural gas-fired power plants are the most common electricity sources in California, providing more than half of the state's electricity.

Air Quality

Compared to coal, at least 1/3 to 1/2 fewer CO_2 emissions are associated with the burning of natural gas. Technology advances have improved the thermal efficiencies of gas-fired plants. In absolute quantities, however, the combustion of natural gas emits relatively large amounts of GHGs and other criteria pollutants that have been traditionally regulated under the federal and state Clean Air Acts. GHG emissions contribute to the warming of the Earth's atmosphere, leading to climate change. For fossil fuel-fired power plants (including natural gas), the GHG emissions include primarily carbon dioxide, with much smaller amounts of nitrous oxide (N_2O, not NO or NO_2, which are commonly known as NOx or oxides of nitrogen), and methane (CH_4 – often from unburned natural gas). Also included are sulfur hexafluoride (SF_6) from high voltage equipment and hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs) from refrigeration/chiller equipment. GHG emissions from the electricity sector are dominated by CO_2 emissions from the carbon-based fuels.

NOx emissions and nitrogen deposits have significant impacts and must have emission controls on natural gas facilities. NOx, SO_2, VOC, and ammonia from natural gas facilities can contribute to the formation of secondary pollutants, ozone and PM_{10}/$PM_{2.5}$. Ozone contributes to ground-level smog, which can lead to serious respiratory health effects.

Figure E.4: Moss Landing

Source: Monterey Bay National Marine Sanctuary

The use of ammonia to control NOx emissions causes nitrogen deposits that can alter the balance of the natural habitat. The excess nitrogen can contaminate groundwater, alter soil chemistry and affect plant and animal life. The transportation and storage of anhydrous ammonia can pose a safety risk without appropriate controls.

In California, natural gas plants often require air emission offsets to mitigate their impacts to air quality. Offsets are in scarce supply in many areas and the use of offsets for power plants has been controversial. The potential availability of offsets is discussed in Appendix C.

Natural Gas-Fired Power Plant Emissions

Natural Gas-Fired Power Plant Emissions	Significant Impacts
CO_2, NOx, CH_4, CO, VOC, PM_{10}, $PM_{2.5}$, and SO_X	GHGs and climate change, nitrogen deposits on species, heat pollution plumes, smog and visibility

Water Use and Quality

Natural gas-fired power plants can impact water quality via effluent and thermal discharge; spills from fuel transport tankers or pipelines; deposition of nutrients, toxins, and salts from power plant emissions onto soils and into bodies of water; and storm water runoff. Securing a sustainable water source in California's water-strapped environment can be extremely challenging.

Power plants that use once through cooling draw billions of gallons of water per day. Inlet water can trap and kill aquatic life, and the returned wastewater warms ambient temperatures and can decrease the level of usable oxygen in the water. Reclaimed water may be available for power plant use but must be treated to be suitable. Air-cooled systems for existing generating units can also be considered but must be balanced with the loss of efficiency and increased cost. However air-cooled systems for new plants are generally cost competitive with once-through cooling plants. The discussion of the impacts of once-through cooling is provided in Appendix C.

Inappropriate discharge of power plant cooling wastewater can contaminate surface and groundwater resources and directly affect species in the vicinity of the plant. Accepted disposal methods include discharge into evaporation ponds, local sewer systems, underground injection, or treatment through zero liquid discharge systems.

Land Use

Gas-fired power plants may be located in urban or rural areas. These plants have on average a land use profile of about 0.2 acres per MW. While the acreage required for a natural gas plant is much less than for other generation facilities, additional land is needed to provide natural gas and water via pipelines to the plant.

Pipelines that extend a number of miles can pass through environmentally sensitive areas, such as wetlands. The construction may require heavy machinery and temporary foundations with large footprints that can permanently alter the landscape and displace local species, unless special drilling practices are incorporated. Early planning can help avoid some of these issues and can identify paths of least impact. Choosing sites of similar development or building alongside existing pipelines can decrease the magnitude of impacts as well.

Biological Resources

Many of the biological resource impacts occur from the direct combustion of natural gas and the water needs of the cooling system. No new power plants using once-through cooling are likely, thereby eliminating the physical and thermal effects to aquatic life. Use of groundwater for cooling, however, could impact plant and animal species that rely on its availability. Nitrogen deposits can alter the chemistry of water and soil, affecting the supply of food and water for animals. Other impacts include construction-related activities and permanent impacts such as habitat loss, bright lighting and noise that can disturb the local species and displacement of land and vegetation.

Hazardous Materials

Natural gas poses fire and possible explosion risks because of its flammability. However, for most gas-fired facilities, natural gas is not stored on-site, but delivered by a gas pipeline. The gas pipelines must meet CPUC General Order 112 standards and 49 CFR 192 standards for pipelines located in populated areas. Existing laws and regulations minimize the risk of pipeline failure.

Chemical wastes from water treatment and effluent water from cooling water system blowdown could cause contamination.

Hydrogen gas cooling is used to dissipate heat from the generator. Special handling is needed during start-up, with air in the chamber first displaced by carbon dioxide before filling with hydrogen, to ensure that the highly flammable hydrogen does not mix with oxygen in the air.

Anhydrous ammonia used to control air emissions is a hazardous material and requires transportation and storage controls.

Visual and Noise

Power plants near airports can cause visibility and safety issues with visible and thermal plumes that can impede air traffic. Cooling towers and the industrial aesthetics of facilities may be visually unappealing if located near commercial or residential areas. Natural gas facilities can have a moderate sound level increase from operation.

Health/Safety and Public Services

The principal health and safety issue related to the operation of natural gas-fired facilities is the use of anhydrous ammonia. Public services are not usually affected by natural gas plants given that the plants are often located in industrial areas with ready access to necessary services.

Nuclear

Nuclear power facilities are thermal plants that use fission, instead of burning fossil fuels, to create heat and make steam. Nuclear power provides roughly 1/6 the electricity in California and most of California's baseload[15] capacity. The latest facility was constructed in the 1970s. This is because California law prohibits the construction of new facilities in the state until the federal government can demonstrate a safe and permanent solution to the disposal of nuclear waste from spent fuel. Plans for the Yucca Mountains storage location have been delayed indefinitely, and federal policy is still evolving and uncertain. However the US Department of Energy (DOE) is contractually obligated to remove the used fuel from storage on nuclear power plant sites.

Figure E.5: Diablo Canyon Nuclear Power Plant

Source: Sea Grant California

Recently, climate change concerns have revived interest in nuclear power because it does not directly generate CO_2 or GHG emissions. However, nuclear power remains a highly debated and controversial resource, with issues involving national security, safety, seismic vulnerability, high volume water use from once-through-cooling, and cost. Delays play a key role in raising costs, as permitting issues and varying interest groups can impede nuclear facility development. Development costs may also be underestimated, since no new facilities have been built recently, raising the learning curve for design and construction. Most significant, however, is the pending uncertainty relating to the long-term storage of nuclear waste, which can remain radioactive for millions of years.

The Nuclear Regulatory Commission (NRC) regulates all nuclear power plants in the United States. In addition to licensing by the Energy Commission, licensing through the NRC is required for both construction and operation to ensure compliance of NRC regulations. Additionally, utilities must obtain CPUC approval to pursue license renewal before receiving California ratepayer funding to cover the costs of the NRC license renewal process. The CPUC proceedings determine whether it is in the best interest of ratepayers for California's two nuclear plants to continue operating for an additional 20 years. The purpose of the CPUC license renewal review is to consider matters within the state's jurisdiction, including the economic, reliability, and environmental implications of relicensing. Additional information regarding nuclear relicensing is found in Appendix C.

Air Quality

Nuclear power does not directly generate any CO_2 or GHG emissions and has relatively little effect on air quality. As with all generating facilities, construction of nuclear plants would create air emissions. If, due to compliance with the

[15] Nuclear, cogeneration, waste-to-energy, and geothermal are generally operated as baseload resources, Power plants that operate in baseload duty cycle run at peak capacity continuously for long periods until shut down for maintenance or refueling. Baseload plants do not have the ability to significantly increase or decrease output capacity and thus cannot follow the rising or falling load.

SWRCB's once-through cooling policy, utilities propose use of cooling towers, air quality issues could arise. Sea water evaporation plumes could cause air quality impacts.

Water Use and Quality

Nuclear facilities require large amounts of water for cooling. California's two nuclear power plants (Diablo Canyon and San Onofre Nuclear Generating Station (SONGS)) use once-through-cooling (OTC), each drawing in and releasing 2.5 billion gallons of warm water per day into the ocean. As discussed previously, (see Appendix C), OTC can kill or impair marine life and alter the natural ecosystem. Although both plants have programs in place to reduce and/or compensate for OTC impacts, the plants are considered by the SWRCB as the largest source of biologic harm caused by electricity generation. The SWRCB OTC Policy requires the state's two nuclear power plants to eliminate OTC by 2021 for Diablo Canyon and 2022 for SONGS. Retrofitting to wet-cooling with cooling towers is a possible option and would substantially lower the amount of water used, but it is less efficient and has a high capital cost.

Relatively small amounts of primary water are used in direct contact with the nuclear reactor to transfer heat to secondary fluids (not in contact with the reactor). The primary water is considered low-level waste and handled as radioactive material.

Land Use

Nuclear facilities have a direct footprint of about 0.75 acres per MW. However, this does not include indirect land use requirements, such as buffer lands, fuel production, and waste storage. These indirect impacts may be 200 times as large as the generation-only footprint. In addition, land impacts would be much greater in the unlikely event of a radiation release from the plant.

According to the *AB 1632 Assessment of California's Operating Nuclear Plants*, with spent fuel currently held at the power plants sites in dry-casks, the immediate and surrounding land is generally regarded as undesirable and unusable for future activities, such as recreation. This is based on the assumption that spent fuel storage creates health and safety risks that preclude certain types of land uses. However, following the decommissioning of the Rancho Seco nuclear power plant near Sacramento and the Maine Yankee nuclear power plant near Wiscasset, Maine, local communities successfully converted the land once used for the power plant and area immediately around it into recreational or economically productive mixed uses. Even with a plant site converted to alternate uses, the question remains whether the continued presence of the spent fuel has a negative impact on property values, business, and tourism in the area.

Biological Resources

Nuclear power plants using OTC without effective mitigation have considerable biological impacts from the entrainment and impingement of aquatic species, and from the discharge of heated water. (See Appendix C) Construction of the facility itself would directly impact any species and habitat of concern within the plant's footprint and indirectly impact species in the region due to increased traffic and discharge.

Hazardous Radioactive Materials

Nuclear power plants generate high-level radioactive waste from spent fuel and low-level waste from water and other materials in direct contact with the reactor. The nuclear waste is treated and stored on site until the US DOE fulfills its contractual obligation to remove the spent fuel from the site, either in spent fuel pools or thick walled concrete dry-casks. This effectively prevents any radioactivity from exiting the storage unit. The physical amount of

waste is relatively small in size, but the potential impacts are highly dangerous and can remain so for millions of years.

The Yucca Mountain project in Nevada was intended to be a permanent national depository, with deep geological storage and monitoring of all spent fuel nuclear waste in the United States. It has been delayed indefinitely and has considerable technical and policy uncertainty for long-term storage viability. Some of the concerns include the potential for groundwater seepage and seismic activity, and the risks associated with transporting nuclear waste to Nevada.

Visual and Noise

Cooling towers and the industrial aesthetics of facilities may be visually unappealing and operations may cause a moderate increase in industrial sound levels. The location of future facilities in remote areas would reduce visual or human noise impacts. Human receptors are typically located at distances where noise issues are not a concern.

Health/Safety and Public Services

The Three Mile Island incident, which occurred in 1979, is considered the worst nuclear incident in United States history. A partial meltdown of the reactor occurred and small amounts of radioactive gases were released, although no deaths or injuries occurred to workers or in the local community. California's nuclear plants came online in the mid-1980s and have been operating for approximately 25 years. To ensure the safety of aging structures, significant capital investment and monitoring of equipment are needed.

For both existing and potential facilities, ongoing safety concerns include seismic vulnerabilities and terrorist attacks, although there have been no serious incidents in the United States. The NRC requires multiple licensing measures that address public safety. These include a safety analysis report, environmental impact assessment, and public hearings before construction.

In 1988, the CPUC established the Diablo Canyon Independent Safety Committee, which is tasked with reviewing and assessing the safety of operations of Diablo Canyon. Committee members conduct meetings twice yearly, visit the plant, and are given extended access to Diablo Canyon reports and records. The committee issues a yearly report on its findings.

In 2008 the Energy Commission assessed the potential vulnerability of Diablo Canyon and SONGS to a major disruption due to a seismic event or plant age-related issues. Per the 2008 Integrated Energy Policy Report Update, each plant faces seismic hazards, which can include uncertainties about the type of fault zone near the plant, potential impacts from earthquakes directly below the plants, or ground motion resulting from an earthquake rupture.

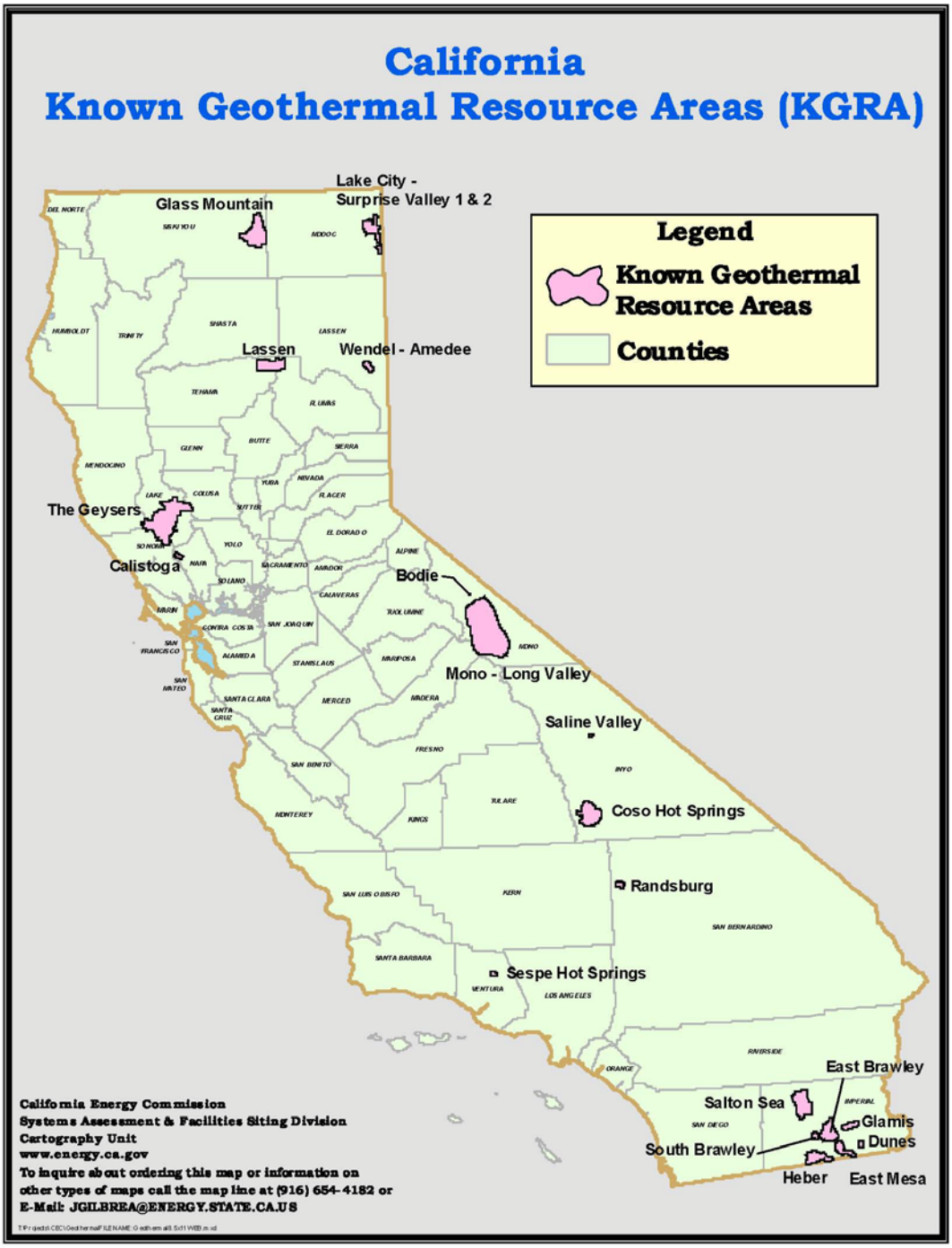
Because of the importance of these facilities to the state's electricity supply, the Energy Commission requested that Pacific Gas and Electric Company and Southern California Edison undertake additional seismic hazards research. These efforts are ongoing.

Geothermal

Approximately 2/3 of total geothermal energy in the United States is produced in California, which contributes 4 to 5 percent of California's electricity. It is an important renewable resource because it provides a reliable baseline source of power, as opposed to the intermittent power from solar and wind. Geothermal facilities are highly location-specific because they require unique geological conditions, usually near seismically active tectonic plate conjunctions. Figure E.6 identifies known Geothermal Resource Areas in California.

Geothermal systems use heat from underground geologic sources to produce steam, which is then used to spin turbines and generate electricity. The heat comes from trapped steam or hot water underground and may be used directly to run the turbines, or can transfer the heat to other fluids to produce steam. There are new technologies emerging designed to exploit hot dry rocks which can artificially create steam when fluids are injected underground. The method of heat extraction and heat transfer will directly influence the types of environmental impacts from geothermal facilities.

Figure E.6: California's Known Geothermal Resources Areas



Source: California Energy Commission

Air Quality

Air quality impacts from geothermal facilities are relatively low because they do not use combustion to generate electricity so only minimal criteria pollutants, such as NO_x, CO, SO_2, and VOCs, are expected. Underground geothermal fluids, either naturally trapped or from injection, will contain non-condensable gases, although far less than the average U.S. power plant. These include greenhouse gases (CO_2, methane, N_2O, and hydrogen), sulfur dioxide, hydrogen sulfide, and ammonia.

In binary plants, geothermal fluids stay in a closed-loop and the heat is transferred to other fluids. In these facilities, the geothermal fluids are generally injected back into the ground after heat extraction and do not make contact with the atmosphere. However, in dry steam and flash steam plants that use the steam directly from underground, the facility is an opened-loop system and non-condensable gases are vented to the atmosphere.

Figure E.7: The Geysers

Source: USGS

The Geysers in California is the largest cluster of geothermal facilities in the state and uses an opened-loop flash steam system. Open-loop systems are more economical, as they do not require heat transfer and cooling towers. Geothermal facilities are also located at Coso Hot Springs and in the Imperial Valley. Others are proposed in these areas and also in northern and eastern California.

Geothermal Emissions

Emissions	Significant Impacts
PM_{10}, H_2S, ammonia, boron and other metals	Strong odor, toxic chemicals, ecosystem damage

Hydrogen sulfide (H_2S) is of particular concern to geothermal projects. It naturally occurs in geothermal fluids, is considered a nuisance odor at low concentrations and is lethal at extremely high concentrations. Hydrogen sulfide is heavier than air and remains in the atmosphere for approximately 18 hours, accumulating in low-lying areas, thus reducing the potential for dissipation over great distances.

Hydrogen sulfide can also convert to sulfur dioxide and sulfuric acid in the atmosphere. Sulfur oxide emissions can injure vegetation, damage freshwater lake and stream ecosystems, decrease species diversity and abundance, and create hazy conditions.

Hydrogen sulfide can be removed from the vent stream with standard abatement technologies by scrubbing or conversion to elemental sulfur, with control efficiencies of H_2S discharge of at least 99 percent. Trace amounts of heavy metals such as mercury, radon, and boron, exist as well in localized sites.

Water Use and Quality

Significant water use and water quality impacts may occur, depending on the type of geothermal system. As mentioned previously, for closed-loop systems, geothermal fluids are usually injected back underground after heat extraction. Cooling towers and large amounts of water are needed for the cooling cycle. If groundwater is the water source, significant drawdown of the groundwater tables may occur. The REAT BMPs manual generally recommends use of dry-cooling technologies. For binary plants located in the desert the REAT agencies recommend use of hybrid-

cooling technologies or per-cooling strategies. For opened-loop and flash steam systems, geothermal fluids require emissions scrubbing and solid waste disposal to avoid a number of adverse water impacts, such as contaminating aquifers or shared resources.

Use of emissions scrubbers in opened-loop systems produces a watery sludge high in sulfur and vanadium, which can be toxic in high concentrations. The wastewater sludge, known as geothermal brine, contains heavy metals, such as arsenic, lead, copper, and zinc. A costly method of remediation involves drying the sludge and shipping it to hazardous waste sites. The preferred method is to reinject geothermal fluids underground to stabilize the geo-pressure and avoid land subsidence, which can lower the elevation of the ground surface, cause ground cracking, and negatively affect the capacity of the groundwater aquifer.

During unexpected events, such as loss of solids removal capability, the spent geothermal fluids from flash systems are typically pumped to brine ponds. Because the geothermal fluid is extremely high in total dissolved solids, a release into the local ground water aquifers could significantly impact local groundwater quality.

Impacts to groundwater could also occur if there was an accidental release of geothermal fluids into the groundwater aquifer. Accidental release of fluid from the geothermal reservoir during drilling or injection is rare, due to the depth of the geothermal resource (for example, below the shallow groundwater aquifer) and the use of sufficiently thick competent casings.

Land Use

Geothermal facilities have a direct land use footprint (generation site) of about 0.2 acres per MW. However, extensive geothermal well fields may be required to provide adequate steam. The plant must be built on or near a geothermal reservoir, typically in seismically active zones and often on previously undisturbed land. Although drilling deep wells to access heat sources may cover substantial land, once operational the well pad covers only about 2 percent of the area of the well field. Ongoing land use issues relate to possible geothermal fluid leaks and spills that can impact soils surrounding the pipelines.

Subsidence can occur naturally or through the extraction of subsurface fluids, including geothermal fluids. Subsidence can be reduced through injection of spent geothermal fluids into the underground reservoir. Injection is regulated by the U.S. EPA to adhere to requirements of the Underground Injection Control Program.

Seismicity

Active seismicity and subsidence generally occur in areas with high levels of tectonic activity (for example, volcanic regions, fault zones), which are the same areas in which geothermal resources occur; therefore, it is difficult to discern between power plant-induced and naturally occurring seismicity and subsidence.

Drilling deep into the Earth's crust to access high-temperature geothermal resources and subsequent reinjection of fluid into the geothermal reservoir may result in micro-earthquakes, which are below magnitude 2-3 on the Richter scale. These micro-earthquakes are typically centered on the injection site and are too low to be noticed by humans. However, the Geopower Deep Heat Mining project in Basel, Switzerland, (an area of high earthquake activity) did cause multiple micro-earthquakes in 2007 that were experienced widely, and was subsequently permanently shut down in 2009. The project was the first commercial application of the hot fractured rock technique, which allows recovery of heat from dry rock. Shortly after this shutdown, Alta Rock Energy abandoned its project 100 miles north of the Geysers which would have extracted vast amounts of renewable energy from deep, hot bedrock.

Biological Resources

Geothermal fluids and brine contain hydrogen sulfide, which can also convert to sulfur dioxide and sulfuric acid in the atmosphere. Open-looped emission scrubbers cycles are required and can remove the hydrogen sulfide. The wastewater generated from this process, and its disposal, is a source of potential impact on the natural habitat.

Emergency geothermal fluid overflows containing brine and condensate may be stored in lined evaporation ponds at the power plant site. Waterfowl and shorebirds or other wildlife could seasonally inhabit or use these evaporation ponds for resting or foraging. The waste brine has high concentrations of heavy metals and minerals, which would be toxic to wildlife. At the time of upset, the heat of the brine is near the boiling point of water, which would kill any invertebrates or plants in the pond that could attract wildlife. Standard practices dictate that the brine be injected as soon as possible after upset, reducing the potential for impacts. Also, ponds may be designed to minimize attraction of birds and other wildlife.

Hazardous Materials

Sulfur byproducts resulting from hydrogen sulfide removal procedures produce waste water sludge, or geothermal brine. As discussed above, the brine can have high concentrations of heavy metals (for example, arsenic, lead, copper, zinc, vanadium) and power plant equipment in contact may be considered hazardous materials. Emergency brine ponds or evaporative ponds may be used to manage the wastewater but in turn may have impacts to the environment. Preferable methods of mitigation include reinjection of the brine underground. (See above sections for more information.)

Visual and Noise

Operating cooling towers and the industrial aesthetics of facilities may be unappealing and can moderately increase sound levels. Facilities are typically located in remote areas, reducing visual or human noise impacts.

Health/Safety and Public Services

Potential exposure to hydrogen sulfide or hot geothermal fluids and steam are the principal health and safety issues associated with geothermal plants. Accidental release of toxic emissions or fluid from the geothermal reservoir during drilling or injection is rare. The remote location of these plants limits public exposure and reduces safety concerns. The limited number of employees during operations would not impact housing, schools, police, emergency services, hospitals, and utilities.

Biomass

A small but growing percentage of power in California comes from biomass. Electrical power can be generated through burning or decomposition of biomass or its byproducts. Biomass resources that can be directly combusted or gasified (creating flammable gas from solids) include forest and wood products or waste, manufacturing waste, agricultural/food processing materials and municipal solid waste. Biomass wood products must be collected and transported to the plant for processing and then prepared as feedstock, which can involve removing contaminants and chopping into chips.

In general, biomass combustion facilities are not eligible for the California RPS, but non-combustion thermal (conversion) technologies are eligible. Methane can be captured and burned from landfills or agricultural facilities with waste decomposition or anaerobic digestion, which can create biogas. The biogas consists primarily of methane (which can be used for energy) and carbon dioxide, with small amounts of hydrogen sulfide and ammonia. The residual products are wastewater and solid waste.

Figure E.8: Covered Lagoon Dairy Digester

Source: ESA, 2010

Most wastewater treatment plants that use anaerobic digesters burn the gas for heat to maintain digester temperatures and to heat building space. Unused gas is either burned off as waste or could be used for fuel in an electric power producing engine-generator or fuel cell. Landfill gas can be used to produce electricity, heat or steam.

Biomass can be used as the feedstock for alcohol fuels (for example, ethanol). Use of air in the conversion process is to be limited to temperature control, only. In addition the process cannot produce air contaminants or emissions, surface or groundwater discharges, or hazardous wastes, and must remove recyclable materials and green waste before conversion of the material to a biofuel. Biomass facilities can have a number of direct and indirect environmental impacts depending on the feedstock and technology. While waste as a feedstock can avoid emissions or landfill use, feedstock from forests, without sustainable management, can increase total CO_2 emissions. Although net emissions may be reduced, local air quality may be adversely affected. In addition, feedstock that is grown specifically for energy can require significant amounts of land and water, causing issues regarding feedstock availability. Dairies generating biomethane face challenges in obtaining air permits.

CalRecycle has released a *Draft Program Environmental Impact Report (PEIR)* for Statewide Anaerobic Digester Facilities for the Treatment of Municipal Organic Solid Waste. The agency has also developed BMPs for monitoring the buildup and migration of methane gas from landfills. The Central Valley Regional Water Quality Control Board (CVRWQCB) has similarly prepared a PEIR that evaluates the environmental effects that could result from the development of dairy manure digester and co-digestion facilities within the Central Valley Region (Region 5); digester facilities may be located at dairy sites or at centralized locations. Impacts and mitigation measures are identified in these documents as well as in the REAT BMP Manual.

Air Quality

Operation of anaerobic digesters results in emissions of criteria air pollutants that could contribute to potential violations of air quality standards or to nonattainment conditions. The CVRWQCB has determined that criteria air pollutant emissions from the cumulative development of dairy manure digester and co-digester facilities in Region 5 exceed the significance thresholds of the San Joaquin Valley Air Pollution Control District for both annual construction emissions and operational emissions. Operations could also create objectionable odors and potentially release hydrogen sulfide and ammonia. Where biogas is combusted, the substantial methane portion is converted to carbon dioxide, which is less damaging as a GHG.

Biomass Emissions

Emissions & Pollutants	Significant Impacts
NOx, PM_{10}, CO_2, VOC, CO, pesticides, fungicides, salts, pathogens	Smog, odors, nitrogen deposits, respiratory hazards, GHGs, local air quality

Water Use and Quality

Biomass facilities may require water for biomass process scrubbers and may generate liquid waste streams for land disposal. Process water must be treated before reuse or discharge. Wastewater from emissions scrubbing can contain heavy metals and nitrates that can have adverse effects on the natural habitat. Wastewater from dairy digesters may contain nutrients, salts, pathogens, and other constituents that can affect water quality. These constituents can be reduced but not eliminated. Improper handling of feedstocks or operational wastewater could also result in dispersion of contaminants to surface water. Liquid wastes require careful monitoring and treatment to avoid contamination to water supplies. Storage of feedstocks also has the potential to generate leachate that could contaminate groundwater.

If feedstock is grown specifically for energy harvesting, then the potential impact to the water supply used to grow the crop should be evaluated. Water demand for crops can be very high and would typically occur when water supplies are most in demand.

Land Use

Biomass power plants require approximately 1-2 acres per MW, depending on the technology. The feedstock, however, may require a much larger amount of land. Feedstock from natural or farmed forests can result in significant indirect land use for biomass facilities, while waste feedstock may not require additional land use (and may actually reduce landfill use). There may also be significant land required for storing feedstock.

Tree farms grown specifically for energy harvesting may also require substantial amounts of land. Sustainable forest management practices can avoid topsoil erosion, depletion of nutrients, soil salinization, and fertilizer and pesticide runoff.

MSW and dairy digesters may operate on-site or at centralized locations near the source of waste. Onsite facilities would generally be consistent with applicable land use plans. Dairy digester facilities would be considered an agricultural use or use compatible with agriculture.

Since digester facilities would be co-located with existing dairies or permitted solid waste facilities, or located in areas zoned for industrial or solid waste handling activities, they are not anticipated to adversely affect biological resources. Landfill biogas facilities would similarly be located onsite. Central location facilities and pipelines have the potential to affect more habitats depending on their location.

Adopted plans protecting biological species (e.g., San Joaquin Multi-species Habitat Conservation and Open Space Plan, Natomas Basin Habitat Conservation Plan (HCP), Kern Water Bank Authority HCP/Natural Community Conservation Planning (NCCP) and East Contra Costa County HCP) generally provide for the continuation and expansion of agricultural facilities. Centralized facilities may trigger the need for compliance measures to protect biological resources.

Transportation and Traffic

A high volume of trucks may be required to transport feedstock to the biomass power plant and the waste from the biomass plant to a disposal site. This can adversely affect the local habitat and the local community who may resist

increased traffic and road maintenance costs. Appropriate government entities can require developers to conduct traffic impact reports and incorporate measures to lower the increase in traffic.

Hazardous Materials

If municipal solid waste is used to generate electricity, acid gases can result and would require measures to reduce acidity. Operation of dairy digester facilities would require the routine handling of gases (e.g. methane, hydrogen sulfide) that can be hazardous. Similar to natural gas and geothermal facilities, biomass facilities use ammonia to reduce NOx emissions. The ammonia is considered hazardous and requires special controls. If municipal solid waste is processed to produce refuge derived fuel, hazardous waste and emissions, like heavy metals, can be generated on-site.

Visual and Noise

Biomass facilities generally are located within existing operations and would not adversely affect scenic resources or noise levels. Frequent truck deliveries can increase noise.

Health/Safety and Public Services

Digester operations could cause the release of toxic pollutants. Diesel emissions from truck traffic could also pose a risk to the public.

Nuisance odor impacts could arise from containment of materials (for example, biosolids) and from decomposition of biomass materials. This would be of more concern at centralized facilities.

The workforce required for construction and operation of a biomass plant is unlikely to adversely impact housing, schools, police, emergency services, hospitals, and utilities.

Solar Thermal and Solar Photovoltaic

Solar is the fastest growing renewable resource in California, and it is projected to be a key resource for meeting the state's renewable energy goals. There are varying types of solar technologies, but they mainly are concentrating solar power (CSP) and solar photovoltaic (PV) systems. CSP technologies use mirrors to concentrate (focus) the sun's light energy and convert it into heat. Some CSP systems (including parabolic troughs, compact linear Fresnel, and power towers) concentrate the heat to create steam that powers a turbine, while other systems(like dish/engine systems, Stirling engines) use the concentrated heat to expand a gas like hydrogen or helium to create mechanical motion to turn a generator. Solar PV systems use panels made of semiconductor material to directly convert sunlight into electricity.

Solar thermal and PV systems share many of the same environmental impacts but differ significantly in water use. Solar thermal plants require large amounts of water to run the turbine and cooling systems and to wash mirrors, whereas solar PV plants require water only for mirror washing. Both can require very large tracts of land for their components, often in undisturbed locations, although solar PV plants may require less ground disturbance. The remoteness of these locations may also increase the need for additional transmission infrastructure and support services. Storage systems like molten salt can store the heat from solar thermal plants to generate electricity at a later time. Electricity from PV plants can be stored with batteries, although size limitations restrict use at the utility scale.

General information on impacts from solar thermal and PV systems and mitigation measures to reduce impacts can be found in BLM's *Draft Solar PEIS* and the *REAT BMP Manual*.

Air Quality

Due to the large amount of land required for solar facility installation, construction may generate a significant amount of fugitive dust. Exhaust emissions would also be caused by heavy, diesel-powered construction equipment, workers commuting to and from the work sites, trucks hauling equipment and supplies to the sites, and crew trucks (for example, derrick trucks, bucket trucks, pickups). Construction may continue for more than a year.

Operations generally cause low air quality impacts. Vehicle use associated with mirror washing would also create emissions.

Figure E.9: Solar Thermal Project in the Mojave Desert

Source: Recharge News

Water Use and Quality

Water use for CSP systems can have significant environmental impacts, especially since these projects are often located in sunny and dry desert regions where water availability may be very limited. Solar thermal systems may require substantial amounts of water for steam, cooling, mirror washing, and other industrial processes, depending on the technology and cooling system required. Solar thermal plants may require up to 65 acre feet per year (AFY) of water per 100 MW, not including cooling water. Cooling water may require an additional 600-800 AFY per 100 MW. Dry-cooling can reduce the amount of water used, but also reduce efficiency and output capacity, particularly in hotter climates such as the desert. PV systems require minimal amounts of water for washing PV panels, approximately 2-10 AFY per 100 MW.

CSP plants can have impacts comparable to other types of thermal power plants (See above sections for more information.), including depletion of groundwater and shared resources supplies, which can lead to water quality degradation and loss of potable water supply. The majority of the solar thermal power plants currently under review by the Energy Commission use dry-cooled technology. Also, the REAT encourages use of dry-cooling as described in the BMP manual's strategic actions.

Construction activities can lead to adverse impacts to soils, including increased soil erosion, soil compaction, loss of soil productivity, and disturbance of soils crucial for supporting vegetation and water-dependent habitats. Activities that expose and disturb the soil leave soil particles vulnerable to detachment by wind and water. Soil erosion results in the loss of topsoil and increased sediment loading to nearby receiving waters. Because many of the solar projects are located in the desert and are near desert washes, water quality impacts can be a significant concern.

Land Use

Land use requirements for both solar PV and solar thermal systems are high, requiring between 4 to 10 acres per MW. Larger plants are often in remote locations, particularly in the California desert. Lands may fall under federal and state protection to avoid displacing natural habitats and species, or to preserve cultural and recreational resources. Additionally, many solar thermal and solar PV systems are located on land managed by the Bureau of Land

Management, and would likely require a BLM land use plan amendment. As noted earlier, remote locations also increase the need for additional transmission lines, which require significant land in their own right. The REAT is encouraging use of previously developed, vacant lands to reduce impacts.

Biological Resources

Depending on its location, a large solar facility located on undisturbed land would likely cause loss of native plant communities, sensitive species and habitat, and loss of connectivity for terrestrial wildlife through habitat modifications. Any wildlife residing within the solar project area would potentially be displaced, injured, or killed during project activities unless mitigated through construction measures. An example of a wildlife species that could be impacted by the construction of a solar facility is the desert tortoise, a state and federally listed threatened species found in the Mojave Desert area of California. Relocating tortoises can be difficult. Some solar PV projects require minimal grading and use fencing that allows wildlife movement through the project. Construction and operation activities may result in direct or indirect impacts to the desert tortoise or its occupied habitat. While each individual project may mitigate the loss of desert tortoise habitat, when a number of developments occur in the desert, there may be significant indirect and cumulative impacts. The Desert Renewable Energy Conservation Plan is being developed to help provide for effective protection and conservation of desert ecosystems while allowing for the appropriate development of renewable energy projects. It will provide long-term endangered species permit assurances to renewable energy developers and provide a process for conservation funding to implement the DRECP.

Additional concerns to biological resources include the introduction and dispersal of invasive or noxious weeds. The permanent and temporary earth disturbance adjacent to native habitats increases the potential for exotic, invasive plant species to establish and disperse into native plant communities, which leads to community and habitat degradation. Siting facilities on previously disturbed lands reduces the impacts. CEQA and other laws and regulations require mitigation or project design features that reduce or address impacts. See the REAT BMP Manual (Chapters 3 and 4) for recommended measures and BMPs.

Hazardous Materials

While solar PV facilities generally do not require hazardous materials other than those required during construction, solar thermal facilities may have fluids considered hazardous. Examples of hazardous materials used in the operation of a solar thermal power plant include heat transfer fluids (such as Therminol VP-1) to create steam. Previous spill modeling involving large quantities of more toxic materials has demonstrated that minimal airborne concentrations would occur at short distances from the spill. Liquid hazardous materials can be released during a transportation accident, and the extent of impact would depend on the location of the accident and the rate of vapor dispersion from the surface of the spilled pool.

Some solar thermal projects using Therminol VP-1 require gas-fired boilers to keep the heat transfer fluid in a liquid state. Natural gas pipelines and propane storage tanks can pose certain hazards. Stirling engines can require storage of large quantities of hydrogen gas.

Adherence to a safety management plan can avoid the likelihood of releases of hazardous materials.

Visual and Noise

Solar projects can cause dramatic changes to the existing landscape, particularly as seen from areas valued for their unique scenic value (for example, within the Mojave National Preserve); designated scenic vistas; or rural residential areas. With the addition of solar projects, views of the desert and rural communities would change from a desert landscape to a more industrial one, characterized by solar panels or mirror arrays that may extend many miles.

Depending on the solar technology, solar collector towers up to 600 feet or more, as well as light rays reflected off ambient atmospheric dust and the bright glow of the receiving portions of the solar collectors could create significant visual change. Glare can also be a significant issue if solar mirrors are visible to cars, trains or airplanes. The visual impacts of solar facilities are highly site-specific and would depend on characteristics, such as topography, proximity to urbanized areas, and the existing character of the land.

Solar facilities do not generate significant noise, with the exception of Stirling engines, which have higher noise levels from the generator, cooling fan and air compressor used on each of the components comprising the facility.

Safety/Health and Public Services

Although the risk may be low, solar facilities may cause health concerns if large quantities of dust are generated in populated areas where valley fever occurs. Valley fever is primarily encountered in southwestern states, particularly in Arizona and California. It is caused by inhaling the spores of the fungus Coccidioides immitis, which are released from the soil during soil disturbance (for example, during construction activities) or wind erosion. The disease usually affects the lungs and can have potentially severe consequences, especially in at-risk individuals. Trenching, excavation, and construction workers are often the most exposed population.

Other safety and health concerns are addressed in previous discussions of heat transfer fluids and glint and glare.

The presence of multiple facilities in a region can strain public services, especially fire protection. Fire districts may not have stations located near solar facilities or may not have adequate personnel to respond to multiple incidents; such concerns have been raised by Riverside County in the recent permitting of large solar plants along the Interstate 10 corridor

Wind

Wind is a growing renewable resource in California and provides roughly 2.5 percent of its electricity. California was the first state in the country to develop large wind farms but now lags behind other states, such as Texas, as a leader in wind power. Although technology advances have made turbines more efficient, large tracks of land are still required. Bird and bat collisions, though location-specific, have been a major concern.

Figure E.10: Altamont Pass Wind Farm

Source: Aspen Environmental Group

More detailed information on impacts from wind facilities and mitigation to reduce impacts can be found in BLM's *Wind Energy Development PEIS*, *California Guidelines for Reducing Impacts to Birds & Bats From Wind Energy Development* and the *REAT BMP Manual*.

Air Quality

The operation of wind facilities does not generate air emissions, other than from mobile source activity for maintenance. Construction of the facilities, typically lasting about a year, can generate fugitive dust and particulates.

Water Use and Quality

Wind development generally does not affect water supplies. However, erosion is a concern due to the practice of siting wind turbines on slopes and ridges where the wind is the strongest and most accessible. This has been an issue in the dry, desert terrain of the Tehachapi region of Southern California, where service roads and tower foundations have created gullies and other land forms resulting from soil erosion. Accelerated wind and water-induced erosion may result from earthmoving activities during construction, causing onsite soil loss and increased sedimentation off site.

Land Use

Wind farms require significant amounts of land (approximately 5.5 acres per MW), although the turbines themselves may occupy only 3 to 5 percent of the land. Wind farms, like other utility-scale renewables, have the potential to conflict with general plans or with the overall character of the surrounding area, disrupt established communities, or physically intrude upon the landscape. The small turbine footprint, however, can allow some activities, such as farming, to continue while impacting others, such as recreation. Many wind facilities are sited on ridge tops of undeveloped land that may be under the jurisdiction of the USFS or the BLM. Should a wind project be sited on federal land, it must be found compatible with the land use plans for these regions. Wind projects are often sited on private lands in closer proximity to urban areas; examples include the Altamont Pass and Solano County wind farms.

Biological Resources

Construction and development of wind farms can lead to temporary or permanent effects to natural vegetation and wildlife habitat. Construction of wind projects would include grading for wind turbine pads, access roads, right-of-way for interconnection systems, and possible maintenance facilities, and meteorological tower pads. All of these construction activities would result in temporary and/or permanent losses of native vegetation, especially if the land has not been previously developed. Impacts to sensitive wildlife species could also occur either directly or through loss of habitat.

Bird and bat deaths associated with wind turbines are the most publicized biological resource concern. Although bird mortality has occurred in the past at the Altamont Pass wind area, studies have shown that bird collisions are not a critical problem at most other wind development areas or in areas where new turbine designs have been used. The previously mentioned *California Guidelines for Reducing Impacts to Birds and Bats From Wind Energy Development* provide information to help reduce impacts to birds and bats from new wind development or repowering of existing wind projects in California.

Hazardous Materials

Turbines that are not well-designed or maintained can cause fluid leaks that drip directly downward or fly off the blade tips. Ground contamination could result. If using hazardous materials, a hazardous materials management plan must be developed to address avoidance, handling, disposal, and cleanup of any spills.

A relatively low potential exists for wind turbines to cause wildfire ignitions due to power collection line failure, turbine malfunction or mechanical failure, and lighting- and bird-related incidents. When mechanical or electrical failures cause turbines to catch fire, they may burn for many hours if located in a rural, ridge-top setting since fire suppression crews would have limited ability to effectively fight fires hundreds of feet above the ground. Wind-blown flaming debris from a turbine fire can ignite vegetation in the surrounding area. Grass or brush fires could be caused by shorts in the electrical cables in the unlikely event that they become stretched or twisted when the turbines turn to

catch the wind. Proper maintenance, vegetation clearing, and adequate access to and within wind farms reduce the risk.

Visual

Wind projects affect visual resources due to the height of towers and rotating blades that occur aloft, where the wind resource is most accessible. Turbines arrayed along ridgelines to capture wind flows over the ridges are visible over greater distances than those on flat or rolling terrain. Visual impacts would depend on the surrounding terrain and the spacing, design, and uniformity of the turbines, markings or lighting, roads built on slopes, and service buildings. The BMPs manual's guidance discourages "skylining" to avoid placing turbines on ridgelines, summits, or other locations where the towers would be silhouetted against the sky, when seem from important, public viewing locations.

The fewer and wider-spaced turbines associated with new wind farms may present a more pleasing appearance in contrast to the more tightly spaced turbines associated with older wind farms.

Shadow flicker may be associated with wind farms. As the blades rotate, shadows pass over the same point causing such an effect. Shadow flicker may become a problem when homes are located nearby or have a specific orientation to the wind farm. Most problems occur generally southwest and southeast of the turbines.

Similar to shadow flicker, blade or tower glint occurs when the sun strikes a rotor blade or the tower at a particular orientation. This can impact a community, as the reflection of sunlight off the rotor blade may be angled toward nearby residences. Blade glint is a temporary phenomenon for new turbines only and typically disappears when blades have been soiled after a few months of operation. The BMPs manual (Chapter 4) offers specific BMPs to address the issues.

Most modern wind turbines are of heights that bring them into airspace regulated by Federal Aviation Administration (FAA). FAA regulations require aircraft warning lights installed on all towers taller than 200 feet. Turbines on wind energy farms can stand up to 300 feet high. Lighting and possibly marking are likely to be required on some portion of the structures. More lights and markings may be required for wind farms sited near airports. On large wind farms, illuminating every turbine could add light pollution to remote areas.

Noise

Noise associated with a wind facility stems from equipment used during construction and the massive rotating elements of the turbine in operation. Principal sources include truck traffic, blasting associated with foundation construction, and operation of heavy equipment. Noise from construction would have limited and short-lived impacts to local populations. Wind farms are typically located in rural or remote areas, with low ambient noise levels. Residential land uses near wind power plants may be affected by turbine noise and operating generators Biological resources would tend to be affected by noise levels that could disrupt critical wildlife life-cycle activities (for example, mating, nesting).

Noise levels associated with new wind farm operations are lower than the earlier-generation of wind power plants. Modern towers are streamlined and insulated to avoid sound. Wind turbines make aerodynamic noises caused by the flowing of air through the blades and mechanical noise from generators. Generally speaking, the higher the speed of the wind, the louder the noise will be, although the noise may be masked by the sound of the wind itself. The topography of the surrounding landscape can affect noise distribution. Hilly terrain, often common at wind farm sites, can be more effective at shielding wind turbine noise than flat terrain. Larger and variable speed wind turbines emit lower noise levels than smaller fixed speed turbines.

Safety/Health and Public Services

Wind turbines can interfere with the military's ability to conduct testing and training activities regardless of whether the project is located on private, local, state or federal land. The military utilizes Special Use Airspace and Military Training Routes that are often far away from any military installation, to conduct these activities. Sometimes, these activities involve the use of land not controlled by the Department of Defense (DoD).

Low level flight training routes and restricted airspace are often used by local and distant military commands. These airspaces, used for combat readiness training, are critical to the safety of our pilots and our nation. Early consultation with DoD is necessary to determine if a planned project will impact military testing or training. Local military installations have designated military Regional Airspace Coordinators/Managers. Their approval or mitigation recommendations expedite the prescreening process.

Wind turbines can interfere with civilian, military, and weather radars. This includes wind turbine obstruction to DoD and Department of Homeland Security long range radars causing national security issues. These radars are looking for non-cooperative low flying aircraft seeking to penetrate the national Air Defense Zone.

Obstruction of FAA and military short range radars may create air safety issues. These radars are installed at most military bases and civilian airports. Wind turbines can also interfere with the NOAA/NWS weather radars, causing erroneous or misleading weather predictions and severe storm warnings. Any construction or alteration exceeding 200 ft above ground level requires the filing of an FAA Form 7460-1, Notice of Proposed Construction or Alteration. The FAA has prepared *Technical Guidance for Evaluating Selected Solar Technologies on Airports* to address safety issues.

Small Hydro

Hydroelectricity provides a significant source of electricity in California with nearly 400 hydroelectric (hydro) plants contributing 15 percent of the state's total power. Hydro plants use the energy from moving non-marine water (from height and pressure differences) to spin turbines and create electricity. Traditional large dams, reservoirs, and on-stream large hydro plants (above 30 MW) are not currently being built, due to their environmental impacts, including modifying stream flows and fish mortality. Small hydro plants (below 30 MW) have fewer impacts compared to large plants; the remaining discussion focuses on small hydro.

In California, RPS small hydro certification requires (for facilities installed since 2006), establishing the right to divert water, acquisition of all applicable permits, and demonstrating that the project will not adversely affect in-stream beneficial uses or a change in volume or timing of stream flows. Small hydro projects in human-made conduits (pipelines, aqueducts, irrigation ditches, and canals) likely offer greatest RPS-eligible potential. Other RPS-eligible hydroelectric opportunities include installing more efficient turbines at existing dams, increasing the use of pumped-storage projects, and encouraging the use of run-of-river turbines that take advantage of flowing water in rivers and streams in such a way as to have minimal impact on fish habitats and natural settings.

The Energy Commission document, *Statewide Small Hydropower Resource Assessment* is a good resource for small hydro. Additionally, FERC has developed a *Guide to Developing Small/Low-Impact Hydropower Projects.*

Environmental impacts from small hydro are usually limited. Land use requirements are generally low for small hydro facilities since they normally use existing conveyances. However, small hydro sites can occur at points along rivers, streams, canals and pipelines that are hundreds of miles long, often in remote areas that are distant from loads. Such projects may require construction of miles of transmission or distribution lines for interconnection to the grid. There may be increased noise from water flow through small hydro facilities, but generally it is not a problem as these facilities are usually located in remote locations. A few small hydroelectric facilities have been determined to be

problematic, and the Energy Commission supports decommissioning the facilities due to their environmental impacts and abundance of other less harmful renewable energy replacement power. The facilities are located on Battle, Kilarc and Cow Creeks, Trinity River, and in the Klamath and Trinity River Basins.

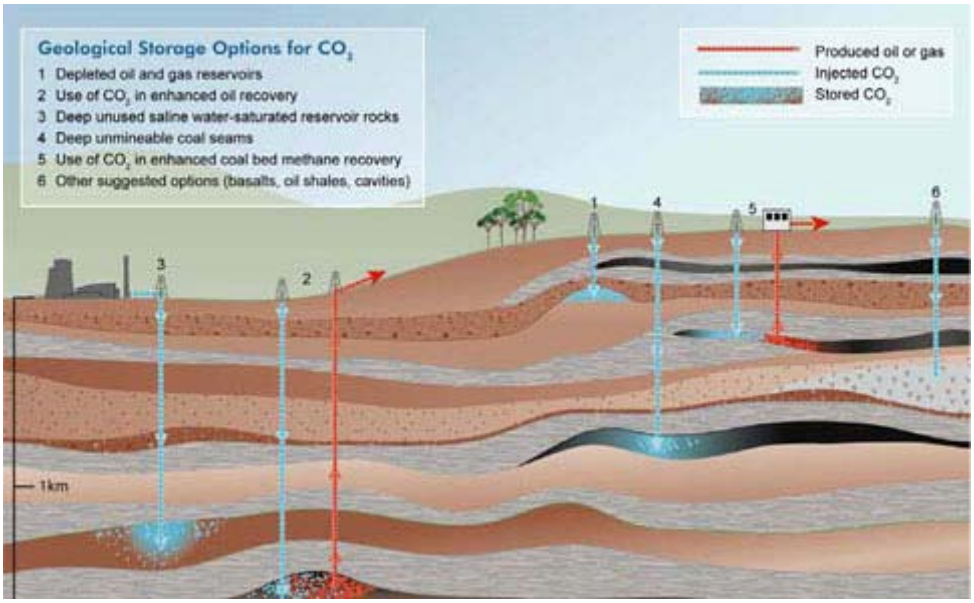
Carbon Capture and Storage

Carbon Capture and Storage (CCS) has been identified as a potential strategy in combating climate change and reducing greenhouse gas emissions from major industrial uses in California. CCS refers to the capture, or removal, of CO_2 at large industrial sources and its subsequent compression, transport, and injection into the subsurface for long term or permanent storage.

CCS targets thick sequences of sedimentary rocks within which there are permeable rocks such as sandstones, which serve as storage reservoirs, and overlying low permeability rocks, such as shales, which serve as seals to block upward migration of the CO2. Figure E.11 provides a general schematic of CCS while Figure E.12 identifies sedimentary basins in California.

The majority of electricity used in California comes from fossil fuels. CCS could capture CO_2 released from fossil fuel power plants and store the gas permanently in forests, underground or in the deep ocean. The concept is still in the demonstration stage. CO_2 extraction, transportation, and storage costs are significant uncertainties, along with the viability of keeping CO_2 sequestered essentially forever. There are a number of risks and environmental impacts associated with CO_2 that mainly revolve around the possibility of leakage.

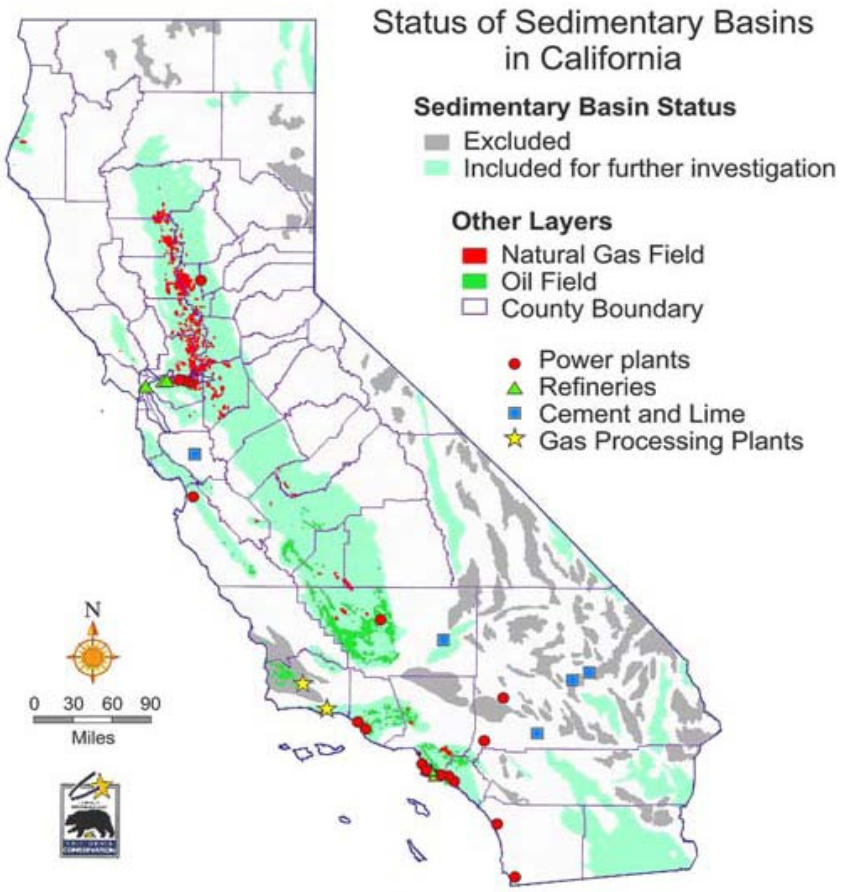
Figure E.11: Carbon Capture and Storage (CCS)



Source: California Energy Commission

The Energy Commission, CPUC, and ARB formed a California Carbon Capture and Storage Review Panel in 2010 to review CCS policy and develop recommendations that could help guide legislation and regulations regarding CCS. The CCS Review Panel presented its findings and recommendations in January 2011, which included that technology currently exists for the safe and effective capture, transport, and geological storage of CO2 from power plants and other large industrial facilities, and that high costs, inadequate economic drivers, remaining uncertainties in the regulatory and legal frameworks for CO2 storage, and uncertainties regarding public acceptance are barriers to the near-term deployment of commercial-scale CCS projects in California.

Figure E.12: California Sedimentary Basins



Source: California Energy Commission

Air Quality

Air quality impacts stem from facility leaks. These can occur from pipelines or the storage of CO_2; the latter would result from migration of the CO_2 from the deeper injection basin to the surface. Large volume leaks could contribute to sudden increases in atmospheric CO_2 and contribute to climate change. High concentrations of CO_2 could also cause plant and animal mortality.

Water Use and Quality

Should CO_2 migrate to the surface, elevated CO_2 concentrations in the shallow subsurface could contaminate groundwater but would also be lethal to plants and subsoil animals. Leaks in the geological storage may lead to increased acidity, leaching chemicals, such as lead, from rocks into surrounding underground water.

Process water may contain nitrates, specifically, NO_3, and other chemicals, such as mercury, selenium, cyanide, and arsenic. Equipment and wastewater may potentially contaminate water sources.

Land Use

CCS facilities generally coexist with other types of energy facilities and could potentially share some of the facility footprint. However, additional land would be required for a network of new pipelines dedicated to CO_2 transport and for vast volumes of permanent underground storage (if using geological sequestration). Because the surface footprint

for a plume with a radius of a few miles could easily encompass scores of individual land parcels, even in unincorporated areas.

Proposed storage locations must be near geologic formations, such as saline aquifers off and on shore, depleted oil and gas reservoirs, enhanced oil recovery, or coal beds. These storage sites would require impermeable cap rocks, geologic stability, and an absence of leak paths. There is a potential for stored CO_2 to adversely affect underground metal components, such as well liners.

Biological Resources

Biological resource impacts would come from potential CO_2 leaks. Leaks in underground storage sites can contaminate water sources and can be fatal to subsurface soil life, plants and animals.

Hazardous Materials

Certain types of carbon capture technology require chemicals to remove CO_2 from the flue gas. In particular, amine[16] solvents are used in water to dissolve CO_2. The process requires reheating to remove pure CO_2 from the air stream, but the remaining solution may contain sulfur, nitrogen oxides, and dust. To save money, it may be feasible to have less pure CO_2 streams injected underground, in which case, some of these toxins may be introduced into storage sites.

Visual and Noise

CCS facilities are associated with thermal plants and are unlikely to add noticeable visual and noise resource problems, unless the facility footprints are enlarged, as noted earlier.

Safety

CCS facility safety concerns mainly revolve around the permanent timeline of CO_2 storage, potentially millions of years. Large volumes of CO_2 injected underground must be monitored indefinitely, and risk management is critical. The built-up pressure of large volumes of CO_2 can induce small seismic events. Also, there are a number of mechanisms that can cause a release, including injection well failure, abrupt leakage, or gradual leakage from undetected faults, fractures, and wells.

Most countries have few specific regulations or frameworks for long-term storage, leakage liability, and monitoring. However, there may be relevant regulations and laws with regard to fossil fuel drilling and extraction. For example, Class II injection wells are regulated by the Department of Conservation Division of Oil, Gas, and Geothermal Resources (DOGGR), under provisions of the state Public Resources Code and the federal Safe Drinking Water Act. Class II injection wells are used to safely dispose of the salt and fresh water produced with oil and gas. Injection is often accomplished in a manner that will increase oil and gas production. However, DOGGR has expressed concern about potential adverse impacts to remaining oil deposits.

[16] Amines are organic compounds and functional groups that contain a basic nitrogen atom with a lone pair. Amines are derivatives of ammonia.

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