SITING THERMAL POWER PLANTS IN THE JURISDICTION OF THE SAN FRANCISCO BAY CONSERVATION AND DEVELOPMENT COMMISSION

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SAN FRANCISCO BAY CONSERVATION AND DEVELOPMENT COMMISSION

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SITING THERMAL POWER PLANTS IN THE JURISDICTION OF THE SAN FRANCISCO BAY CONSERVATION AND DEVELOPMENT COMMISSION

Summary and Recommendations. Due to the potential impacts of locating thermal power plants and their ancillary facilities in the jurisdiction of the San Francisco Bay Conservation and Development Commission ("BCDC"), BCDC has specific responsibilities pertaining to the siting of thermal power plant projects that generate 50 megawatts ("MW") or more of electricity. These responsibilities are mandated by the McAteer-Petris Act (Government Code Section 66645) and the Warren Alquist Act (Public Resources Code Section 25523 (c)).

The potential impacts that power plants have on the San Francisco Bay and its surrounding environment include impacts on fish, other aquatic organisms, and wildlife and their habitats, water resources, air quality, community and land use and on the public's visual and physical access to and along the shoreline of the Bay. In order to address these impacts and ensure that power plants are not sited in locations containing sensitive cultural (e.g., land use including *San Francisco Bay Plan* designated priority use areas, public access, community impacts) and natural resources (e.g., tidal marshes, air quality, water resources), BCDC is required to identify those locations within its jurisdiction where the siting of a power plant would be inconsistent with the *San Francisco Bay Plan* ("Bay Plan"), the Suisun Marsh Protection Plan ("Marsh Plan"), the Suisun Marsh Preservation Act (Public Resources Code Section 29000-29610) or the McAteer-Petris Act (Government Code Section 66600-66682) and would therefore harm Bay natural and cultural resources. BCDC identifies these locations as *non-siting* areas in its power plant non-siting regulation ("power plant regulation") and depicts these locations on its power plant non-siting maps ("power plant maps"). BCDC is required to update this report and the associated maps, and the regulation if necessary, every five years to respond to changing conditions. The California Energy Commission ("CEC"), which is responsible for reviewing and permitting power plants in California, is prohibited from permitting a power plant proposed for a location within a non-siting area as designated by the power plant regulation and depicted on the power plant maps.

For the purposes of this guide the term "power plant" or "thermal power plant" means any stationary or floating generating facility using any source of thermal energy, with a generating capacity of 50 megawatts or more. (Public Resources Code Section 25120). The term "ancillary facility" means any facility that is required for the operation of a thermal power plant and includes electric transmission lines, intake and discharge lines for cooling systems, fuel pipelines and steam pipelines. Co-generation facilities are also identified as ancillary facilities for the purposes of this guide. Only thermal power plants, their ancillary facilities and co-generation facilities are subject to the provisions of this guide and the areas designated by the power plant regulation and depicted on the power plant maps.

The Power Plant Non-Siting Regulation and Maps. The Power Plant Non-Siting Report adopted by BCDC in 1978 included four sets of maps that identified the areas where power plants and ancillary facilities may not be located due to the potential impacts these facilities could have on the Bay and its resources. These maps were hand drawn on USGS Quad Sheet Maps and were organized into three sets of 32 maps per set, identifying the resources, such as parklands, wildlife refuges and public access and a fourth set, a result of overlaying the first three sets of maps, that identified and defined the designation for each area for the purposes of

siting a power plant. Since the creation of these maps in 1978, they have not been updated to reflect changes in land use around the Bay, such as the addition of parklands and public access public access areas, new scientific information about the Bay, such as the location of sensitive habitat areas, or amendments to the Bay Plan or Marsh Plan.

This report includes an update of the information contained on the USGS Quad Sheet paper maps, and a conversion of these maps into a digital geographic information system ("GIS") format, and a regulation that defines the designations and what is prohibited and what is permitted within each designation. The regulation, which is located in Appendix D of this report, establishes the areas where power plants are prohibited and the areas where power plants and ancillary facilities may be considered. The maps serve as a visual interpretation of this regulation, depicting the general location of each designation. Although accuracy was an important goal in the development of the maps, the maps are derived from data that were mapped at different scales and levels of accuracy. As such, the accuracy of the feature and location boundaries cannot be guaranteed. Precise determinations of feature boundaries and locations may require field inspections with BCDC staff, qualified individuals, land owners and managers. Additionally, more specific site information, such as the resources that are identified at the site, can be obtained by contacting BCDC staff.

In addition to being converted into a GIS format, the maps also include new, updated information. Since 1978 there have been significant additions of parkland, wildlife refuges and public access areas. Additionally, the Bay Plan maps have been amended over 30 times, including changes to Bay Plan designated priority use areas, and this update reflects those changes. The addition of parklands, wildlife refuges and changes in habitat types due to mitigation, restoration and natural processes have increased the number of sites that are no longer suitable for the siting of power plants. Reflecting these changes is necessary in order to protect the resources and to identify early in the project development process those areas that are clearly unsuitable for the siting of a power plant. The power plant maps are located in the conclusions section of this report and are also available on the internet on BCDC's website <www.bcdc.ca.gov>. A description of the designations is located at the beginning of this section and in Table 1, located at the end of this section.

The power plant maps depict the areas that are designated by the power plant regulation and are based on resources within the Bay and along the shoreline. Some of the resources identified on the maps include federal, state, local and private parklands and open spaces, federal, state, local and private wildlife refuges, Bay habitat restoration sites, public access areas icluding the Bay Trail, the Bay Plan priority use areas, the Suisun Marsh Primary and Secondary Management Areas, tidal marshes, salt ponds, tidal flats, riparian vegetation, marine mammal haul-out areas and pupping sites, threatened and endangered species habitats and important fish habitats.

The maps depict areas both within the Commission's jurisdiction and outside of its jurisdiction. Only the areas that are designated within the Commission's jurisdiction are subject to BCDC's regulatory authority and the provisions in this report. The purpose of including areas outside of the Commission's jurisdiction is to depict the entire size of the resources, rather than a shoreline band depiction of the resources. For example, where a park is both within and outside of BCDC's jurisdiction, the whole park is depicted on the maps. However, only the area of the park that is within BCDC's 100-foot shoreline band jurisdiction is subject to BCDC's regulations and the provisions of this report. The information for these maps was obtained from a variety of sources, including the 1978 USGS power plant non-siting maps, BCDC's Bay Plan Maps and permit files, the San Francisco Estuary Institute's "EcoAtlas" and the "California Natural Diversity Database." A complete list of the data sets available and the source of each data set is located in Appendix C to this guide.

Each resource that is designated in the power plant regulation and depicted on the power plant maps is identified in the McAteer-Petris Act, the Suisun Marsh Preservation Act, the Bay Plan or the Marsh Plan as a significant Bay resource and protected by existing provisions and policies within these documents. The maps are a result of compiling these provisions and policies and translating this information onto maps in order to provide a depiction of those areas where the location-regardless of design, features or mitigation proposals of a power plant-would be inconsistent with the McAteer-Petris Act, the Suisun Marsh Preservation Act, the Bay Plan or the Marsh Plan. Areas are not designated if simple mitigation measures could be proposed that would make a plant acceptable and consistent with BCDC's laws and policies. A complete inventory of the resources designated in this guide and depicted on the maps, along with the associated regulations and policies, is located in Appendix B of this guide.

The Non-Siting Area Designations. BCDC has developed four designations for the purposes of identifying those locations in the area of BCDC's jurisdiction that are unsuitable for power plants and their ancillary facilities: fully designated areas and three partially designated areas, A, B and C. Fully designated areas do not permit the location of either power plants or ancillary facilities, while partially designated areas allow for the review of proposals for certain, identified ancillary facilities and, in one category, Category A, for power plants. The designations are designed to protect sensitive ecological resources (e.g., critical Bay habitats, threatened or endangered species, water resources, air quality, wildlife refuges, restoration areas), significant cultural resources (e.g., public access, visual access, parks, historic resources, residential areas), and priority use areas designated in the Bay Plan, and the Suisun Marsh Primary and Secondary Management Areas as identified by the Marsh Plan.

Below is a description of each designation and what is prohibited and permitted within each designation. In addition to projects being consistent with the designations described below, projects must also be otherwise consistent with the Commission's other laws and policies.

Full Designation. The areas that are fully designated are:

- Existing and proposed public parks;
- Existing and proposed public and private wildlife refuges;
- Existing and proposed bay habitat restoration sites;
- Wildlife Priority Use Areas;
- Waterfront Park or Beach Priority Use Areas, including marinas, fishing piers and boat launching ramps;
- Suisun Marsh Primary Management Area;
- Tidal marshes, tidal flats and managed wetlands;
- Riparian vegetation;
- Habitat of species that are listed by a fish and wildlife management agency as threatened or endangered; and
- Marine mammal haul-out areas and pupping sites.

Power plants and ancillary facilities may not be sited within the areas that are fully designated except for ancillary facilities that the Commission determines would have no substantial adverse environmental effects and would not conflict with priority use areas identified in the *San Francisco Bay Plan*. The purpose of designating these areas is to prevent impacts by power plants and ancillary facilities and to guide power plants that require a shoreline location to appropriate areas along the shoreline that will not result in impacts to these sensitive resources. These resources are selected as areas that should be fully designated due to their sensitivity and the determination that simple mitigation and design measures would be insufficient to address

all of the likely impacts to these resources. These resources are also designated in recognition that the Bay and its shoreline is a large area and that there are more suitable locations to site a power plant or an ancillary facility than in those resource areas listed above. For a more detailed description of the types of impacts that siting a power plant or ancillary facility could have on these resources see Chapter 6 of this guide.

Partial Designation, Category A. The following resources are partially designated by Category A:

- Water-related industry priority use areas;
- Port priority use areas; and
- Airport priority use areas.

The siting of power plants or any ancillary facility may be located within the areas that are partially designated within Category A if the Commission determines that the location of these facilities would not preclude or adversely affect the existing or future use of these priority use areas for their primary purposes.

The partially designated categories were developed to allow certain ancillary facilities to be located within areas where there would be little or no impact to the resources located in these areas. In the case of Category A, the Commission determined that power plants and ancillary facilities may be sited in some priority use areas where they would not preclude the use of these priority use areas for their primary purposes. Under certain circumstances, power plants and ancillary facilities could be sited without precluding or adversely affecting the existing and future use of these areas for their primary uses, by utilizing land that is not required for the existing or future functioning of the primary use. For example, in an area designated for airport priority use, it may be possible to locate a power plant on a site within the airport priority use area that is not currently in use and is not usable or necessary for expansion for airport purposes. However, if it is determined that a proposed project would either preclude or adversely affect the use of the priority use area for water-related industry, port functions or airport uses, then the proposed project would not be permitted on the site. Such an example would be a power plant that is proposed for an area designated for port use that could be needed for future port expansion.

Partial Designation, Category B. The following resources are partially designated in Category B:

- The Commission's Bay and certain waterway jurisdiction other than the areas otherwise identified;
- Existing and proposed (already funded) public access areas, including the San Francisco Bay Trail, when alternative access is provided during construction and original access is restored thereafter;
- Suisun Marsh Secondary Management Area; and
- Salt ponds.

The following ancillary facilities may be located within Category B areas. Other ancillary facilities may be located within Category B areas when the Commission determines they would have no substantial adverse environmental effects and would not conflict with priority use areas identified in the *San Francisco Bay Plan*. Power plants may not be constructed within these areas.

- Underground or underwater electric transmission lines;
- Intake or discharge lines and structures for cooling systems;

- Underground or underwater fuel pipelines; and
- Underground or underwater steam pipelines.

Within Category B, the Commission determined that the facilities listed above could be located within the surface waters of the Bay, existing and proposed public access, the Suisun Marsh Secondary Management Area and salt ponds, without creating impacts that could not be avoided or mitigated. By allowing for facilities that are underground or underwater and pass completely through the area, it is possible for these facilities to be located within these areas without impacting the primary use of the areas. However, there could be temporary impacts to these resources during construction and maintenance. In such cases, the proposal to develop an ancillary facility within these areas must be accompanied with a proposal to reduce or eliminate any impacts these areas. For example, while placing an underground transmission line or pipeline beneath existing public access, the public access area could be impacted and the ability to travel along this public access could be temporarily impeded or eliminated. In the case of public access, all projects that propose to temporarily impede existing public access must provide an alternative route so that the public may still pass through the area.

Partial Designation, Category C. The following resources are partially designated in Category C:

- Migratory fish routes;
- Subtidal areas;
- Spawning areas; and
- Nursery sites for juvenile fish or other aquatic organisms.

Within the resources that are partially designated in Category C, the siting of a power plant is prohibited but the following ancillary facilities may be located within the resource areas partially designated within Category C if the Commission determines that the location of these facilities would not create impacts or preclude the use or functions of the resources that are designated:

- Overhead electric transmission lines;
- Intake or discharge lines for cooling systems that pass completely through the area;
- Underground or underwater fuel pipelines; and
- Underground or underwater steam pipelines.

Although the ancillary facilities listed above may be considered in the resource areas described in Category C, certain restrictions may be required to ensure that proposed projects do not create adverse impacts on the aquatic resources listed in Category C. Examples of such restrictions are time periods when construction and maintenance would not be permitted due to the migration or spawning of fish or other aquatic organisms.

The ancillary facilities that may be located within Category C are very similar to the ancillary facilities that may be located within Category B. The one difference is that Category C permits above ground electric transmission lines, while Category B requires that any electric transmission lines proposed within the resources identified be located underground or underwater. The reason for this is that the resources described in Category C are mostly found under the water and would not be as sensitive to the location of above ground electric transmission lines. In order to avoid aesthetic impacts and reduce impacts to avian life, Category B requires that electric transmission lines be located under the Bay, public access areas, the Suisun Marsh Secondary Management Area and the salt ponds.

California Energy Commission's Electricity Demand Projections. When designating areas where power plants would be prohibited due to natural or cultural resource conflicts, the Commission is required to coordinate with the California Energy Commission's ("CEC") demand forecasts. Government Code 66645(b) requires that BCDC "consider the conclusions, if any, reached by the CEC in its most recently promulgated comprehensive report...."

The most recent CEC report that contains demand projections is entitled the *2002-2012 Electricity Outlook Report* ("Outlook Report"). The Outlook Report was written in response to the 2000 energy crisis and includes an analysis of the crisis and California's significant demand response in 2001. The report describes the difficulty in determining how much supply will be needed to meet projected demand during this period of uncertainty. The reasons for the uncertainty include: (1) assessing the permanence of the demand response that occurred in 2001, (2) the variability of available in-state and imported generating resources, (3) the capacity of the electricity transmission system and (4) the uncertainty surrounding which already approved plants will actually be constructed. Power plant projects that have already received approval are not being built as quickly as projected and, in many cases, development has not even begun on these plants.

The CEC identifies Southern California, San Diego and San Francisco as areas where supply shortages could occur due to constraints on the capacity of the transmission lines that serve these regions. The City and County of San Francisco is identified as having the greatest significance level of risk for supply shortages, with an estimated supply shortfall of approximately 200 MW. The report describes the situation in San Francisco as, "[a]t peak load, San Francisco is short of its own area resources by up to 130 MW. Therefore, like San Diego, it strongly depends on the import of power. Transmission capacity to San Francisco is limited, and in cases observed in San Francisco when peak load is high or local power units are out of order, San Francisco is at risk of a power shortage, which has occurred several times in recent years." For 2003, the CEC finds little to no risk for a power shortfall in Northern California (including the Bay Area outside of the City and County of San Francisco) and Central California or for the areas served by the Los Angeles Department of Water and Power and the Sacramento Municipal Utility District. However, the study did not attempt to quantify overall risk, and the conclusions are contingent on underlying assumptions that could and have changed. The changes are due to power plants not being constructed in a timely fashion once the projects are approved and for proposed projects being put on hold. In most cases these decisions to delay the development of a project are based on economic considerations. These delays may affect the risk of power shortages in areas where little or no risk was projected.

Likelihood of Power Plant Proposals within BCDC's Jurisdiction. It is difficult to determine the likely type, size and location of the power plants that may be proposed within BCDC's jurisdiction within the next five years. However, reviewing the CEC's Outlook Report and recent proposals in and near the Commission's jurisdiction provides enough information to make general assumptions about the facilities that are likely to be proposed in the Bay Area within the next five years. The City and County of San Francisco is likely to be the location of new or expanded generating facilities in the next five years in order to make up for the current shortfall of generation and transmission capacity and to replace aging facilities such as the Hunters Point Power Plant and the Potrero Power Plant.

By reviewing the most recently proposed projects within the Bay Area and the state, it is possible to identify the likely type and size of a facility that would be constructed in San Francisco, or elsewhere around the Bay, to meet projected demand. The most common recently proposed facilities are combined-cycle, natural gas powered thermal power plants sited at inland locations using closed-loop, wet-cooling technology where the source of cooling water is treated wastewater. Combined-cycle plants use both gas turbines and steam turbine generators to produce power. In a combined-cycle gas turbine, the hot exhaust gases of a gas turbine are used to provide all, or a portion of, the heat source for the boiler, which produces steam for the

steam turbine generator. This combination increases the thermal efficiency over coal or oil fueled steam boiler plants. Combined-cycle plants have an efficiency of approximately 53 to 54 percent (meaning that 54 percent of the energy goes to the production of electricity, while the remaining 46 percent goes to waste), greater than the approximately 33 percent efficiency of steam boiler plants. Therefore, combined-cycle plants reduce fuel consumption by 25 percent over that required by steam boiler plants and use 50 percent less cooling water per megawatt hour than old steam boiler plants, on a per megawatt basis. Very few facilities have been proposed for locations along the shorelines of surface bodies of water like the Bay, the Pacific Ocean or the Delta. Closed-loop, wet-cooling re-circulates water through cooling towers where heat is dissipated to the atmosphere through evaporation. Since water is re-circulated, the volume of water used is significantly less than that required for once-through cooling, requiring only about 200 to 250 gallons per megawatt hour. However, a portion of the water that circulates through a cooling tower is lost to evaporation, while essentially no water is lost in once-through cooling. The only power plants that have been proposed along the Bay or Ocean shoreline are expansions or re-powering of existing facilities that were already located along the shoreline.

New power plants or expansions of existing facilities over the next five years will likely have a capacity of over 500 MW, use combined-cycle technology and a closed-loop, wet-cooling system. No new power plants utilizing once-through cooling systems have been proposed in over 20 years. However, once-through cooling systems have been proposed in conjunction with re-powerings and expansions of existing coastal and Bay power plants. The majority of new power plants have been sited at inland locations, away from the coast or the Bay. Consequently, it appears unlikely that new facilities would be proposed within the Commission's jurisdiction. Moreover, it appears that a shoreline location is not necessary for the location and operation of a new, modern thermal power plant. Those that are proposed will most likely be expansions or re-powering of existing facilities and would probably include the replacement of existing technology with combined-cycle technology, reducing water demand and increasing plant efficiency, providing the opportunity to use an alternative cooling technology. Therefore, whenever an expansion or re-powering of a power plant is proposed that includes Bay fill as part of the project to accommodate increased once-through cooling capacity, the Commission should determine whether feasible alternatives to once-through cooling are an option, such as wet, dry or hybrid technologies, and if so, determine that an upland location is available for the project.

Availability of Adequate Sites within BCDC's Jurisdiction. By reviewing the CEC's demand projections in the Outlook Report, the types, sizes and locations of power plants proposed in California and the Bay Area in the last several years, and the areas that BCDC has designated where power plants are prohibited, it is possible to estimate whether or not there are likely to be enough sites within BCDC's jurisdiction for the siting of power plant projects.

For the limited number of sites where it is determined that there is no feasible alternative to the use of Bay water for cooling purposes, sufficient areas are available to accommodate the likely number of power plants that would be proposed within BCDC's jurisdiction. In order to ensure that there are an adequate number of areas where power plants may be sited if an alternatives analysis establishes that a power plant requires a shoreline location, BCDC has changed the designations in this update that once prohibited the location of a power plant in water-related industry, port and airport priority use areas. This update allows BCDC to consider the siting of power plants and ancillary facilities within water-related industry, port and airport priority use areas if the Commission determines that the location of such a facility would not adversely affect or preclude the existing or future use of the priority use area for its primary purpose. In addition, the only areas that have been designated to prohibit the location of a power plant are those areas with significant natural or cultural resources, such as tidal

marshes, threatened and endangered species habitats, parklands and wildlife refuges. The other areas within BCDC's jurisdiction do not prohibit the siting of power plants that require a shoreline location and the siting of these facilities may be considered by the Commission to determine if they indeed require a location along the shoreline.

Although it is unlikely that a stand alone, thermal power plant would require a location within BCDC's jurisdiction, it is likely that certain ancillary facilities will require a location within BCDC's jurisdiction. The types of facilities that are likely to require a location within BCDC's jurisdiction are electric transmission lines, fuel pipelines, steam pipelines, co-generation facilities and, in rare cases where there are no alternatives to once-through cooling, intake and discharge lines for cooling systems.

By reviewing BCDC's designations it appears as though there are sufficient areas available to locate these facilities within BCDC's jurisdiction. In order to ensure that there is sufficient area available for the location of these facilities, several changes have been made since the last update of this report. Rather than prohibiting all power plants and ancillary facilities from being located in public access areas, this update allows BCDC to consider the location of underground transmission lines, fuel and steam pipelines and intake and discharge lines for cooling systems. Additionally, certain ancillary facilities may now be considered within areas identified as migratory fish routes, spawning areas and nursery sites for juvenile fish and other aquatic organisms. In both cases, the location of ancillary facilities below public access areas and within areas where aquatic resources have been identified, the projects may be subject to certain restrictions in order to avoid impacts to these resources. The only areas within the Commission's jurisdiction that prohibit the siting of ancillary facilities are those areas where the resources are so sensitive that impacts could not be avoided, such as threatened and endangered species habitats, marine mammal haul-out areas and pupping sites, wildlife refuges and tidal marshes.

Additionally, BCDC's designations also allow for the consideration of co-generation facilities. Co-generation facilities are defined as any technology which simultaneously produces heat energy and electrical or mechanical power from the same fuel in the same facility. A common application pairs gas turbines with water heat-recovery steam generators. Because low-grade heat is being recovered and used in industrial applications, overall thermal efficiencies increase to 72 percent, resulting in a waste stream of only 28 percent. Additionally, co-generation facilities generally use wastewater from the adjacent facility for cooling purposes. Co-generation facilities are most likely to be sited in industrial areas. Industrial areas are either not designated by BCDC or are partially designated, such as the water-related industry, port and airport priority use areas. In these areas, co-generation facilities can be considered by BCDC and are not prohibited by the designations.

Under the current circumstances, it appears that an adequate number of siting opportunities are available within BCDC's jurisdiction for both the small number of power plants where there is no alternative to once-through cooling and for the co-generation facilities and ancillary facilities that would require sites within BCDC's jurisdiction. However, it is possible that circumstances could change and the analysis of the adequacy of sites available within BCDC's jurisdiction could be different in five years, when this report must be updated. If this is found to be the case, these new circumstances can be considered within the next update of this report, when the designations can be reviewed, and possibly changed, to reflect new circumstances.

Review of Proposals Outside of Designated Non-Siting Areas. When a power plant is proposed in a location that is consistent with BCDC's designations, the proposal may be considered by BCDC and the CEC. In such cases, BCDC reviews the proposal and recommends approval or denial of the project to the CEC. Under state law, the CEC is the only permitting authority for power plant projects, therefore BCDC does not have the authority to permit or deny a power plant. However, the CEC relies upon state and local agencies to review proposals and identify where the proposals are consistent with the laws, ordinances, regulations and

standards (LORS) that apply to the proposed project site. In reviewing a power plant project, BCDC could find that the project is entirely consistent with the relevant LORS and recommend approval of the project to the CEC or determine that the project proposal is inconsistent and urge the CEC to deny the project or only approve of the proposal with alterations or under certain conditions which would make the project consistent, such as additional public access or an alternative cooling system.

Although the CEC is the sole permitting authority for power plant projects, it is required by the Warren Alquist Act to meet the requirements of BCDC laws and plan provisions. Public Resources Code Section 25523(d)(1) states that CEC determinations on power plant proposals should include specific provisions to meet the requirements of BCDC law as identified in BCDC's review and comments to the CEC on such proposals unless the CEC finds that BCDC's recommendations would either result in greater adverse environmental impacts or are not feasible.

BCDC's role in proposals outside of the designated areas, but within the Commission's jurisdiction, requires reviewing the proposal to ensure consistency with existing policies and provisions and working closely with the CEC, particularly on feasibility issues relating to technology. Upon receiving an Application for Certification ("AFC") for a project proposal within BCDC's jurisdiction, the CEC is required to transmit a copy of the application to BCDC. BCDC is then responsible for submitting a report to the CEC which analyzes the proposal's consistency with BCDC's policies and provisions.

All state and local reviewing agencies are allowed 180 days to review the application and submit comments and recommendations to the CEC. Since the information necessary to review a project may be different for each agency, it is incumbent upon each reviewing agency to work with the CEC and the applicants to ensure that the appropriate studies are undertaken to allow for a full and timely review of the project. Since all agencies must submit their responses to the CEC within the prescribed time period, usually at the same time, an unfortunate outcome of this overall deadline is that agencies are unable to review studies and analysis completed by the other agencies that are also reviewing the proposal. This information is often critical to determining potential impacts and consistency but, due to the deadlines established, is not completed in time for inter-agency review. Additionally, the analysis and comments from other agencies often results in changes to the project proposal and subsequent amendments to the AFC. In such circumstances, the reviewing agencies must continue to review, comment and make recommendations to the CEC regarding the project's consistency with applicable laws, ordinances and regulations. The applicant can also agree to extend the review period to allow more time for inter-agency coordination, the completion of additional studies and the review of additional information.

Other issues may also delay the review of a project, such as the need for additional information that is not required in CEC's submittal process. For example, before BCDC can find a project consistent with its regulations and policies, it must review an alternatives analysis that demonstrates that there is no alternative to once-through cooling, and therefore Bay fill. Additionally, BCDC requires that projects incorporate maximum feasible public access consistent with the project and if an applicant does not include access in the proposal, this could delay the review of the project beyond the 180-day review period.

BCDC Considerations in the Review of Power Plant Projects. For BCDC there are several key considerations in the review of power plant projects proposed outside of the designated non-siting areas. The Bay Plan includes a policy on power plants that states that these facilities "may be located in any area where they do not interfere with and are not incompatible with residential, recreational, or other public uses of the Bay and shoreline, provided that any pollution problems resulting from the discharge of large amounts of heated brine into Bay

waters, and water vapor into the atmosphere can be precluded." (Other Uses of the Bay and Shoreline, Policy 9). In addition to this policy there are other laws and policies that the Commission must consider when reviewing power plant projects. These considerations are described below.

Bay Fill and Once-Through Cooling. In addition to reviewing the project for consistency with the Bay Plan policy described above, another important consideration is whether or not the project requires a location in the area of the Commission's jurisdiction. The Commission may permit fill in the Bay or certain waterways for a project only in those cases where the Commission determines that there is no feasible upland alternative to the fill required by the once-through cooling system. However, a power plant project which requires the use of once-through cooling and, therefore, large amounts of Bay water for cooling purposes, is a water-oriented use as defined by the McAteer-Petris Act for which fill may be permitted. In cases where an alternative cooling technology or source of water exists that obviates the need for fill to provide cooling water to the power plant, a power plant would not be considered a water-oriented use and the Commission would not be able to permit the fill unless it determined that fill was needed for the health and safety of the public in the entire Bay Area or that the fill was a minor fill to provide public access to the Bay or improve shoreline appearance. Section 66605 of the McAteer-Petris Act states that (1) fill in the Bay or certain waterways can be authorized only when public benefits of the fill exceed the public detriment form the loss of water areas; (2) the fill must be limited to water-oriented uses (such as water intake and discharge lines for power generating plants requiring large amounts of water for cooling purposes (once-through cooling systems)), or minor fill for improving shoreline appearance or for public access; (3) fill can be authorized only when no alternative upland location exists for such purposes; (4) the water area authorized to be filled should be the minimum necessary to achieve the purpose of the fill; and (5) the nature, location and extent of any fill should be such that is will minimize harmful effects to the Bay Area, such as, the reduction or impairment of the volume surface area or circulation of water, water quality, fertility of marshes or fish or wildlife resources, or other conditions impacting the environment, as defined in Section 21060.5 of the Public Resources Code. This section of the Public Resources Code defines the environment as "the physical conditions which exist within the area which will be affected by a proposed project, including land, air, water, minerals, flora, fauna, noise, objects of historic or aesthetic significance." (Public Resources Code Section 26060.5)

Power plants no longer require shoreline locations except in areas where power supply is inadequate, transmission capacity is constrained, an alternative water supply is unavailable, land area is constrained or where the use of all alternative technologies would result in greater adverse environmental impacts. In these cases once-through cooling may be the only cooling technology available. However, in most cases, other technologies, such as wet, hybrid, or dry, could constitute a feasible alternative to a once-through cooling system which require fill in the Bay. In such cases, BCDC is required by the McAteer-Petris Act to recommend against the project and recommend the use of an alternative technology that does not require fill in the Bay.

Wet, dry and hybrid technologies reduce the location constraints and allow for the use of alternative sources of water, such as reclaimed or municipal water. Only once-through cooling systems require such extraordinary amounts of water as to make alternative sources of water infeasible. With water requirements of up to 40,000 gallons per megawatt hour, it would be impossible to run plants that use once-through cooling systems using alternative sources of water. However, the significantly reduced water demands of wet (up to 250 gallons per megawatt hour), dry (less than 25 gallons per megawatt) and hybrid technologies, allow plants to use municipal or reclaimed water supplies. Additionally, water usage can be substantially reduced by updating old steam boiler plants to combined-cycle technology, making alternative cooling systems more feasible.

Since there are many options for cooling power plants, an alternatives analysis must find that there are no feasible alternatives to using large amounts of Bay water for this purpose. Each project must analyze all other feasible alternatives to once-through cooling system using Bay water, such as dry cooling, hybrid or wet cooling using a different source of water for cooling purposes. In most cases, an alternative to the use of large amounts of Bay water for cooling purposes should be available in the form of either dry cooling or closed-loop wet cooling systems using reclaimed or treated waste water. The availability of such an alternative would eliminate the need to either fill the Bay or certain waterways or to locate the facility in the area of the Commission's jurisdiction.

The Provision of Maximum Feasible Public Access. Another important consideration for the Commission is whether the project includes maximum feasible public access consistent with the project. Section 66602 of the McAteer-Petris Act states that "...existing public access to the shoreline and waters of the San Francisco Bay is inadequate and that maximum feasible public access, consistent with a proposed project, should be provided." Additionally, the San Francisco Bay Plan states that "...maximum feasible public access should be provided in and through every new development in the Bay or on the shoreline... ,the access should be permanently guaranteed..., should be consistent with the physical environment..., provide for the public's safety and convenience..., and be built to encourage diverse Bay related activities and movement to and along the shoreline...." The provision of public access is especially important in projects such as power plants, which are large, industrial uses that have the potential to separate the public visually and physically from the Bay for a long distance. It is critical that public access be incorporated into the design of the project to ensure that it is pleasant, safe and does not result in a significant visual or physical separation of the public from the Bay and its shoreline.

Potential Impacts of Power Plants Sited Along the Bay Shoreline. The impacts to the Bay, its shoreline and aquatic habitats from power plants and associated once-through cooling systems can be substantial. These impacts are described in more detail in Chapter 6 of this report. A general description of these impacts includes impacts to aquatic organisms through entrainment and impingement, the loss of aquatic habitat in those areas where the intake and discharge structures and supports would be placed, thermal discharge impacts, land use impacts, air quality impacts, water quality impacts, impacts to the surrounding community and the potential for both the physical and visual disruption of public access to the Bay and its shoreline.

In cases where there is no feasible alternative to the use of once-through cooling, projects should reduce impacts to Bay resources to the maximum extent practicable. These impacts can be reduced by including technologies that prevent impacts in the design of a new plant or expansion or repowering of an existing plant. Examples of technologies that can reduce entrainment and impingement impacts include certain types of screens and the reduction of water intake flows. In order to reduce impacts to the surrounding community, the proposal should, to the maximum extent practicable, include mitigation for air quality and other environmental impacts within the neighborhood where the impacts would occur, rather than proposing mitigation at a distance from the project. Although power plants are large, industrial uses, it is possible to mitigate visual and public access impacts through sensitive design. Existing view corridors to the Bay should be preserved to the maximum extent feasible and public access should be incorporated into the design of the project, rather than added to the project as an afterthought. Recent power plant designs have included public access that also offers an educational opportunity to the public, by allowing them to view certain aspects of the plant through creative design features, such as windows or portals that allow the public to see into the interior of the plant.

Power plant facilities can result in significant visual and public access impacts along the shoreline of the Bay. There are challenges to preserving view corridors to the Bay and to providing pleasant, safe public access that allows the public access to and along the Bay shoreline. However, it has recently been recognized that these are important aspects of power plant design that have often been overlooked in the past. In the past, power plant projects were not designed by architects, but by engineers, solely for the purposes of creating power. While the function of the plant is of utmost importance, it is not acceptable to completely neglect the other aspects of plant design. By incorporating creative solutions to the visual and public access impacts that these plants can have, it is possible to avoid these significant impacts, provide the public with an interesting, enjoyable visual and physical access experience and educate the public about the creation of power. Below is a list of submittal recommendations that pertain to these potential impacts. These submittal recommendations are meant to assist BCDC staff and applicants with the review of power plant proposals.

BCDC Applicant Submittal Recommendations. Early consultation with BCDC staff can significantly expedite the review and analysis of a proposed power plant project. In addition to early consultation, the project submittal should include the information necessary for the Commission and its staff to analyze and evaluate the project and to provide the CEC with its comments and recommendations within 180 days. The following is a checklist of the information that is necessary for the Commission and the Commission's staff to perform this analysis and file the report with the CEC within 180 days.

1. Review the power plant regulation and maps to identify the proposed site and determine whether the project is fully designated, partially designated or not designated on the maps. Power plants are not permitted on sites that are fully designated by the power plant regulation. Certain ancillary facilities, including co-generation facilities, are permitted in partially designated areas. Both power plants and ancillary facilities can be considered for sites that are not designated on the maps.
2. Conduct an alternatives analysis to identify any feasible alternatives to proposed Bay fill and to establish whether the project requires a location within BCDC's jurisdiction. This alternatives analysis should review all available alternatives to once-though cooling systems, such as wet cooling using towers, and an alternative source of cooling water, dry cooling and hybrid cooling systems. In order for the project to be considered by the Commission, the alternatives analysis must demonstrate that there is no feasible alternative to fill associated with a once-through cooling system and that the Bay fill is necessary in order to develop the project.
3. Include technology within the plant design that reduces the water usage requirements of the once-through cooling system and the entrainment and impingement impacts of once-through cooling. Such technologies include combined-cycle systems over boiler systems and the use of cooling towers that allow for the recycling of some the water through the system and eliminate the thermal waste associated with typical once-through cooling systems. Entrainment and impingement impacts can be reduced through the use of cylindrical wedgewire screens and fine-mesh screens, which have been shown to reduce both entrainment and impingement, sometimes significantly.
4. Incorporate a plan to mitigate any adverse Bay impacts necessary for the project. Mitigation for Bay impacts must be included in the project proposal in order for the Commission to complete its analysis and provide comments and recommendations to the CEC in a timely fashion. Early consultation on mitigation issues will expedite BCDC's review and analysis.

5. Incorporate the location, size and type of maximum feasible public access that will be included in the project. Consult with the San Francisco Bay Trail staff, any established community or neighborhood groups and BCDC staff regarding the appropriate public access for the site. Early consultation regarding the location, size and type of public access will expedite BCDC's review and analysis of the project.

6. In order to mitigate for the visual and community impacts associated with the siting of a power plant project, plant design should be as aesthetically pleasing as possible. Rather than attempting to hide such a large facility, the project should be designed to be an interesting and even attractive addition to the Bay shoreline. Examples of such designs are the power plant at Indiana State University, some design features of the old Seaholm Power Plant in Texas and design ideas that were developed by the College of Architecture and Environmental Design at California Polytechnic University ("CalPoly"), San Luis Obispo. The power plant at Indiana State University and the design concepts developed by the College of Architecture and Environmental Design at Cal Poly San Luis Obispo included the provision of public visual access to certain portions of the production process and the integration of these facilities more sensitively into their environments. Designs should provide for public views to the Bay and links to the public access from surrounding areas to the Bay.

7. Due to the increased localized impacts these projects have, particularly on air quality, projects should include all available pollution prevention technology to avoid impacts to adjacent sensitive receptors, including San Francisco Bay and surrounding residential neighborhoods.

8. In order to address the impacts of the project on the surrounding community, mitigation for air quality impacts and other Bay impacts should be located, to the maximum extent practicable, within the community surrounding the project site. This includes purchasing any necessary offset credits from pollution sources that are as close to the impacted community as possible. Communities where power plants are located should not bear a greater burden than those where these facilities are not located, particularly communities that already receive impacts from existing industrial areas, urban development and roadways. Projects should be evaluated for environmental justice concerns and the mitigation for the impacts of the project should be located, to the maximum extent practicable, within the community where the impacts will be occurring. This will ensure, to the maximum extent practicable, that the project will not result in additional impacts to communities already suffering from noise, air and water pollution, a lack of open space and public access and aesthetic impacts.

Recommendations

1. Due to the sensitivity and regional importance of certain Bay natural and cultural resources and the potential for a thermal power plant project and its associated ancillary facilities to have significant, unmitigable impacts on these resources, the siting of power plants and ancillary facilities is prohibited in the areas identified as fully designated by the power plant regulation and depicted on the power plant maps.

2. Although power plants are unlikely to require a shoreline location within BCDC's jurisdiction, there are areas where the location of a power plant may be considered by the Commission. These are areas within BCDC's jurisdiction where the siting of a power plant may not be incompatible with the existing or planned land uses on and adjacent to the site. In these areas, such as port, airport and water-related industry priority use areas, the Commission may consider the location of a power plant to determine the consistency of the project with BCDC's other laws and policies and plan provisions.

3. Although power plants normally will not require a shoreline location within BCDC's jurisdiction, the ancillary facilities associated with power plants, such as transmission lines, steam pipelines and fuel pipelines may need to be located within BCDC's jurisdiction. These facilities should not be located in areas that are fully designated by the power plant regulation, but may be considered by the Commission in less sensitive areas.

4. Co-generation facilities can be considered in all areas within BCDC's jurisdiction except for those areas where they are specifically prohibited by the power plant regulation, which are areas that are fully designated and areas that are in the partially designated areas, categories B and C. Since co-generation facilities are most likely to be sited in industrial areas, which are either not designated or are partially designated, there should be an adequate number of sites available for the Commission to consider. As with stand-alone power plants, the Commission must find that any proposed facility is consistent with its laws and policies prior to recommending that the project be approved by the CEC.

5. Whenever a new, expanded or re-powered thermal power plant project is proposed that includes Bay fill as part of the project to accommodate new or increased once-through cooling capacity, the Commission should determine whether feasible alternatives to once-through cooling are an option, such as wet, dry or hybrid technologies, and if so, determine whether an upland location is available for the project.

6. Power plants no longer require shoreline locations except in areas where power supply is inadequate, transmission capacity is constrained, an alternative water supply unavailable, land area is constrained or where the use of all alternative technologies would result in greater adverse environmental impacts. In these cases once-through cooling may be the only cooling technology available. However, in most cases, other technologies, such as wet, hybrid, or dry, could constitute a feasible alternative to a once-through cooling system which require fill in the Bay or certain waterways. In such cases, BCDC is required by the McAteer-Petris Act to recommend against the project and recommend the use of an alternative technology that does not require fill in the Bay.

7. In cases where there is no feasible alternative to the use of once-through cooling, the Commission should ensure that power plant projects are designed to reduce impacts to Bay natural and cultural resources to the maximum extent feasible. These impacts can be reduced by including the best available technologies in the design of a new plant, or the expansion or re-powering of an existing plant. These technologies are available to reduce the impacts of entrainment and impingement of fish and other aquatic organisms, the impacts of thermal discharges and impacts to air quality.

8. Power plants are large, industrial uses that have the potential to separate the public visually and physically from the Bay for long distances. The Commission should review projects to ensure that maximum feasible public access consistent with the project is incorporated into plant design. This public access should be designed to be pleasant, safe and should not result in significant visual and/or physical separation of the public from the Bay and its shoreline.

9. In order to address the impacts of the project on the surrounding community, mitigation for air quality impacts and other Bay impacts should be located, to the maximum extent feasible, within the community surrounding the project site. This includes purchasing any necessary offset credits from pollution sources that are as close to the impacted community as possible. Communities where power plants are located should not bear a greater burden than those where these facilities are not located, particularly communities that already receive impacts from existing industrial areas, urban development and roadways. Projects should be evaluated for environmental justice

concerns and the mitigation for the impacts of the project should be located, to the maximum extent practicable, within the community where the impacts will be occurring. This will ensure, to the maximum extent practicable, that the project will not result in additional impacts to communities already suffering from noise, air and water pollution, a lack of open space and public access and aesthetic impacts.

10. In order to allow for an accurate and timely review of thermal power plant projects, applicants should include the following items when submitting the CEC for projects within BCDC's jurisdiction: (a) an alternatives analysis to once-through cooling and any Bay fill, (b) the location, size and type of maximum feasible public access that is proposed with the project, (c) a plan to mitigate adverse Bay impacts and (d) a plan to mitigate within the community where the impacts will occur.

Table 1: Power Plant Non-Siting Designations

Designation	Resources
Full Designation: No power plants or ancillary facilities may be located within areas that are fully designated by the Power Plant Non-Siting Regulation and depicted on the Power Plant Non-Siting Maps,* except for ancillary facilities that the Commission determines would have no substantial adverse environmental effects and would not conflict with priority use areas identified in the *San Francisco Bay Plan.*	• Existing and proposed public parks[1] • Existing and proposed public and private wildlife refuges • Wildlife priority use areas • Existing and proposed Bay habitat restoration areas • Waterfront park or beach priority use areas, including marinas, fishing piers and boat launching ramps • Suisun Marsh Primary Management Area • Tidal marshes, tidal flats and managed wetlands • Riparian vegetation • Habitat of species that are listed by a fish and wildlife management agency as threatened or endangered • Marine mammal haul-out areas and pupping sites
Partial Designation, Category A: A power plant and any ancillary facility may be located within a Category A area as designated by the Power Plant Regulation and depicted on the Power Plant Non-Siting Maps, when the project would not preclude or adversely affect the existing or future use of the priority use area for its primary purpose.*	• Water-related industry priority use area • Airport priority use area • Port priority use area
Partial Designation, Category B: No power plants may be located within a Category B area as designated by the Power Plant Non-Siting Regulation and depicted on the Power Plant Non-Siting Maps. The following ancillary facilities may be located in the partially designated area Category B: Underground or underwater electric transmission lines, intake or discharge lines and structures for cooling systems, underground or underwater fuel pipelines and underground or underwater steam pipelines.*	• The Commission's Bay and certain waterway jurisdiction other than areas otherwise identified (e.g., tidal marshes, Suisun Marsh Primary Management Area) • Existing and proposed public access areas, including the San Francisco Bay Trail • Suisun Marsh Secondary Management Area (except for the water-related industry site.) • Salt ponds

[1] For the purposes of this guide, proposed is defined as funded. Prior to designating proposed wildlife areas, public access areas and parklands, these areas must be fully funded.

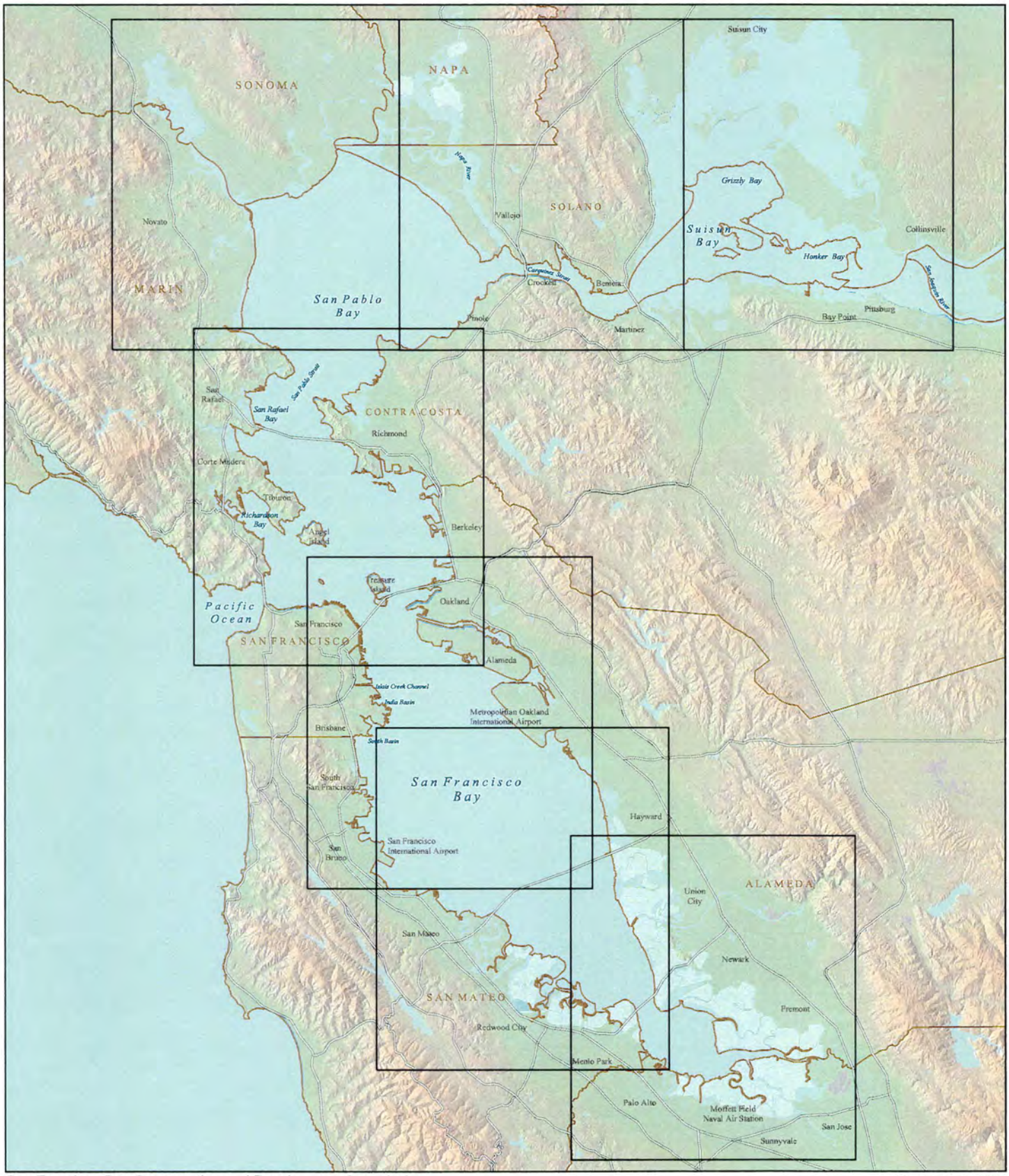
Table 1: Power Plant Non-Siting Designations (Continued)

Designation	Resources
Partial Designation, Category C: No power plants may be located within areas that are partially designated by the Power Plant Non-Siting Regulation and depicted on the Power Plant Non-Siting Maps. The following ancillary facilities may be located in the partially designated areas identified as Category C: Overhead electric transmission lines, intake or discharge lines for cooling systems that pass completely through the area, underground or underwater fuel pipelines and underground or underwater steam pipelines.*	• Subtidal areas • Migratory fish routes • Spawning areas • Nursery sites for juvenile fish and other aquatic organisms

*and otherwise consistent with the Commission's other laws and policies.

Power Plant Non-Siting Index Map

San Francisco Bay



San Francisco Bay Conservation and Development Commission

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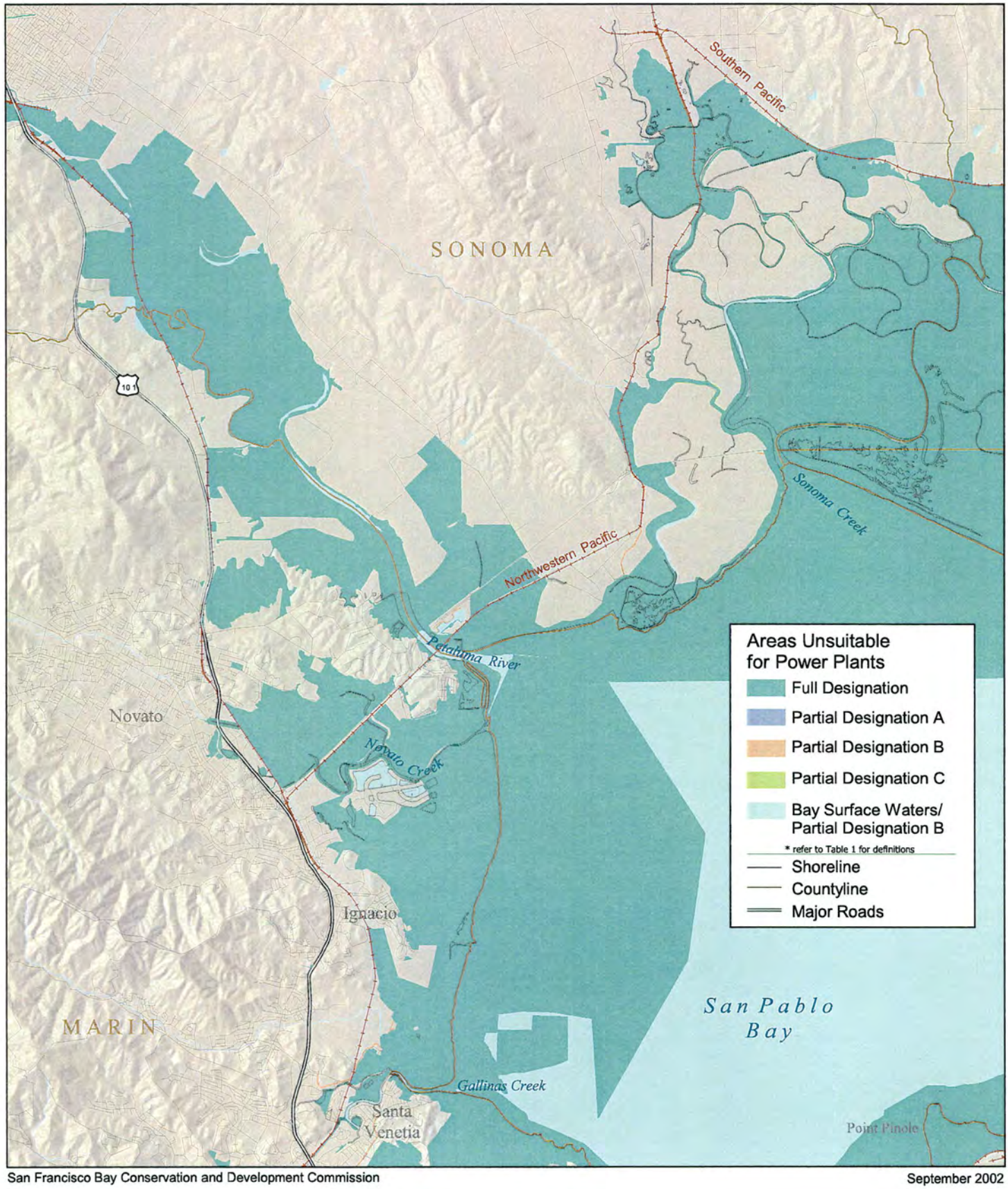
Power Plant Non-Siting Map 1

San Pablo Bay

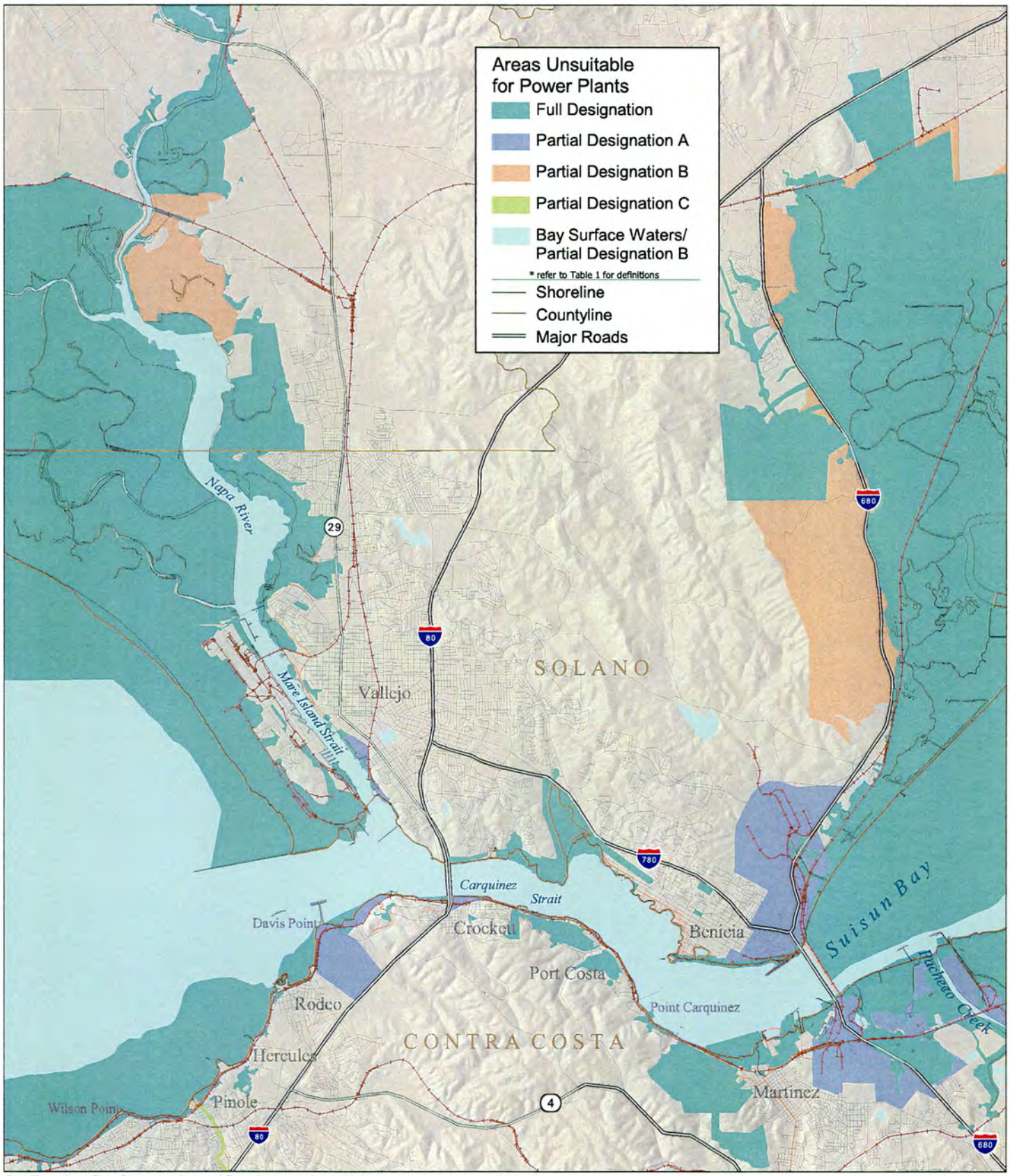


San Francisco Bay Conservation and Development Commission

September 2002

Power Plant Non-Siting Map 2

Carquinez Straight

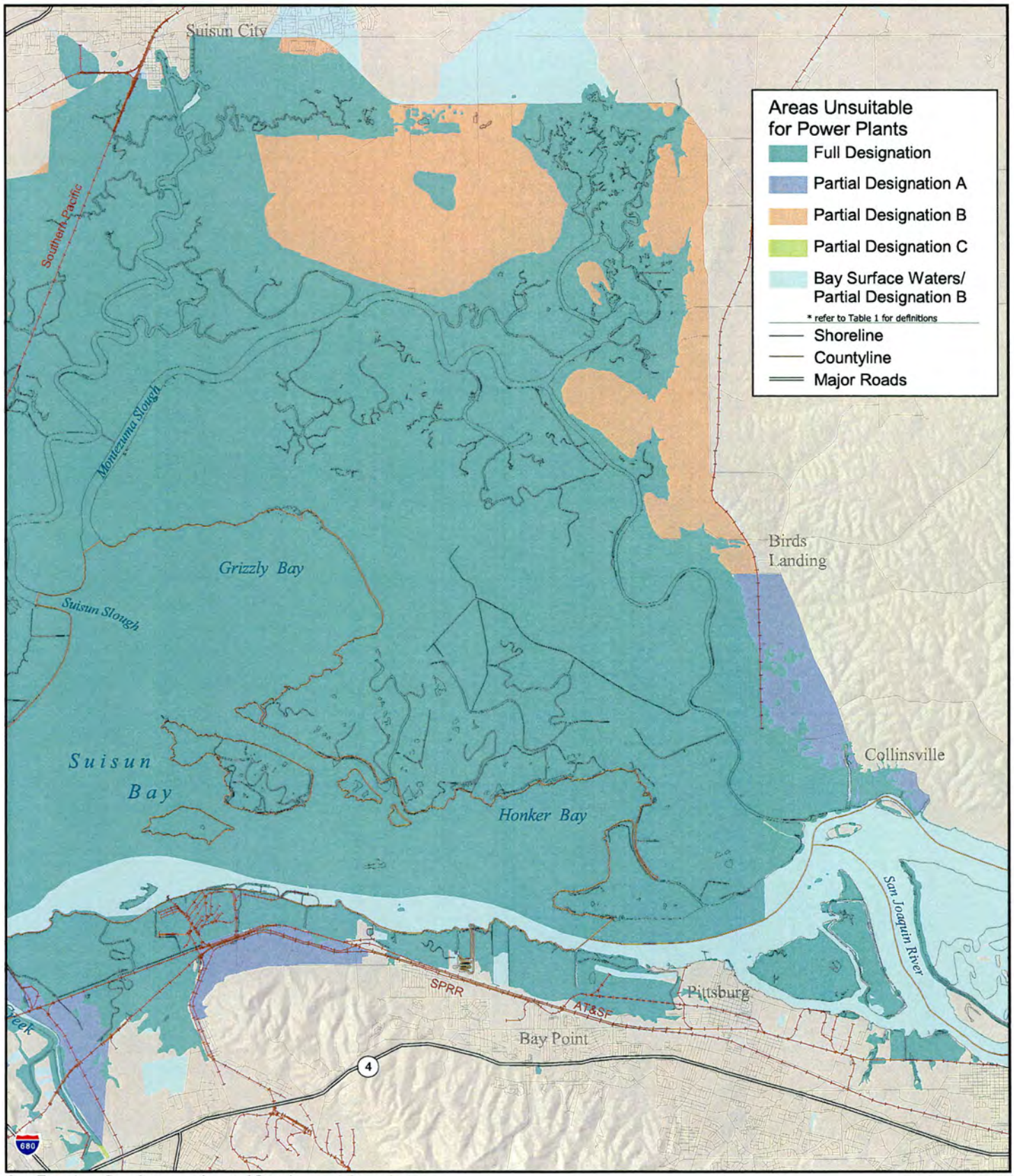


San Francisco Bay Conservation and Development Commission

September 2002

Power Plant Non-Siting Map 3

Suisun Bay and Marsh

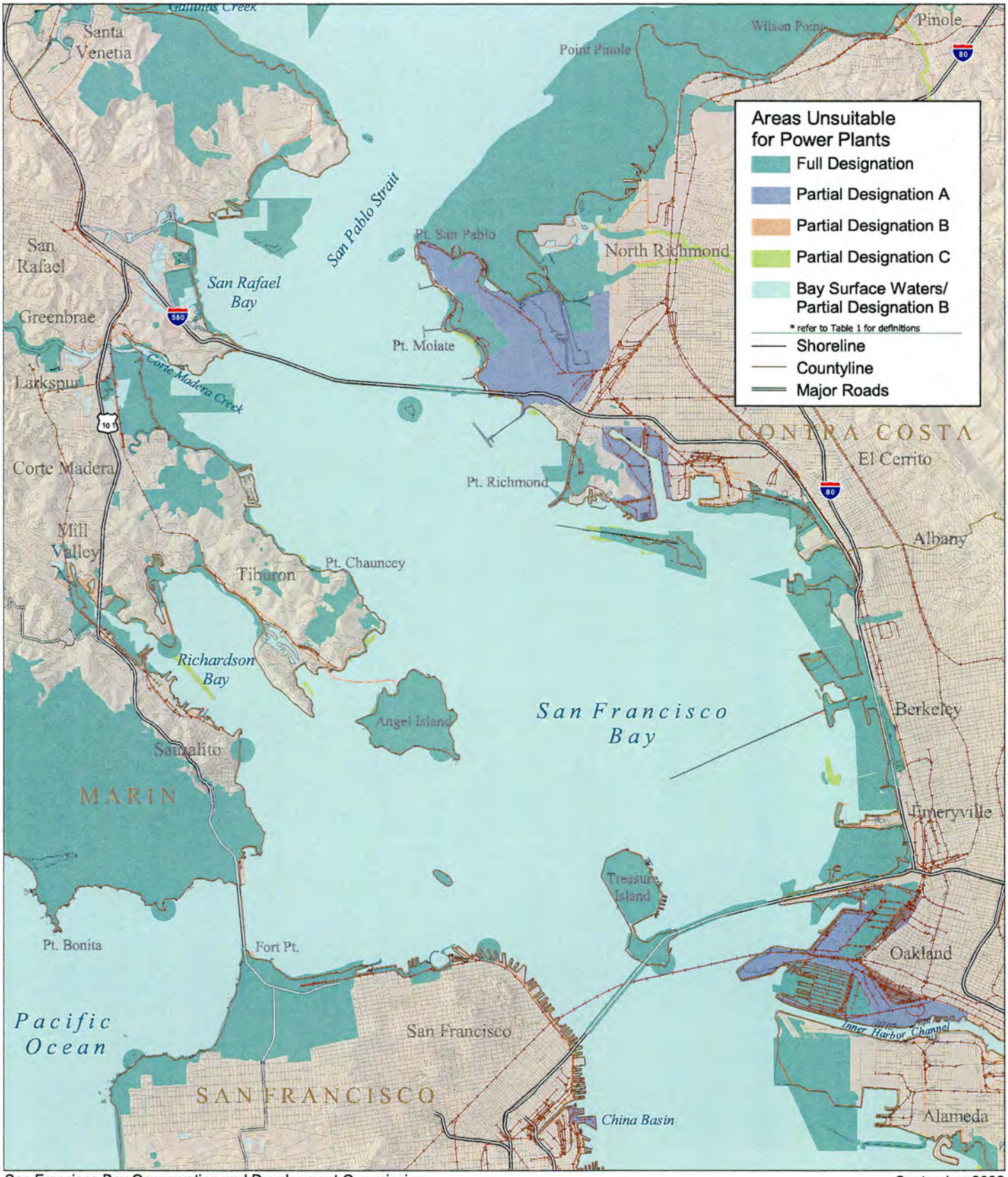


San Francisco Bay Conservation and Development Commission

September 2002

Power Plant Non-Siting Map 4

Central Bay North

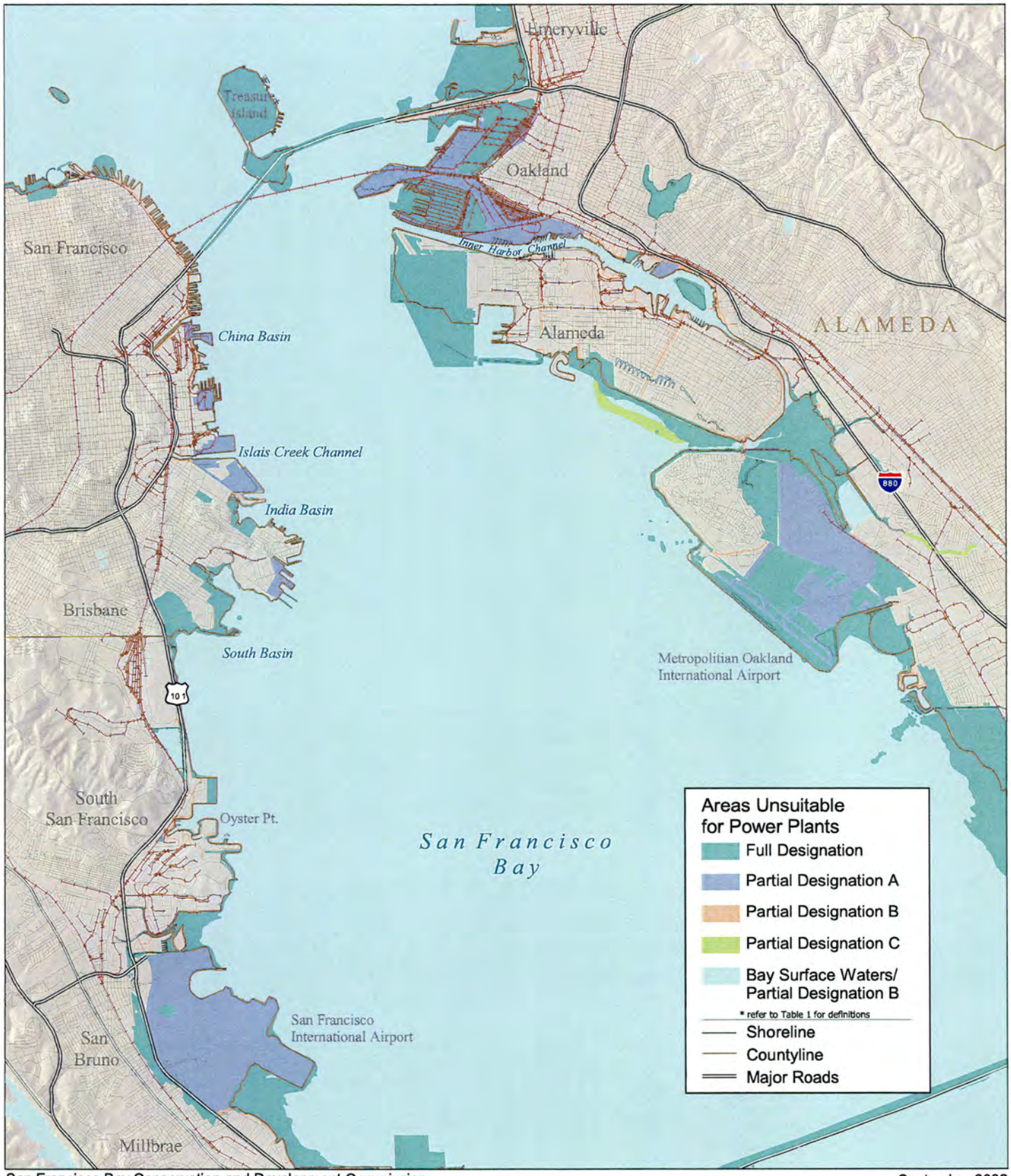


San Francisco Bay Conservation and Development Commission

September 2002

Power Plant Non-Siting Map 5

Central Bay



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Power Plant Non-Siting Map 6

Central Bay South

San Francisco Bay Conservation and Development Commission

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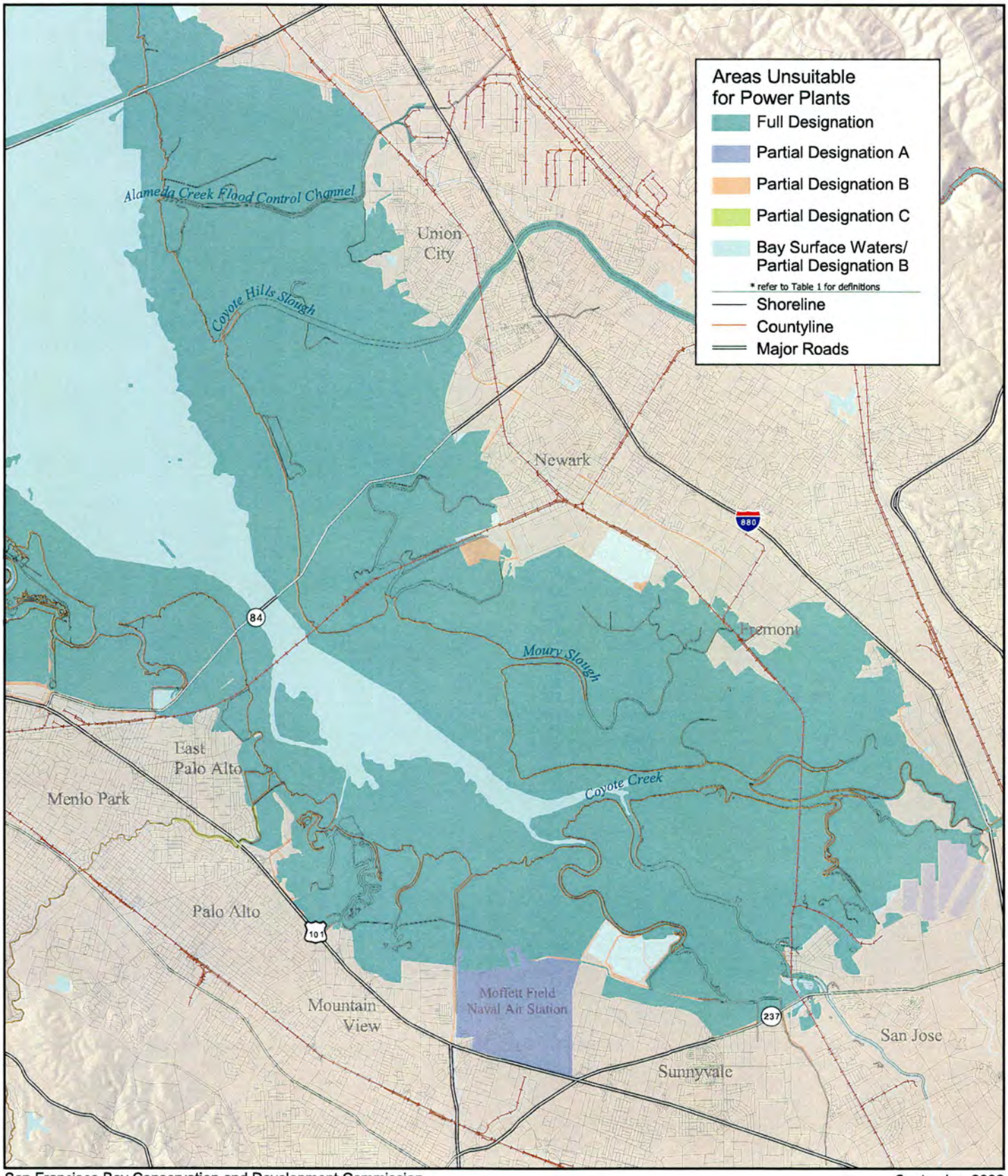
Power Plant Non-Siting Map 7

South Bay



San Francisco Bay Conservation and Development Commission

September 2002

INTRODUCTION: PURPOSE AND USE OF THIS REPORT

The San Francisco Bay Conservation and Development Commission ("BCDC" or "Commission") is the coastal management agency for the San Francisco Bay estuary. The Commission's jurisdiction includes the San Francisco and San Pablo Bays, the Suisun Marsh and a 100-foot band along the estuary's shoreline. A complete description of the Commission's jurisdiction can be found in Appendix A to this report. Generally, BCDC regulates fill in the Bay and development along the shoreline, determining if fill is essential to a proposed project and ensuring that any fill that is approved is the minimum required for a project. Additionally, BCDC requires that projects incorporate maximum feasible public access to and along the Bay shoreline.

Due to the potential impacts of locating thermal power plants on the shoreline of the Bay, BCDC has specific responsibilities pertaining to power plant projects. These responsibilities were mandated by the legislature in McAteer-Petris Act and the Warren Alquist Act. The potential impacts that power plants have on the surrounding environment include impacts to fish, other aquatic species, and wildlife and their habitats, water quality, air quality and visual and physical access. In order to address these impacts and ensure that power plants are not sited in locations containing sensitive Bay resources, BCDC is required to identify those areas within its jurisdiction where the siting of a power plant would be inconsistent with the *San Francisco Bay Plan* ("Bay Plan"), the *Suisun Marsh Protection Plan* ("Marsh Plan"), the Suisun Marsh Preservation Act or the McAteer-Petris Act and would therefore harm the Bay's resources. BCDC identifies these areas as non-siting areas in the power plant regulation and depicts this information on digital maps called the power plant maps. The California Energy Commission ("CEC"), which is responsible for reviewing and permitting power plants, is prohibited from permitting a power plant proposed for a location within a non-siting area identified by the power plant regulation.

In addition to the responsibility for identifying those areas where the siting of a power plant would be inconsistent with BCDC's regulations and policies, which is particular to BCDC and the California Coastal Commission, BCDC is also responsible for reviewing power plant projects proposed for locations outside of the non-siting areas and providing recommendations to the CEC. During this review process, which includes all jurisdictions with regulations pertaining to proposed sites (e.g., cities, counties, California Department of Fish and Game), BCDC reviews power plant proposals to determine whether or not these projects are consistent with the McAteer-Petris Act, the Marsh Act, the Bay Plan and the Marsh Plan. In order to find a project consistent with BCDC's policies and regulations, the Commission must determine that there is no alternative to any Bay fill proposed by the project, that the fill that is proposed is the minimum necessary and that the project incorporates the maximum feasible public access consistent with the project, to and along the shoreline and includes the appropriate type and amount of mitigation for Bay resource impacts.

This report is an update to BCDC's previous document entitled *Designation of Areas Within the Jurisdiction of the San Francisco Bay Conservation and Development Commission that are Unsuitable for Power Plants* ("Power Plant Report"). The most recent update to this document was approved by the Commission on December 20, 1990. Since this time there have been many changes within the energy industry, including improved technology for preventing the impacts associated with these facilities, the deregulation of energy provision and the aging of existing power plants. Additionally, there have been changes along the shoreline of the San Francisco Bay. These changes include additional parklands, wildlife refuges and trails, as well as amendments to Bay Plan policies and priority use areas. Rather than performing a minor update on the document, as had been done in the past, it was determined that a significant

revision was required in order to reflect the se changes. These revisions include updating the power plant maps and providing additional information within the document that is meant to clarify BCDC's role in siting power plants along the Bay. Below is a description of the information contained within the report, as well as recommendations for using the report.

The purpose of this report is to identify those areas within the Commission's jurisdiction where, due to the location of sensitive resources and areas of regional importance, the siting of a power plant would be inconsistent with the Bay Plan, the Marsh Plan, the Marsh Act or the McAteer-Petris Act. Additionally, this report is designed to assist project proponents, the CEC, the Commission and its staff and the public in the review of power plant projects proposed within BCDC's jurisdiction. To assist interested parties in siting or reviewing power plant projects located outside of the non-siting areas, the report includes information regarding relevant BCDC policies and regulations, California's energy resources, the regulatory structure involved in the siting of power plants and the environmental impacts associated with these facilities. To assist in the design and development of project proposals, the final section of the report identifies the necessary components of a power plant project proposed within the Commission's jurisdiction. For the purposes of this report, the term power plant is defined as a thermal power plant. A thermal power plant is defined within the Warren Alquist Act as "Any stationary or floating electrical generating facility using any source of thermal energy, with a generating capacity of 50 megawatts or more." The term "ancillary facility" means any facility that is required for the operation of a thermal power plant and includes electric transmission lines, intake and discharge lines for cooling systems, fuel pipelines and steam pipelines. Co-generation facilities are also identified as ancillary facilities for the purposes of this report. Only thermal power plants, their ancillary facilities and co-generation facilities are subject to the provisions of this report and the areas designated by the power plant regulation and depicted on the power plant maps

The most appropriate use of this report is to read through the Summary and Recommendations section and refer to the power plant regulation and the power plant maps to determine the location of a proposed project and the designation of the proposed project site. The purpose of the Summary and Recommendations section of the report summarizes the key points of the report, including the steps for reviewing projects that are within the designated areas, as well as for those outside of the designated areas. The Summary and Recommendations section also includes a description of the CEC's most recent demand projections, the availability of sites within BCDC's jurisdiction, the impacts of thermal power plants on the Bay and some submittal recommendations to expedite the review process for those projects that are not designated by the power plant regulation as unsuitable for power plants. The power plant regulation is located in Appendix D of this report. The power plant maps, which depict the areas that are designated by the power plant regulation, are located at the end of the Summary and Recommendations section of this report and are available on-line through BCDC's website <www.bcdc.ca.gov>.

If a project is not designated by the power plant regulation, then reviewing Chapters 2 and 7 will assist interested parties in determining if the project includes the necessary components, such as an alternatives analysis, the minimum amount of fill and the maximum feasible public access required by the McAteer-Petris Act. However, if the proposed project is located within an area designated by the regulation as a non-siting area, then the proposal may not be considered further by either BCDC or the CEC. As described earlier, the CEC is prohibited from approving any power plant proposed within the areas designated by BCDC as non-siting areas. However, outside of these areas, BCDC may review projects and provide recommendations to the CEC based on the proposal's consistency with the Bay Plan, the Marsh Plan, the Marsh Act and the McAteer-Petris Act.

CHAPTER 1

BACKGROUND AND OVERVIEW

Introduction to this Update. Since the last update of the Power Plant Report, California's energy market has been deregulated and the state has experienced an energy crisis, which was characterized by rolling blackouts and skyrocketing prices. The California energy crisis began in the summer of 2000 and resulted in blackouts in the San Francisco Bay Area and skyrocketing prices in San Diego County. Initially, it appeared that an increase in demand and a shortage in supply caused the blackouts and high prices. However, this simple explanation does not capture the many issues that coalesced to create the energy crisis, which affected both the people and the economy of the state. This chapter will describe the San Francisco Bay Conservation and Development Commission's ("BCDC") role in siting power plants around the San Francisco Bay, provide information regarding the state's energy resources, explain the process of energy provision before and after deregulation and explain some of the factors that contributed to the energy crisis. The chapter will also describe some of the impacts of the crisis on California and the Bay Area and recommend an appropriate response by BCDC to ensure that the agency is able to effectively respond to new proposals for power plants, while protecting the Bay's natural and cultural resources.

BCDC's Jurisdiction. BCDC is required by two California state laws the McAteer-Petris Act and the Warren Alquist Act to determine those areas within its jurisdiction that are not suitable for the siting of power plants due to the adverse effects that these facilities have on the Bay and its resources. A complete description of BCDC's jurisdiction is located in Appendix A of this report. This authority is exercised through BCDC's Thermal Power Plant Non-Siting Report ("Power Plant Report"), the power plant regulation and set of maps that accompany the report and depict the information contained in the regulation. As directed by the McAteer-Petris Act, the Power Plant Report, the power plant regulation and supporting maps identify those locations where power plants may not be sited due to conflicts with sensitive resources or with priority land use designations identified in BCDC's *San Francisco Bay Plan* ("Bay Plan"). BCDC is required to update the Power Plant Report every five years.[2] The specific responsibilities are described in Section 66645 of the McAteer-Petris Act. This section states:

Joint Responsibility Over Power Plant Sites and Facilities.

(a) In addition to the provisions of Sections 25302, 25500, 25507, 25508, 25514, 25516.1, 25519, 25523 and 25526 of the Public Resources Code, the provisions of this section shall apply to the Commission and the State Energy Resources Conservation and Development Commission [California Coastal Commission] with respect to matters within the responsibility of the latter.

(b) After one or more public hearings, and prior to January 1, 1979, the Commission shall designate those specific locations within the Suisun Marsh, as defined in Section 29101 of the Public Resources Code, or the area of jurisdiction of the Commission, where the location of a facility, as defined in Section 25110 of the Public Resources Code, would be inconsistent with this title or Division 19 (commencing with Section 29000) of the Public Resources Code. The following locations, however, shall not be so designated: (1) any property of a utility that is used for such a facility or will be used for the reasonable expansion thereof; (2) any site for which a notice of intention to file an application for certification has been filed pursuant to Section 25502 of the Public Resources Code prior

[2] Government Code, Section 66645(c)

to January 1, 1978, and is subsequently approved pursuant to Section 22515 of the Public Resources Code; and (3) the area east of Collinsville Road that is designated for water-related industrial use on the Suisun Marsh Protection Plan Map. Each designation made pursuant to this section shall include a description of the boundaries of those locations, the provisions of this title or Division 19 (commencing with Section 29000) of the Public Resources Code with which they would be inconsistent, and detailed findings concerning the significant adverse impacts that would result from development of a facility in a designated area. The Commission shall consider the conclusions, if any, reached by the [California Energy Commission] in its most recently promulgated comprehensive report issued pursuant to Section 25309 of the Public Resources Code. The Commission also shall request the assistance of the [California Energy Commission] in carrying out the requirements of this section. The Commission shall transmit a copy of its report prepared pursuant to this subdivision to the [California Energy Commission].

(c) The Commission shall revise and update the designations specified in subdivision (b) not less than once every five years. The provisions of subdivision (b) shall not apply to any sites and related facilities specified in any notice of intention to file and application for certification pursuant to Section 25502 of the Public Resources Code prior to designation of additional locations made by the Commission pursuant to this subdivision.

(d) Whenever the [California Energy Commission] exercises its siting authority and undertakes proceedings pursuant to the provisions of Chapter 6 (commencing with Section 25500) of Division 15 of the Public Resources Code with respect to any thermal power plant or transmission line to be located, in whole or in part, within the Suisun Marsh or the area of jurisdiction of the Commission, the Commission shall participate in those proceedings and shall receive from the [California Energy Commission] any notice of intention to file an application for certification of a site and related facilities within the Suisun Marsh or the area of jurisdiction of the Commission. The Commission shall analyze each notice of intention and, prior to commencement of the hearings conducted pursuant to Section 25513 of the Public Resources Code, shall forward to the [California Energy Commission] a written report on the suitability of the proposed site and related facilities specified in that notice. The Commission's report shall contain a consideration of, and findings regarding, the following:

(1) If it is to be located within the Suisun Marsh, the consistency of the proposed site and related facilities, with the provisions of this title and Division 19 (commencing with Section 29000) of the Public Resources Code, the policies of the Suisun Marsh Protection Plan (as defined in Section 29113 of the Public Resources Code) and the certified local protection program (as defined in Section 29111 of the Public Resources Code) if any.

(2) If it is to be located within the area of jurisdiction of the Commission, the consistency of the proposed site and related facilities with the provisions of this title and the San Francisco Bay Plan.

(3) The degree to which the proposed site and related facilities could reasonably be modified so as to be consistent with this title, Division 19 (commencing with Section 29000) of the Public Resources Code, the Suisun Marsh Protection Plan, or the San Francisco Bay Plan.

(4) Such other matters as the Commission deems appropriate and necessary to carry out Division 19 (commencing with Section 29000) of the Public Resources Code. [3]

Section 66645(d) describes BCDC's additional responsibilities pertaining to power plant proposals. As this section describes above, BCDC is also responsible for making recommendations regarding power plant proposals to the California Energy Commission ("CEC"), which was established by the Warren-Alquist Act as the sole permitting authority for power plant projects.

The initial version of the Power Plant Report included a description of BCDC's legislative mandate pertaining to power plants, BCDC's jurisdiction and the current projections for increased state power capacity needs made by the CEC in its Electricity Report. Due to a lack of both staff time and new power plant proposals, the last update of the Power Plant Report was completed in 1990. This report serves as a comprehensive update of the 1990 report. A comprehensive update is required at this time in order to reflect the changes that have occurred in the energy industry, (e.g., deregulation, technological advances) and around the San Francisco Bay (e.g., additional parklands, amendments to the Bay Plan) and to equip BCDC with the information needed to respond expeditiously if an application is filed to construct a new power plant or expand an existing plant in BCDC's jurisdiction. This update is particularly timely in that it will help BCDC to understand the components of deregulation, the issues that contributed to the 2000 energy crisis and the potential impacts on the lands and waters under BCDC's jurisdiction.

BCDC's History Regarding Power Plants. Since BCDC was created by the California legislature in 1965, only a few power plant facilities have been proposed within the Commission's jurisdiction. The power plants that were sited along the shoreline prior to the establishment of BCDC were the Potrero and the Hunters Point power plants in San Francisco and the Pittsburg power plant complex in Contra Costa County. Several power plants have been proposed since BCDC was established including two large facilities in Collinsville (Montezuma 1 and 2) and Pittsburg (Pittsburg 8 and 9), a co-generation facility in Crockett, a facility near San Francisco and a facility in Oakland. More recently, two new projects are being proposed along the shoreline of the Bay, an expansion of the Potrero power plant and a project that is currently on hold located at San Francisco International Airport's property. Since the laws requiring BCDC to regulate thermal power plant facilities of 50 or more megawatts, the agency has only formally reviewed a few projects. These projects included an expansion proposal for the Potrero Power Plant in San Francisco, a power plant in Pittsburg, a proposal in Collinsville, a second proposal to expand the Potrero power plant, a proposal for a resource recovery facility in Redwood City, a co-generation facility in Crockett and a peaker plant in San Francisco. (See Figure 1: Existing Power Plants within BCDC's Jurisdiction). The Commission has recommended approval of the peaker facility to the California Energy Commission ("CEC"). In the case of the recent proposal to expand the Potrero Power Plant, BCDC did not recommend approval of the proposed project, recommending instead an alternative cooling system that did not require fill in the Bay. This recommendation was sent to the CEC and this project is still under review by the CEC.

Energy Resources in California. California has approximately 1,000 generating facilities with a combined capacity of 55,000 megawatts of electricity. (See Figure 2: California's Statewide Power Plants 2001). The state's transmission system consists of 40,000 miles of power lines that connect regional utilities to the national and international power grid. The power lines that connect the state to the national and international power grid allow California to import an additional 8,000 megawatts. California has a fairly diverse mix of energy supplies, including oil/gas fired thermal, hydroelectric, nuclear, renewable sources, geothermal and coal powered facilities. (See Figure 3: Sources of California's Generating Capacity). Over 30 percent of

[3] Government Code, Section 66645

California's generating capacity is derived from natural gas fired thermal facilities. Approximately 82 percent of California's energy supply is produced within the state, leaving 18 percent to be made up by out of state imports. California receives these imports from Canada, the Pacific Northwest, the Rocky Mountain region and the Southwest.

San Francisco Bay Area Coastal Power Plants

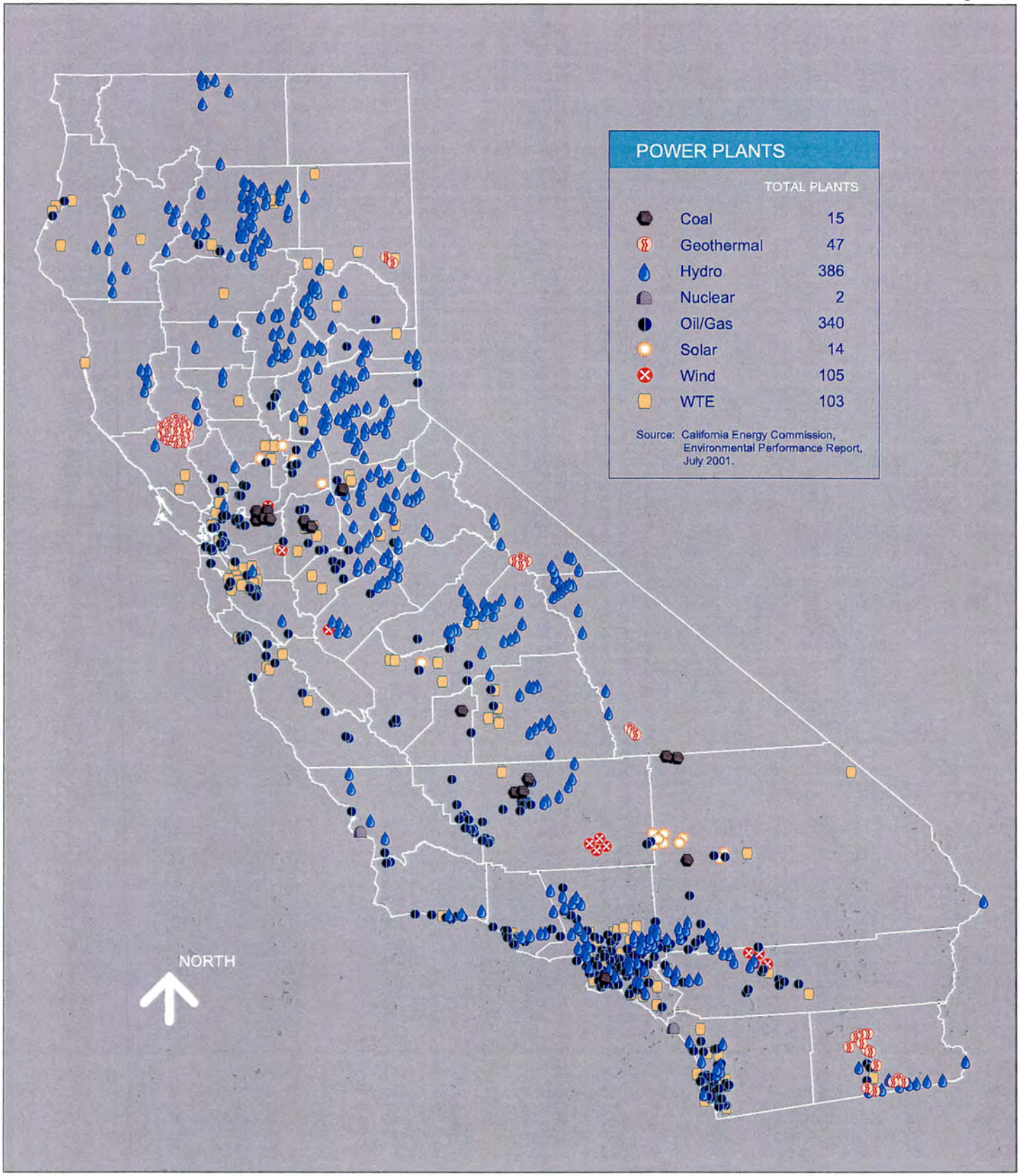
Figure 1

San Francisco Bay Conservation and Development Commission

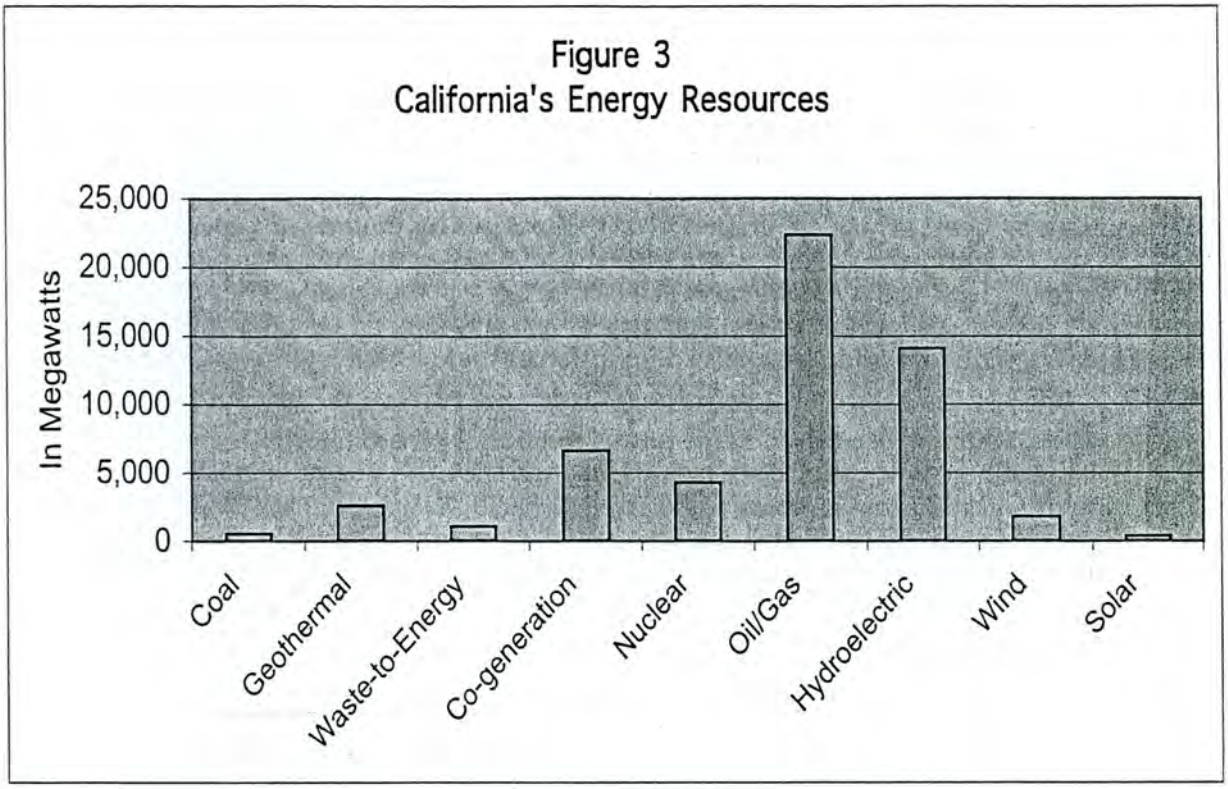
September 2002

California Statewide Power Plants

Figure 2



San Francisco Bay Conservation and Development Commission



From 1990 to 1994 the CEC certified eleven power plants, three of which were not built due to poor market conditions. The remaining nine plants that were constructed produce approximately 957 megawatts ("MW"). Between the years of 1994 and 1997, no power plants were proposed due to the uncertainty created by the restructuring and deregulation of the electric power market. Since 1999, 33 power plants were approved for a total of 12,352 MW of electricity.[4] Of these plants, 15 have been constructed and are now producing 4,137 MW of power, while 16 are currently under construction or on hold. Currently, there are 16 power plants under review that, if approved and constructed, would increase capacity by another 10,549 MW.[5] For perspective, the entire city of San Jose uses approximately 1,000 MW per day.

The San Francisco Bay Area has approximately 30 oil/gas fired plants around the region (located in all counties except for Marin and Sonoma), nine landfill gas facilities located in Contra Costa, Napa, San Mateo, Santa Clara and Sonoma counties, two waste-to-energy facilities in Alameda County, eighteen wind facilities in Alameda, Contra Costa and Solano counties, five coal fired thermal power plants in Contra Costa County one oil facility in Alameda County, one natural distillate facility in San Francisco County, five hydroelectric facilities located in Alameda, Napa, Santa Clara, Solano and Sonoma counties and twelve geothermal facilities in Sonoma County. The county that produces the most power in the Bay Area is Contra Costa County, producing approximately 4,500 megawatts. The only county in the Bay Area that does not provide power to the state's electricity grid is Marin County.

[4] California Energy Commission. 2002-2012 Energy Outlook Report.
[5] California Energy Commission Website. Update on Energy Commission's Review of California Power Projects. Updated: July 30, 2002.

From January 2000 to July 2002, eight natural gas fired thermal power plants were proposed in the Bay Area that would produce approximately 4,300 megawatts. Of these facilities, only one is located in BCDC's jurisdiction; the expansion of the Potrero Power Plant in San Francisco proposed by Mirant. The Bay Area also has a number of renewable energy facilities that are currently proposed, including five landfill gas plants, two wind powered facilities, one digester gas plant and one small hydroelectric facility. Additionally, the Bay has over 30 existing and a number of proposed co-generation facilities that are located in existing industrial complexes. These co-generation facilities, which are located in all of the Bay Area counties except for Sonoma and Marin, generally use cooling water from the host industrial site. Co-generation facilities have far fewer land and water impacts than stand-alone power plants, since they are located on already developed industrial land and generally use water and heat that is recycled from the neighboring industrial site. For a brief description of these technologies see Chapter 3 of this report.

Energy Provision. Before deregulation of the power industry by the California legislature, energy was provided either by a utility distribution company ("UDC") or a municipally-owned utility. The utility distribution companies in California are Pacific Gas & Electric ("PG&E"), Southern California Edison ("Edison") and San Diego Gas & Electric ("SDG&E".) These utilities were responsible for the development of power plants, the generation of electricity, the transmission system and the metering and billing of customers. The agencies responsible for regulating the industry included the CEC, the California Public Utilities Commission ("CPUC") and the Federal Energy Regulatory Commission ("FERC").

The CEC was created by the state Warren-Alquist Act to oversee the development and siting of power plants and to project California's future energy needs through analysis performed in biennial reports. The main purpose of the CEC before deregulation was to ensure that California's electricity supply met future demand and that power plants were appropriately sited to meet projected demand and avoid significant environmental or cultural impacts. One of the ways the CEC ensured that future demand would be met by sufficient supply was by making demand projections in its biennial Electricity Report. The Warren-Alquist Act also established the CEC as the sole permitting authority for power plant projects, making the agency responsible for reviewing and permitting power plant facilities. [6]

The primary purpose of the CPUC is to regulate privately owned telecommunications, electric, natural gas, water, railroad, and rail transit and passenger transportation. The CPUC is also singularly responsible for assuring that California utility customers have safe, reliable utility service at reasonable rates, protecting utility customers from fraud and promoting the health of California's economy.

The FERC was established in 1977 as an independent commission with the primary purpose of regulating the transmission of oil and natural gas, the transmission and wholesale sales of electricity and the licensing of hydroelectric companies. Chapter 4 of this report contains a description of each agency involved in the regulation of power plants.

Structure of the Regulated System. Prior to deregulation, the provision of electricity was heavily regulated and fairly simple. The CEC determined the state's future electricity needs by working closely with the utility distribution company and municipally-owned utilities, major industries and local governments to establish accurate growth trends for the state. If future growth indicated an increase in demand for electricity beyond current capacity in a particular region, then the utility distribution company would determine the appropriate way to increase supply. Supply can be increased either by developing a new generating facility or expanding the capacity of transmission lines in a particular region. The UDC or municipally-owned utility would respond to increased demand by applying to the CEC for a permit to build a new

[6] Public Resources Code, Section 25500

generating facility or expand the capacity of the transmission system. The CPUC regulated the entire system and was responsible for the utilities' service to customers and the FERC regulated wholesale transmission rates and power transactions between the utilities. Both the CPUC and the FERC were required by law to establish "just and reasonable" rates for electricity. This process was designed to ensure that Californians were protected from power shortages and high prices. Equally important, the process also protected the state from the development of unneeded generating facilities, which would increase rates for consumers and degrade the environmental quality of the state. Through this process, generating capacity was kept closely aligned with demand. Under the regulated system, the utilities were also responsible for having enough generating capacity to meet peaks in demand, despite the increased cost of developing and maintaining plants to meet peak demands. This increased capacity cost California ratepayers and utilities more, but provided consumers with enough capacity to meet the demand peaks and ensure a reliable energy supply.

Structure of Deregulation. The deregulation of a variety of industries began in the 1970s and 80s. Some of the industries that have been deregulated include cable television, telecommunications, airlines and electricity. The theory behind deregulation is that by reducing government regulation and opening up industry to competition, efficiencies will increase, prices will drop and customer services will improve. These were the goals behind the deregulation of the electricity market in California in 1996. Both industry and consumers supported deregulation in the state, believing that efficiencies would be improved, services expanded and prices reduced below those being paid in the regulated market. Before deregulation, Californians paid the highest rates for electricity in the country.[7] However, in contrast to very high rates, Californians averaged lower monthly power bills than the rest of the country through the implementation of successful conservation strategies. California uses less electricity per person than any other state in the country.[8] Deregulation was thought, however, to be the solution for reducing the high rates that the state's businesses and residents were paying for power and thus further reducing the states power bills. In addition, deregulation was seen as an important step to retain existing industries and to attract new ones. With increased competition between states for industry, the cost of doing business (e.g., taxes, electricity rates, developer's fees) has become an important determining factor for industry when selecting a location for expansion or deciding whether or not to stay in a region.

Assembly Bill 1890, (Assembly Member Brulte) approved in 1996 by the Legislature and signed by Governor Wilson, set up the deregulation of the electricity industry in California. As described previously, prior to deregulation energy was provided either by an UDC or municipal-utility. These utilities were responsible for the development of the power plants, the generation and transmission of electricity and the metering of use and billing of customers. After deregulation, the bundle of services that were once provided by the utility distribution companies were dismantled, some remaining with the utility companies, while generation was opened up for provision by market competitors, such as energy wholesalers like Mirant and Duke Power. The municipal utilities, such as the Los Angeles Department of Water and Power, opted not to become part of the deregulated market and retained all the components required for electricity provision, including generating capacity. For the utility distribution companies, such as PG&E, SDG&E and Edison, deregulation opened up the generation of power to market competition. The utilities retained the transmission lines, metering and billing functions and some generation capacity.

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[7] California Energy Commission. 2002-2012 Electricity Outlook Report.

[8] Texas House of Representatives. House Research Organization Focus Report. April 1999. Retail Competition in Electricity Generation: Experience in California and Pennsylvania.

Deregulation only affected a portion of power provision-the generation of power. The transmission of electricity remained regulated and the public utilities retained responsibility and ownership of these lines. In retaining the transmission lines, the public utilities also retained responsibility for providing the public with electricity, regardless of which company generates the electricity. The role of the regulatory agencies was also altered by deregulation. Although the CEC retained its permitting function, it no longer a requirement that the CEC make a finding that a proposed power plant is needed to meet projected demand. In a deregulated market, it was determined that competition would be sufficient to determine whether or not a power plant was necessary to meet demand, as power wholesalers would not build plants that did not make economic sense, but would build plants in order to meet increased demand. The CPUC no longer regulates either the generation or transmission of electricity. The competitive market is now responsible for generation and FERC regulates the transmission through oversight of the Independent System Operator ("ISO"). The CPUC continues to be responsible for regulating distribution throughout the state and establishing the rates that are charged by the utility distribution companies to their consumers. The FERC's role in California has expanded through its oversight of the ISO, which is responsible for the operation of the transmission facilities and of the Power Exchange ("PX"), which was once the market that determined the clearing prices for wholesale energy.

Several things made the structure of California's deregulated market unique among those countries and states that had either already deregulated or were in the process of deregulating their power industry, such as Great Britain, Pennsylvania and Texas. One difference is that California established two entities, the PX to oversee wholesale pricing and the ISO to oversee management of the utility owned transmission system. The creation of two entities to separately oversee pricing and transmission was unique to California's deregulation structure.[9] No other country or state separated these functions and delegated their management to separate entities. Another unique aspect of the deregulation structure is the strong emphasis that California placed on the spot market for the purchase of electricity. Other governments placed a much stronger emphasis on long-term contracts, using the spot market in combination with these contracts.[10] Contrary to this model, California focused almost exclusively on the spot market and required the utility distribution companies to purchase all of their electricity from the spot markets run by the PX. Additionally, California provided a strong incentive to the existing public utilities to sell off their generating facilities. All of these things were incorporated into the deregulation of the market and were intended to increase competition and eliminate the competitive advantage of the existing public utilities. Unfortunately, rather than increasing competition, it is believed that these strategies contributed to the electricity blackouts and the skyrocketing prices that California began experiencing in the summer of 2000.

Causes of the Energy Crisis. There were many factors that contributed to the energy crisis that California began to experience during the summer of 2000. Despite attempts to discover a single culprit behind the skyrocketing prices and rolling blackouts, it appears that the combination of a variety of elements led to the crisis. The explanation is not as simple as a significant shortage of supply or price gouging by power providers or a poorly structured deregulation scheme, although all appear to have contributed to the crisis. Rather it evolved from a series of events, including a deregulation scheme that relied almost exclusively on the spot market, dry weather conditions in the Pacific Northwest and a large number of power plants taken off-line for unscheduled maintenance. All of these factors combined, resulted in skyrocketing prices and rolling blackouts.

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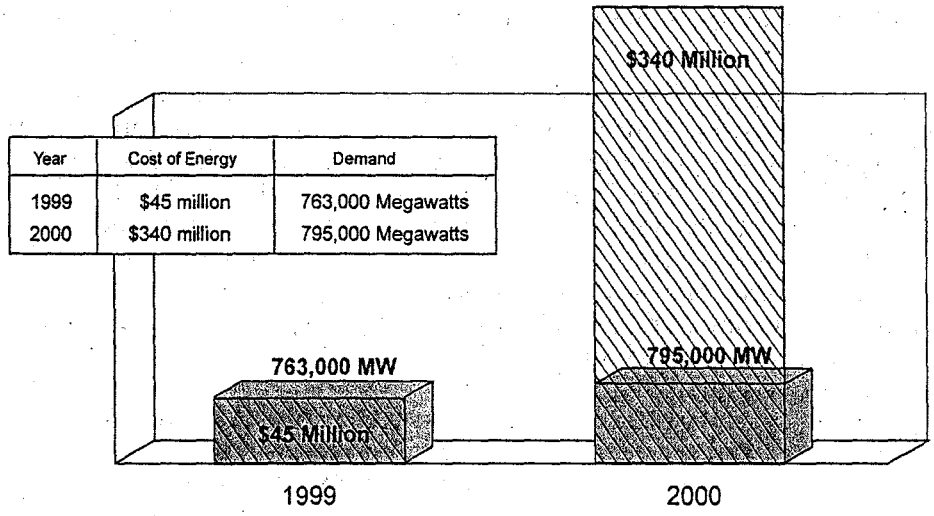
[9] California Public Utilities Commission. California's Electricity Options and Challenges Report to Gray Davis.
[10] Borenstein, Severin. January 2001. The Trouble with Energy Markets and Some Solutions. UC Berkeley.

Demand. Between 1990 and 1999 California's economy grew at a rate of approximately 2.8 percent annually, while population and energy usage lagged behind with a rate of growth annually of approximately one percent. Between 1999 and 2000, California's economy jumped at a rate of over seven percent and the rate of increase in energy usage jumped from one to two percent. In addition to a surge in economic growth, California also experienced a warmer than usual summer in 2000. Conventional wisdom stated that the combination of economic growth and warmer weather significantly increased demand in the summer of 2000 over that of 1999. However, according to FERC and the CPUC, peak hour demand increased only slightly over 1999. Taking a day during the summer of 2000 and comparing it with the same day during the summer of 1999 can test the significance of the demand side of the equation. On June 29, 1999, California's electricity usage was 763,000 MW, which cost approximately $45 million dollars. One year later, on June 29, 2000, California's electricity usage was slightly higher at 795,000 MW, but the cost of this power was significantly higher-$340 million.[11] The increase in usage between 1999 and 2000 was around 4 percent but the increase in cost was seven times that of the previous year. The CPUC states that the total volume handled by the system in 2000 decreased by two percent from 1999, while the revenue generated during this same period increased by 316 percent.[12] These figures indicate that California received less power and paid a much higher price for the power that it did receive. (See Figure 4: Comparison of Cost and Usage, 1999 and 2000).

Figure 4
Comparison of Cost and Usage Between 1999 and 2000



Note: 1999 to 2000 energy volume down 2%
1999 to 2000 revenue generated up 316%

[11] California Public Utilities Commission. California's Electricity Options and Challenges Report to Governor Gray Davis.
[12] California Public Utilities Commission. November 2000. Analysis of the Federal Energy Regulatory Commision Order and Staff Report.

California's per person demand is significantly less than the rest of the country due in large part to successful demand reduction and conservation strategies. While California's population growth slightly exceeds the rest of the United States by approximately 0.1 percent, the growth in energy usage per person is less than the rest of the country by approximately 1.3 percent. With an annual growth rate of approximately one percent, the growth rate in energy consumption has been approximately 2.5 percent. In comparison, California has grown approximately 1.1 percent per year over the last decade and energy consumption has grown at approximately the same rate, at 1.1 percent.[13] The increases in residential consumption in California have been largely due to the increase in new households, rather than increased consumption by existing households. This increase is a result of both an increase in the number of households in the state and the type of residence and location of the new dwelling units. The majority of the new homes built in California over the last decade have been large, single-family dwellings located in the warmer regions of the state. However, due to incentives in California to build residences and businesses to be more energy efficient, the state has been able to grow without significantly increasing demand for energy. [14]

Demand increases in adjacent western states; such as Colorado, Arizona and Nevada have also had an impact on the amount of energy available to California consumers. Approximately 18 percent of California's energy supplies come from outside of the state. As these regions grow and their demand for electricity increases, the amount of power available for export to California is reduced. Census Bureau figures show that over the last decade Washington, Oregon, Utah, Arizona and Nevada have been growing rapidly. Between 1990 and 1995, the population of Oregon grew by 10 percent, Utah grew by 16 percent, Arizona grew by 18 percent and Nevada grew by 27 percent.[15] This population growth has translated into an increased demand for electricity, leaving less for export to California. Although not a significant issue at this time, as adjacent states continue to grow less electricity will be available for export to California. This could result in a need for additional generating facilities within the state. An additional effect could be that these states could increase the amount of electricity they import from California.

Supply. While many blamed environmental regulations and not-in-my-back-yard ("NIMBY") opposition for the supply constraints and the lack of new plants approved and built during the 1990s, the lack of power plant projects had more to do with the market than with environmental or NIMBY concerns. The California Energy Commission certified eleven power plants between 1990 and 1994. Only eight of these plants were constructed, resulting in an increase of 952 MW. The other three plants were not built because of poor market conditions.[16] Due to investor uncertainty, only one new power plant was proposed between the years of 1994 and 1997, during the restructuring of the market. After the legislation deregulating the market was approved, the number of power plant proposals increased significantly, with 13 being proposed in 1999. The CEC has identified 33 plants that have been approved since 1999, representing a generating capacity of 12,352 MW. Of these 33 plants, 16 are under construction and 15 have been constructed and are producing power. The 15 power plants that have been constructed are producing approximately 4,137 MW of electricity. [17] Additionally, there are 16

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[13] Natural Resources Defense Council and the Silicon Valley Manufacturing Group. August 2001. Energy Efficiency: Leadership in Crisis. How California is Winning.

[14] California Energy Commission, Oregon Department of Energy, Washington State Energy Office. April 1997. The Energy Yardstick.

[15] California Energy Commission. Public Interest Energy Research.

[16] Audit of the California Energy Commission's Permit Process.

[17] California Energy Commission's Website. Update on Energy Commission's Review of California Power Projects. Updated July 30, 2002.

projects currently under review, which represent over 10,000 megawatts of electricity.[18] However, the CEC estimates that reserves will be lower in the deregulated market due to the lack of market incentives to keep large reserves to meet peak demands. Lower reserves will result in greater price increases during peak demand periods and will require demand responses and conservation measures to reduce usage during peak periods. Such demand responses were evident during the summer of 2001 when Californians cut demand from five percent up to twelve percent.[19] A twelve percent decrease in demand is the equivalent of the amount of power that can be produced by ten large power plants, or 5,000 megawatts.

Other factors that impacted supply included a significant increase in the number of power plants that were shut down for scheduled and unscheduled maintenance and the amount of hydroelectric power that was available for export from the Pacific Northwest. In a study done by FERC, it was found that there was a significant increase in the number of power plants that were shut down for unscheduled maintenance. In December 1999 the amount of megawatts that were unavailable due to maintenance was approximately 2,570. One year later, this number climbed to approximately 8,990 MW. Between January 2000 and 2001 that number increased from 2,423 MW to 9,940 MW.[20] (See Figure 5: Percentage of Power Unavailable to California due to Unscheduled Maintenance)

Considering that California's total capacity is 55,000 MW, 9,940 MW constitutes a significant reduction in supply, representing enough electricity to power approximately nine large cities. FERC's study of the California energy crisis stated "it is not clear exactly why these plants were out of service." The study goes on to speculate that the increase in outages could be due to either a previous lack of maintenance and a need to fix small problems in preparation for high loads or that owners could have withheld capacity by "taking plants out of service at critical times to drive up prices."[21] Regardless of the motive, the off-line plants significantly reduced available supply.

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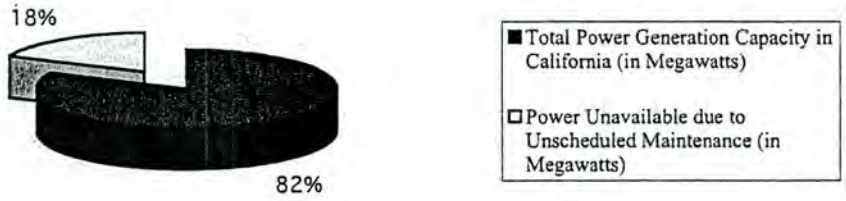
[18] California Energy Commission's Website. . Update on Energy Commission's Review of California Power Projects. Updated July 30, 2002.

[19] Natural Resources Defense Council and the Silicon Valley Manufacturer's Group. August 2001. Energy Efficiency: Leadership in Crisis. How California is Winning.

[20] California Public Utilities Commission. November 2000. Analysis of the Federal Energy Regulatory Commission Order and Staff Report.

[21] Federal Energy Regulatory Commission. November 2000. Order Proposing Remedies for California Wholesale Electric Markets.

Figure 5
Percentage of Power Unavailable to California due to Unscheduled Maintenance
(January 2001)



Due to reduced snowfall, lower runoff and higher temperatures in the Pacific Northwest there was lower hydroelectric capacity available for export to California in 2000. From 1999 to 2000, there was a 32 percent reduction in the amount of scheduled exports from the region to California. Despite the reduction of available imports into California, the level of power imported into the state remained the same as 1999 levels. Additionally, while California was undergoing a serious power shortage, exports out of the state increased over 1999 levels.[22] Rather than following expected patterns, the import/export patterns appear to have been responding more to the structure of deregulation than to the supply and demand of the affected regions. One explanation for these import/export numbers is that in-state generators were exporting power out of state to avoid in-state price caps. Once this power was out-of-state it was no longer subject to the price caps in place for power sold within the state, and it was transferred back to California and sold at uncapped, out-of-market prices. Another factor that reduced supply was the reduction of output from co-generation, alternative energy providers and other qualified facilities. These power providers stopped producing power when the UDC's were unable to pay for the supplies and these facilities could not afford to continue to contribute to the state's power supply.

Structure of Deregulation. The deregulation of the electricity industry established two new entities, the PX and the ISO. The PX was designed to manage the market for buying and selling power, while the primary role for the ISO was to oversee transmission, balance supply and demand and ensure system reliability. The ISO also managed the real time market described above, purchasing additional power when the capped, day-ahead market was unable to procure the necessary amount to meet demand. The ISO purchases were designed to account for between three and five percent of all power purchases and to meet demand during emergencies and unforeseen peak periods. Since these purchases were to be made only to maintain system balances and to avoid blackouts, the real-time market was not subject to the same caps that were part of the day-ahead market. The ISO was able to pay any price necessary in order to avoid blackouts and crashes in the system. Since the real-time market was uncapped, any shift to that market would most likely result in an increase in wholesale prices. Rather than making

[22] California Public Utilities Commission. November 2000. Analysis of the Federal Energy Regulatory Commission Order and Staff Report.

up the projected five percent of power purchases, which was considered to be a worst case scenario, the real-time was responsible for approximately 20 percent of power purchases in the year 2000. The majority of these purchases were made out-of-market, from either out-of-state or municipal generators and therefore they were not subject to any caps. These out-of-market purchases were made at exorbitant prices, with the amount of energy traded declining by two percent compared to 1999, but the cost of energy increasing by 316 percent.[23] Between June 2000 and September 2000, California spent over $10 billion on electricity, exceeding by $3 million the amount spent on electricity for the entire year of 1999.[24]

California was the only deregulated market to separate the management of the pricing mechanism and the maintenance of the transmission system into two distinct organizations. Additionally, California's deregulated market was also unique in the emphasis placed on the spot market. Other regions that had deregulated prior to California focused on long term contracts rather than the spot market. Spot markets made up a maximum of 20 percent of transactions in New England and only 10 to 15 percent in the markets in Pennsylvania-New Jersey-Maryland, Australia, Norway and Sweden.[25] In contrast, California relied almost exclusively on spot markets, requiring the utility distribution companies to sell their power into the PX's day-ahead market and buy all of their power exclusively from the PX. Spot markets have historically been very volatile in other regions, with prices skyrocketing and dropping very quickly. This volatility is the reason why all deregulated markets except California's rely more on long term contracts to increase price stability and system reliability, using the spot market primarily to make up shortfalls.

By relying on the spot market and establishing the ISO as an emergency market not subject to price caps, deregulation provided an incentive for both buyers and sellers to under-schedule the next days demand and supply. For buyers, under-scheduling demand could drive prices down if the projected supplies were more plentiful than the projected demand. Conversely, sellers attempted to under-schedule supply, creating a shortage to drive up prices. There have been reports of wholesalers taking plants off-line for unscheduled maintenance or exporting supplies out-of-state in order to reduce the amount of power available to sell into the day-ahead market managed by the PX. Under scheduling by both buyers and sellers resulted in an increase in the amount of emergency purchases that the ISO was required to make in order to avoid system crashes and blackouts. During these periods of shortfall, the ISO would request that in-state producers increase output and call on out-of-state and municipal utilities to provide power to California. These out-of-market purchases increased (power purchased from out-of-state or municipal generators) significantly from June 2000 to December 2000, the number of purchases in December being approximately 18 times the purchases in June.[26] The California Power Exchange's Compliance Unit stated, "Uncapped out-of-market calls provide an incentive to generators to export their day-ahead supply for use in the out-of-market purchases. Generators could schedule exports of power through contracts with out-of-state entities (possibly affiliates), park the power in surrounding control areas, and then resell the power at a higher price into California as out-of-market, thus avoiding price caps."[27] This would provide an explanation for the amount of power being imported into the state remaining the same even as the supplies available from the Pacific Northwest were reduced by 32 percent from the previous year.

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[23] California Public Utilities Commission. November 2000. Analysis of the Federal Energy Regulatory Commission Order and Staff Report.

[24] California Energy Commission. December 2000. Draft AB 970 Trends Report Executive Summary and Recommendations.

[25] Mansur, Erin. Pricing Behavior. UC Berkeley.

[26] California Public Utilities Commission. November 2000. Analysis of the Federal Energy Regulatory Commission Order and Staff Report.

[27] California Power Exchange Compliance Unit

A heavy reliance on the spot market and the separation of the pricing and transmission functions were both identified as contributing factors in California's energy crisis. In response, FERC eliminated the requirement that utilities buy and sell all of their power into the PX and dismantled the PX. Additionally, restrictions were removed that made it difficult for utilities to enter into long-term contracts. Unfortunately, these market alterations came too late for the utilities to enter into long-term contracts, since their credit status made it impossible for them to enter into long-term contracts. The poor credit status of the utilities (PG&E filed for bankruptcy and Edison was close to doing the same) forced the state to enter into contracts directly with wholesale generators in an attempt to stabilize prices and increase the reliability of supply. Since the winter of 2001, the state has been purchasing power and has entered into long-term contacts with wholesalers. These power purchases have cost the state millions and millions of dollars, have threatened other state programs and contributed to the elimination of the surplus that had existed just one year ago.[28]

California's Response. In addition to entering into long-term contracts with generators in order to increase system reliability, California also focused on decreasing demand for electricity. Through a series of initiatives, including a massive public education effort, strengthened state efficiency standards and a host of new financial incentives to save electricity, demand during peak periods dropped by more than 12 percent from the previous year and overall demand dropped approximately six percent. These are significant decreases, 12 percent being equivalent to the amount of power that can be produced by ten large power plants. The demand reduction in California has resulted in the most successful statewide energy campaign in history. The reduction in June 2001 represented approximately 4,750 MW and saved the state from the rolling blackouts experienced in the fall of 2000. All users contributed to the savings, with hundreds of companies committing to cutting usage by 20 percent, state buildings reducing power demand by approximately 26 percent and 29 percent of households reducing demand by at least 20 percent.[29]

In a deregulated, market-driven electricity economy, demand reduction strategies will be critical to avoiding blackouts and skyrocketing prices, particularly during peak demand periods. The reserves that were once common in the regulated power market will not be available to meet peak demand in a deregulated market. These reserves are expensive and require the expansion of production and transmission capacity. The expansion of these capacities to meet peak demands is not economically attractive to industry if it is going to sit idle the majority of the time. By reducing demand, Californians can reduce the cost of energy, eliminate the need to expand capacity by building additional stand-alone or peaker plants and improve the health of the environment.

Likely Impact on the Bay and BCDC's Response. During the initial months of the energy crisis it seemed likely that there would be a significant increase in power plant construction proposals in the state. Although there has been a significant increase in proposals, the plants that are being proposed along the coast are exclusively expansions or re-powerings of existing plants.[30] The proposals for new power plants are located at inland locations, using alternative sources of cooling water and technology, such as dry cooling or wet cooling using treated municipal wastewater. Within BCDC's jurisdiction there is only one proposal for a stand-alone power plant. The proposal is an expansion of the Potrero Power Plant in San Francisco. The

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[28] Los Angeles Times. "PG&E Declares Bankruptcy," by Tim Reiterman and Michael Landsberg. April 7, 2001.

[29] Natural Resources Defense Council and the Silicon Valley Manufacturer's Group. August 2001. Energy Efficiency: Leadership in a Crisis. How California is Winning.

[30] California Energy Commission. July 2001. Environmental Report of California's Electric Generation Facilities.

majority of new proposals for stand-alone power plants have been located at inland sites, using municipal and/or recycled water supplies rather than diverting surface water from large bodies of water such as bays and oceans. Due to environmental concerns and regulations, technological advances and the cost of bay and ocean front property, it is unlikely that a large number of power plants will be proposed along the San Francisco Bay shoreline.

However, trends could change as municipal sources become strained by increased residential and business demands. Therefore, it is important for BCDC to maintain updated information identifying those sites that are inappropriate for power plants due to the location of sensitive or regionally important Bay resources, while providing an adequate number of sites where these plants may be sited provided the proposals meet the other provisions and policies of the McAteer-Petris Act, the Suisun Marsh Preservation Act, the Bay Plan and the Marsh Plan. The rest of the report specifically describes BCDC's role in the siting of power plants in the Suisun Marsh or area of BCDC's jurisdiction, identify the regulations and policies that are pertinent to the siting of power plants, describe the environmental impacts that these plants can have on the Suisun Marsh or the area of BCDC's jurisdiction, and the technology that is available to the electricity industry that can mitigate these impacts.

CHAPTER 2

SITING A POWER PLANT WITHIN BCDC'S JURISDICTION

The Power Plant Non-Siting Report adopted by BCDC in 1978 included four sets of maps which identified the areas where power plants and ancillary facilities may not be located due to the potential impacts these facilities could have on the Bay and its resources. These maps were hand drawn on USGS quad sheet maps and were organized into three sets, identifying the resources, such as parklands, wildlife refuges and public access and a fourth set, a result of overlaying the first three sets of maps, which identified and defined the designation for each area for the purposes of siting a power plant. The maps have never been updated to reflect changes in land use around the Bay, such as the addition of parklands or public access or amendments to the Bay Plan or Marsh Plan.

This report includes an update of the information contained on the USGS quad sheet maps and a conversion of these maps into a digital geographic information system ("GIS") format and a regulation that defines the designations and what is prohibited and what is permitted within each designation. The regulation, which is located in Appendix D of this report, establishes the areas where power plants are prohibited and the areas where power plants and ancillary facilities may be considered. The maps serve as a visual interpretation of this regulation, depicting the general location of each designation. Although accuracy was an important goal in the development of the maps it is important to recognize that the maps are derived from data that were mapped at different scales and levels of accuracy. As such, the accuracy of the feature and location boundaries cannot be guaranteed. Precise determinations of feature boundaries and locations may require field inspections with BCDC staff, qualified individuals, land owners and managers. Additionally, more specific site information, such as the resources that are identified at the site, can be obtained by contacting BCDC staff.

In addition to being converted into a GIS format, the maps also include new, updated information. Since 1978 there have been significant additions of parkland, wildlife refuges and public access areas. Additionally, the Bay Plan maps have been amended over 30 times, including updates to the Bay Plan priority use areas, and this update reflects those changes. The addition of parklands, wildlife refuges and changes in habitat types due to mitigation, restoration and natural processes have increased the number of sites that are no longer suitable for the siting of power plants. Reflecting these changes is necessary in order to protect the resources and to identify early in the project development process those areas which are clearly unsuitable for the siting of a power plant. The power plant maps are located in the conclusions section of this report and are also available on the internet on BCDC's website <www.bcdc.ca.gov>. A description of the designations is located at the beginning of this section and in Table 1, located at the end of this section.

The power plant maps are a depiction of the areas that are designated by the power plant regulation and are based on resources within the Bay and along the shoreline. Some of the resources identified on the maps include federal, state, local and private parklands and open spaces, federal, state, local and private wildlife refuges, Bay habitat restoration sites, public access areas including the Bay Trail, the priority use areas, the Suisun Marsh Primary and Secondary Management Areas, tidal marshes, salt ponds, tidal flats, riparian vegetation, marine mammal haul-out areas and pupping sites, threatened and endangered species habitats and important fish habitats.

The maps depict areas both within the Commission's jurisdiction and outside of its jurisdiction. Only the areas that are designated within the Commission's jurisdiction are subject to BCDC's authority and the provisions in this report. The purpose of including areas outside of

the Commission's jurisdiction is to depict the entire size of the resources, rather than a shoreline band depiction of the resources. For example, where a park is both within and outside of BCDC's 100-foot shoreline band jurisdiction, the whole park is depicted on the maps. However, only the area of the park that is within BCDC's jurisdiction is subject to BCDC's regulations and the provisions of this report. The information for these maps was obtained from a variety of sources, including the original USGS power plant non-siting maps, BCDC's Bay Plan Maps and permit files, the San Francisco Estuary Institute's "EcoAtlas" and the "California Natural Diversity Database." A complete list of the data sets available and the source of each data set is located in Appendix C to this report.

Each resource that is designated in the power plant regulation and depicted on the power plant maps is identified in the McAteer-Petris Act, the Suisun Marsh Preservation Act, the Bay Plan or the Marsh Plan as a significant Bay resource and protected by existing provisions and policies within these documents. The maps are a result of compiling these provisions and policies and translating this information onto maps in order to provide a depiction of those areas where the location, regardless of design, features or mitigation proposals of a power plant, would be inconsistent with the McAteer-Petris Act, the Suisun Marsh Preservation Act, the Bay Plan or the Marsh Plan. Areas are not designated if simple mitigation measures could be proposed that would make a plant acceptable and consistent with BCDC's laws and policies. A complete inventory of the resources designated in this report and depicted on the maps, along with the associated regulations and policies, is located in Appendix B of this report.

The Non-Siting Area Designations. BCDC has developed four designations for the purposes of identifying those locations in the area of BCDC's jurisdiction that are unsuitable for power plants and their ancillary facilities: fully designated areas and three partially designated areas, A, B and C. Fully designated areas do not permit the location of either power plants or ancillary facilities, while partially designated areas allow for the review of proposals for certain, identified ancillary facilities and, in one category, Category A, for power plants. The designations are designed to protect sensitive ecological resources (e.g., critical Bay habitats, threatened or endangered species, water resources, air quality, wildlife refuges, restoration areas) significant cultural resources (e.g., public access, visual access, parks, historic resources, residential areas) and priority use areas designated in the Bay Plan and the Suisun Marsh Primary and Secondary Management Areas as identified by the Marsh Plan.

Below is a description of each designation and what is prohibited and permitted within each designation. In addition to projects being consistent with the designations described below, projects must also be otherwise consistent with the Commission's other laws and policies.

Full Designation. The areas that are fully designated are:

- Existing and proposed public parks;
- Existing and proposed public and private wildlife refuges;
- Wildlife priority use areas;
- Waterfront park or beach priority use area, including marinas, fishing piers and boat launching ramps;
- Suisun Marsh Primary Management Area;
- Tidal marshes, tidal flats and managed wetlands;
- Existing and proposed (already funded) Bay habitat restoration sites;

- Riparian vegetation;
- Habitat of species that are listed by a fish and wildlife management agency as threatened or endangered; and
- Marine mammal haul-out areas and pupping sites.

Power plants and ancillary facilities may not be sited within the areas that are fully designated. The purpose of designating these areas is to prevent impacts by power plants and ancillary facilities and to guide power plants that require a shoreline location to appropriate areas along the shoreline that will not result in impacts to these sensitive resources. These resources were selected as areas that should be fully designated due to their sensitivity and the determination that simple mitigation and design measures would be insufficient to address all of the likely impacts to these resources. These resources were also designated in recognition that the Bay and its shoreline is a large area and that there are more suitable locations to site a power plant or an ancillary facility than in those resource areas listed above. For a more detailed description of the types of impacts that siting a power plant or ancillary facility could have on these resources see Chapter 6 of this report.

Partial Designation, Category A. The following resources are partially designated in Category A:

- Water-related industry priority use areas;
- Port priority use areas; and
- Airport priority use areas.

Within the areas that are partially designated in Category A, the siting of power plants or any ancillary facility may be located within the areas that are partially designated within Category A if the Commission determines that the location of these facilities would not preclude or adversely affect the existing or future use of these priority use areas for their primary purposes.

The partially designated categories were developed to allow certain ancillary facilities to be located within areas where there would be little or no impact to the resources located in these areas. In the case of Category A, it was determined that power plants and ancillary facilities may be sited in some priority use areas where they would not preclude the use of these priority use areas for their primary purposes. Under certain circumstances, power plants and ancillary facilities could be sited without precluding or adversely affecting the existing and future use of these areas for their primary uses, by utilizing land that is not required for the existing or future functioning of the primary use. For example, in an area designated for airport priority use, it may be possible to locate a power plant on a site within the airport priority use area that is not currently in use and is not usable or necessary for expansion for airport purposes. However, if it is determined that a proposed project would either preclude or adversely affect the use of the priority use area for water-related industry, port functions or airport uses, then the proposed project would not be permitted on the site. Such an example would be a power plant that is proposed for an area designated for port use that was needed for future port expansion.

Partial Designation, Category B. The following resources are partially designated in Category B:

- The Commission's Bay and certain waterway jurisdiction other than the areas identified as either fully designated (e.g., tidal marshes);
- Existing and proposed (already funded) public access areas, including the San Francisco Bay Trail;
- Suisun Marsh Secondary Management Area; and
- Salt ponds.

Within the areas that are partially designated in Category B, the siting of a power plant is prohibited but the following ancillary facilities may be located if the Commission determines that the location of these facilities would not create impacts or preclude the use or functions of the resources and areas that are listed above:

- Underground or underwater electric transmission lines;
- Intake or discharge lines and structures for cooling systems;
- Underground or underwater fuel pipelines; and
- Underground or underwater steam pipelines.

Within Category B, it was determined that the facilities listed above could be located within the surface waters of the Bay, existing and proposed public access, the Suisun Marsh Secondary Management Area and salt ponds, without creating impacts that could not be avoided or mitigated. By allowing for facilities that are underground or underwater, it is possible for these facilities to be located within these areas without impacting the primary use of the areas. However, there could be temporary impacts to these resources during construction and maintenance. In such cases, the proposal to develop an ancillary facility within these resources must be accompanied with a proposal to reduce or eliminate any impacts these areas. For example, while placing an underground transmission line or pipeline beneath existing public access, the public access area could be impacted and the ability to travel along this public access could be temporarily impeded or eliminated. In the case of public access, all projects that propose to temporarily impede existing public access must provide an alternative route so that the public may still pass through the area.

Partial Designation, Category C. The following resources are partially designated in Category C:

- Migratory fish routes;
- Subtidal areas;
- Spawning areas; and
- Nursery sites for juvenile fish or other aquatic organisms.

Within the resources that are partially designated in Category C, the siting of a power plant is prohibited but the following ancillary facilities may be located within the resource areas partially designated within Category C if the Commission determines that the location of these facilities would not create impacts or preclude the use or functions of the resources that are listed above:

- Overhead electric transmission lines;
- Intake or discharge lines and structures for cooling systems;
- Underground or underwater fuel pipelines; and
- Underground or underwater steam pipelines.

Although the ancillary facilities listed above may be considered in the resource areas described in Category C, certain restrictions may be required to ensure that proposed projects do not create adverse impacts on the aquatic resources listed in Category C. Examples of such restrictions are time periods when construction and maintenance would not be permitted due to the migration or spawning of fish or other aquatic organisms.

The ancillary facilities that may be located within Category C are very similar to the ancillary facilities that may be located within Category B. The one difference is that Category C permits above ground electric transmission lines, while Category B requires that any electric transmission lines proposed within the resources identified be located underground or

underwater. The reason for this is that the resources described in Category C are mostly found under the water and would not be as sensitive to the location of above ground electric transmission lines. In order to avoid aesthetic impacts and reduce impacts to avian life, Category B requires that electric transmission lines be located under the Bay, public access areas, the Suisun Marsh Secondary Management Area and the salt ponds.

Table 1: Power Plant Non-Siting Designations

Designation	Resources
Full Designation: No power plants or ancillary facilities may be located within areas that are fully designated by the Power Plant Non-Siting Regulation and depicted on the Power Plant Non-Siting Maps,* except for ancillary facilities that the Commission determines would have no substantial adverse environmental effects and would not conflict with priority use areas identified in the *San Francisco Bay Plan.*	• Existing and proposed public parks[1] • Existing and proposed public and private wildlife refuges • Wildlife priority use areas • Existing and proposed Bay habitat restoration areas • Waterfront park or beach priority use areas, including marinas, fishing piers and boat launching ramps • Suisun Marsh Primary Management Area • Tidal marshes, tidal flats and managed wetlands • Riparian vegetation • Habitat of species that are listed by a fish and wildlife management agency as threatened or endangered • Marine mammal haul-out areas and pupping sites
Partial Designation, Category A: A power plant and any ancillary facility may be located within a Category A area as designated by the Power Plant Regulation and depicted on the Power Plant Non-Siting Maps, when the project would not preclude or adversely affect the existing or future use of the priority use area for its primary purpose.*	• Water-related industry priority use area • Airport priority use area • Port priority use area
Partial Designation, Category B: No power plants may be located within a Category B area as designated by the Power Plant Non-Siting Regulation and depicted on the Power Plant Non-Siting Maps. The following ancillary facilities may be located in the partially designated area Category B: Underground or underwater electric transmission lines, intake or discharge lines and structures for cooling systems, underground or underwater fuel pipelines and underground or underwater steam pipelines.*	• The Commission's Bay and certain waterway jurisdiction other than areas otherwise identified (e.g., tidal marshes, Suisun Marsh Primary Management Area) • Existing and proposed public access areas, including the San Francisco Bay Trail • Suisun Marsh Secondary Management Area (except for the water-related industry site.) • Salt ponds

[1] For the purposes of this guide, proposed is defined as funded. Prior to designating proposed wildlife areas, public access areas and parklands, these areas must be fully funded.

Table 1: Power Plant Non-Siting Designations (Continued)

Designation	Resources
Partial Designation, Category C: No power plants may be located within areas that are partially designated by the Power Plant Non-Siting Regulation and depicted on the Power Plant Non-Siting Maps. The following ancillary facilities may be located in the partially designated areas identified as Category C: Overhead electric transmission lines, intake or discharge lines for cooling systems that pass completely through the area, underground or underwater fuel pipelines and underground or underwater steam pipelines.*	• Subtidal areas • Migratory fish routes • Spawning areas • Nursery sites for juvenile fish and other aquatic organisms

*and otherwise consistent with the Commission's other laws and policies.

Siting of a power plant along the Bay Shoreline in areas not identified on Power Plant Maps. In areas not designated by the power plant regulation or depicted on the power plant maps, a power plant proposal may be considered by BCDC and the CEC. In such cases, BCDC reviews the proposal and recommends approval or denial of the project to the CEC. The CEC is the only permitting authority for power plant projects, therefore BCDC does not have the authority to permit or deny a power plant. However, the CEC relies upon state and local agencies to review proposals and identify where the proposals are consistent with the laws, ordinances, regulations and standards (LORS) that apply to the proposed project site.[31] In reviewing a power plant project, BCDC could find that the project is entirely consistent with the relevant LORS and recommend approval of the project to the CEC or determine that the project proposal is inconsistent and recommend that the CEC deny the project or only approve of the proposal with alterations that would make the project consistent, such as additional public access or an alternative cooling system.

Although the CEC is the sole permitting authority for power plant projects, it is required by the Warren Alquist Act to meet the requirements of state and local LORS. The Public Resources Code states that CEC determinations on power plant proposals should include specific provisions to meet the requirements of BCDC law as identified in BCDC's review and comments to the CEC on such proposals unless the CEC finds that BCDC's recommendations would either result in greater adverse environmental impacts or are not feasible.[32]

BCDC's role in proposals outside of the non-siting area but within the Commission's jurisdiction requires reviewing the proposal to ensure consistency with existing laws and policies and working closely with the CEC, particularly on feasibility issues relating to technology. Upon receiving an application for a project proposal within BCDC's jurisdiction the CEC is required to transmit a copy of the application to BCDC. Under the CEC's timeline, the Commission has 180 days from the receipt of the application to review and compile a report. The purpose of this report is to analyze the proposal's consistency with BCDC's policies and regulations. All other state and local agencies receive the same 180 days, at the end of which CEC staff compile and review the recommendations contained in these reports.[33] Since the information necessary to review a project may be different for each agency, it is incumbent upon each reviewing agency to work with the CEC and the applicants to ensure that the appropriate studies are undertaken to allow for an accurate and timely review of the project. All agencies must submit their responses to the CEC within the prescribed time period, usually at the same time. One unfortunate outcome of this overall deadline is that agencies are unable to review studies and analysis completed by the other agencies that are also reviewing the proposal. This information is often critical to determining potential impacts and consistency, but due to the deadlines established, is not completed in time for inter-agency review. However, the applicant can agree to extend the review period to allow more time for inter-agency coordination, the completion of additional studies and the review of additional information.

Other issues may also delay the review of a project, such as the need for additional information that is not required in the CEC's submittal process, but which is necessary for BCDC to complete the review of a project. For example, before BCDC can find a project consistent with its laws and policies, it must review an alternatives analysis that demonstrates

[31] Public Resources Code, Section 25523 (d)(1)
[32] Public Resources Code, Section 25523 (c)
[33] Public Resources Code, Section 25519 (e)

that there is no alternative to once-through cooling, and therefore Bay fill. Additionally, BCDC requires that projects incorporate maximum feasible public access consistent with the project and if an applicant does not include access in the proposal, this could delay the review of the project beyond the 180-day review period.

For BCDC there are several key considerations in the review of power plant projects proposed outside of the designated non-siting areas. The Bay Plan includes a policy on power plants that states that these facilities "may be located in any area where they do not interfere with and are not incompatible with residential, recreational, or other public uses of the Bay and shoreline, provided that any pollution problems resulting from the discharge of large amounts of heated brine into Bay waters, and water vapor into the atmosphere can be precluded." However, the most important consideration is whether or not the project requires a location in the area of the Commission's jurisdiction. Only those power plant proposals which require large amounts of Bay water for cooling may be considered a water-oriented use under the McAteer-Petris Act and for which the Commission may permit fill in the Bay or certain waterways for water intake or discharge lines. In addition to determining that the project requires large amounts of Bay water for cooling, the Commission must also find that there is no upland alternative to the extension of lines in the Bay to obtain and/or discharge the large amounts of Bay water needed to cool the power plant. Since there are many options for cooling power plants, an alternatives analysis must find that there are no feasible alternatives to using large amounts of Bay water for this purpose. Each project must analyze all other feasible alternatives to a once-through cooling system using Bay water, such as dry cooling, hybrid wet/dry cooling or wet cooling using different source of water for cooling purposes. In most cases, an alternative to the use of large amounts of Bay water for cooling purposes should be available in the form of either dry cooling or closed-loop wet cooling systems using reclaimed or treated waste water. The availability of such an alternative eliminates the need to either fill the Bay and certain waterways or to locate the facility in the area of the Commission's jurisdiction.

The impacts to the Bay and other aquatic habitats from once-through cooling systems can be substantial. These impacts are described in detail in Chapter 6 of this report. A general description of these impacts include entrainment and impingement of aquatic organisms, the loss of aquatic habitat in those areas where the intake and discharge structures and supports would be placed, thermal discharge and the potential for both the physical and visual disruption of public access to the Bay.[34]

As described above, feasible alternatives to fill for Bay water intake and discharge lines translate to alternatives to once-through cooling methods. Once-through cooling technology was once the most common technology used to cool power plants. Prior to the development and maturity of other technologies such as closed-loop wet cooling, dry cooling and hybrid cooling systems, as well as other water reducing technologies such as combined-cycle plants, power plants required large amounts of cooling water in order to produce power. Since the amount of water needed for cooling purposes was large, usually the only source that could provide such a large amount of water was surface bodies of water such as oceans, bays, rivers and deltas. Currently, once-through cooling systems have several advantages to power providers over other technologies, including lower capital and maintenance costs and that these systems are more efficient, allowing for the production of more power, than the alternative systems. Despite these advantages, once-through cooling systems are currently rarely proposed by project proponents. In California, no new power plant proposals have included once-through cooling technology. The only projects that have included this technology are expansions or re-powerings of existing plants where this technology was already in use.

[34] Government Code, Section 66605

However, alternative cooling technologies, which are further described in Chapter 3 of this report, have different space and water supply requirements which may make them difficult to implement in certain cases. Wet and hybrid cooling systems require an alternative source of water supply, such as recycled water or treated municipal wastewater or treated wastewater from a treatment plant. Dry cooling requires land area to place the air cooling condensers. Additionally, the capital costs for these technologies are currently higher than those costs for once-through cooling. In areas where power supply is inadequate, transmission capacity is constrained, an alternative water supply unavailable and land area constrained, once-through cooling may be the only cooling technology available. However, in most cases one of the other technologies, wet, hybrid, or dry, could be defined as a feasible alternative to the once-through cooling that requires fill in the Bay or certain waterways. In such cases, BCDC is required by the McAteer-Petris Act to recommend against the project and recommend the use of an alternative cooling technology that does not require fill in the Bay.

If it is determined that there is no feasible alternative to the once-through cooling system and that the project requires Bay fill and BCDC has not provided an adequate number of sites to accommodate the project, then the Commission must refer to the power plant regulation and a joint resolution developed in 1982 that outlines the siting priorities adopted by the CEC, the California Coastal Commission and BCDC. This joint resolution established priorities for identifying appropriate sites for power plants in the event that the California Coastal Commission or BCDC did not make enough sites available for the siting of power plants in their designation processes. The priorities set in this joint resolution are as follows:

1. Expand facilities within existing power plant sites.
2. Develop new sites adjacent to existing sites.
3. Develop new sites in undeveloped areas.
4. Develop new sites in partially designated areas.
5. Develop new sites in designated areas only after a determination that the coastal or Bay site has greater relative merit than available inland sites, that the proposed development is developed to be consistent with the primary use of the land, that there will be no substantial adverse environmental effects and that approval of any public agency having ownership or control of the land is obtained and that opportunities consistent with 1, 2, 3 and or 4 are not feasible.[35]

Other important considerations for the Commission when reviewing power plant proposals include public access, mitigation, and community impacts such as air pollution and noise. A full discussion of the potential impacts that power plants have on these resources and the consideration BCDC gives to these resources when reviewing a project, is located in Chapters 6 and 7 of this report.

In addition to the roles described above, BCDC is also the coastal management agency as defined for the consistency determination process for reviewing federal projects in the coastal zone. Under the Coastal Zone Management Act, federal agencies are generally required to carry out their activities and programs in a manner consistent with approved coastal management plans. BCDC's approved coastal management program is based on the provisions and policies of the McAteer-Petris Act, the Suisun Marsh Preservation Act of 1977, the San Francisco Bay

[35] Public Resources Code, Section 30108.

Plan, the Suisun Marsh Protection Plan and the Commission's administrative regulations. The Commission reviews consistency determinations made for federal projects by determining the project's consistency with these regulations and policies and either concurring or objecting to the consistency determination. There are four different types of consistency processes, which are described below:

1. A federal activity that directly affects land of water uses within the coastal zone must be consistent to the maximum extent practicable with the coastal management program.
2. A federal development project located within the coastal zone must be consistent to the maximum extent practicable with the coastal management program.
3. A project that affects land or water uses located within the coastal zone and that requires a federal permit, license, or other authorization must comply with and be conducted in a manner that is fully consistent with the coastal management program.
4. A state or local project that affects land or water uses within the coastal zone and that is supported by federal financial assistance must comply with and be conducted in a manner that is fully consistent with the coastal management program.

If the Commission objects to a project that is reviewed for consistency to the maximum extent practicable, as described in either 1 or 2 above, the federal agency can still proceed with the activity if it determines that the proposed project is consistent to the maximum extent practicable with the coastal management program. However, if the Commission objects to a project that must comply with and be conducted in a manner that is fully consistent with the coastal management program, as described in either 3 or 4 above, then the activity can not proceed.

Consistency determinations may be required for power plant projects that receive federal financial assistance or will require a federal permit or other federal authorization. In such cases the Commission must review each proposal to determine consistency with the relevant regulations and policies in the McAteer-Petris Act, the Suisun Marsh Preservation Act of 1977, the Bay Plan, the Marsh Plan and the Commission's administrative regulations.

CHAPTER 3

THE POWER GENERATION AND DISTRIBUTION SYSTEM

California has one of the most diverse mixes of power generation in the country. Due to a variety of factors, including strict environmental regulations, a strong research and development community and a desire by the state for increased efficiency and reduced environmental impacts, California's power facilities are made up of a mix of traditional thermal and hydroelectric power plants and a range of alternative supplies. These generating sources include coal, oil/gas, nuclear, hydroelectric, wind, solar, geothermal, waste-to- energy, co-generation facilities, combined-cycle and distributed energy. Although the non-siting designation only applies to thermal power plants that generate 50 or more megawatts, it is important to understand how all of the generating facilities fit together to supply power to California and to be aware of all of the alternatives to thermal power plants. The following is a brief description of these generating sources, the primary ancillary facilities that are associated with power plants and the state's transmission grid.

Natural Gas, Coal or Fuel Oil-Fired Thermal Power Plant. These facilities make up the majority of the generating power in the United States, with coal and fuel oil being more common in the east, while natural gas predominates in the west. There are only 15 coal-fired power plants in California, contributing approximately 560 MW of power to the state. In contrast, there are 63 oil/gas plants that generate approximately 22,365 MW for California. The Bay Area has five coal-fired power plants, over 20 natural gas powered plants and two fuel oil-fired facilities. The environmental impacts of thermal power plants vary significantly depending on the fuel source used to develop the power. Briefly, power plants that burn coal or petroleum to generate electricity release more emissions into the air and result in more combustion wastes than natural gas fired plants. Chapter 6 of this report contains a more detailed discussion of the environmental impacts of thermal power plants.

Steam Turbine Generators. Thermal power plants that generate electricity from steam are comprised of four parts: (1) a heating subsystem (fuel to produce the steam), a steam subsystem (boiler and steam delivery system), a steam turbine, and a condenser (for condensation of used steam). The combustion of coal, natural gas or oil is usually used to provide heat for the system. The fuel is pumped into the boiler's furnace and then the boilers generate steam. High temperature, high pressure steam is generated in the boiler and then enters the steam turbine. At the other end of the steam turbine is a condenser that is maintained at low pressure and low temperature. The turbine blades are driven by steam rushing from the high pressure boiler to the low pressure condenser and these turbine blades power the electric generator. In this system a constant flow of low temperature cooling water in the condenser tubes is required to keep the condenser shell at the appropriate pressure and to ensure efficient electricity generation. Steam turbine systems using once-through cooling require approximately 40,000 gallons per megawatt hour in order to produce power efficiently. Steam turbine generation releases approximately 65 percent of the energy it produces as waste, with 10 percent released in the air and 55 percent in the water. The remaining 35 percent is turned into electricity and is sent to the transmission grid.[36]

Gas Turbine Generation. A gas turbine system is similar to the steam turbine described above. The significant difference is that a gas turbine system uses combustion gases rather than steam to turn the turbine blades. Within a gas turbine system, the turbine drives both an electric generator and a rotating compressor to pressurize the air. This pressurized air is mixed with

[36] Environmental Protection Agency Office of Compliance. September 1997. Sector Notebook Project. Profile of the Fossil Fuel Electric Power Generation Industry.

either gas or liquid fuel in a combustion chamber. Unlike steam turbine systems, gas turbine systems do not have boilers, a steam supply, condensers or a waste heat disposal system. Therefore, the capital costs for gas turbine systems are much less than for steam systems. However, the technology is less efficient than steam turbines, producing electricity at only about 20 to 30 percent efficiency.[37] Gas turbine systems do not require cooling water for any process. Gas turbine systems are used primarily as peaker plants, producing electricity only to meet peak demands.[38]

Combined-cycle Generation. Combined-cycle generation uses both gas and steam turbine generators to produce power. In a combined-cycle gas turbine the hot exhaust gases of a gas turbine are used to provide all, or a portion of, the heat source for the boiler, which produces steam for the steam turbine generator. This combination increases thermal efficiency over coal or oil fueled steam boiler plants. Combined-cycle plants have an efficiency of approximately 53 to 54 percent (meaning that 53 to 54 percent of the energy produced goes to the production of electricity, while the remaining 46 to 47 percent goes to waste), greater than the approximately 33 percent efficiency achieved by steam boiler plants. Therefore, combined-cycle plants reduce fuel consumption by 25 percent over that required by steam boiler plants and require 50 percent less cooling water per megawatt than steam boiler plants.[39]

Co-generation. Co-generation facilities are defined as any technology which simultaneously produces heat energy and electrical or mechanical power from the same fuel in the same facility. A common application pairs gas turbines with heat recovery system generators. Because low grade heat is being recovered and used in industrial applications, overall thermal efficiencies increase to 72 percent, resulting in a waste stream of only 28 percent. In most cases, co-generation facilities also use waste water from industrial users and require no additional water supply for cooling purposes. There are approximately 277 co-generation facilities in the state, which produce approximately 6,642 MW of electricity. The Bay Area has approximately 38 co-generation facilities. The average size of co-generation facilities is only 24 MW.

The Fuels: Coal, Petroleum and Gas. Coal, petroleum and gas are the primary fuels used to generate electricity at thermal power plants. Currently, coal is used as the fuel source to produce more than half of the electricity generated in the United States. However, the amount of electricity that is produced by burning coal has been steadily decreasing since the 1970's. As a fuel source, coal requires the most extensive handling, storage and processing. In order to handle, store and process the coal, coal fueled facilities require more extensive facilities. Coal fired thermal power plants also require more control devices in order to reduce the associated emissions, which include soot, dust and ash.

Petroleum is the least common fuel source for power plants, used in less than five percent of all power generation in the United States. Facilities that use petroleum require many of the same handling, storage and processing areas that are needed for coal.

Natural gas is used in areas where there is a readily available supply of the resource or in states that have strict environmental regulations pertaining to air emissions. Natural gas is more commonly used in the west and is the primary fuel source in California. It is considered a cleaner source of fuel than either coal or petroleum, requires less handling and results in fewer emissions.

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[37] Environmental Protection Agency Office of Compliance. September 1997. Sector Notebook Project. Profile of the Fossil Fuel Electric Power Generation Industry.

[38] Environmental Protection Agency Office of Compliance. September 1997. Sector Notebook Project. Profile of the Fossil Fuel Electric Power Generation Industry.

[39] Power Plant ...

Nuclear. Rather than producing heat by burning coal, petroleum or natural gas like fossil fuel burning power plants, nuclear power plants produce the necessary heat by the fission of uranium in a reactor. As in fossil fuel powered plants, this heat is also used to convert water to steam, which drives a steam turbine generator to produce electricity. In spite of this similarity, the components that make up nuclear power plants are different from fossil fueled power plants. Rather than boilers and condensers, nuclear plants have reactors and control rods. The heat is produced in the reactor by neutrons striking Uranium atoms to cause these atoms to fission. The control rods are located within the reactor and are used to speed up or slow down the fission process. When the fission process speeds up, more heat is produced, while slowing down the process reduces the heat. In many nuclear reactors water is used to remove some of the heat that is created by the fission process, slowing down the neutrons. In these plants, water is required for the fission process to occur.

There are only two nuclear plants that remain in operation in California, producing approximately 4,310 MW. The two power plants that remain in operation are the San Onofre nuclear facility located in San Diego County and the Diablo Canyon facility in San Luis Obispo. Both plants are located along the coast of the Pacific Ocean and use ocean water in a once-through system for cooling purposes. Although some consider nuclear power plants to be a cleaner source of electricity than fossil fuel powered facilities, there are still considerable environmental impacts created by nuclear facilities. Although nuclear facilities do not release traditional air pollutants, these facilities rely on fossil fuel powered plants to enrich the uranium that is required to power these facilities. In fact, some of the oldest coal power plants in the Midwest produce electricity primarily for the purpose of uranium enrichment.[40] Additionally, nuclear power plants require two-and-a-half times the amount of water for cooling purposes as fossil fueled thermal power plants. The nuclear power facility located in San Onofre consumes 500 metric tons of croaker and white fish annually. To put this number in perspective, 500 metric tons is roughly equivalent to the annual catch of seven million recreational fishermen.[41]

The most significant environmental impact that nuclear power plants have on the environmental and to human health is the radioactive waste that is produced by these plants and the threat of a major failure at the facility. Currently, the radioactive waste is impossible to dispose of, with few facilities available to receive such waste. In response to the danger posed by these wastes, California has placed a moratorium on the development of any additional nuclear facilities until appropriate disposal facilities are developed to receive the radioactive waste produced by nuclear power plants.[42] An additional concern is the significant damage that could occur if there was a major failure in the cooling system of a nuclear facility. Such a failure could result in a nuclear meltdown and result in a loss of both human life and the lives and habitats of scores of other species.

Geothermal. There are three different types of technologies that are used to convert geothermal fluids to steam. The technologies are dry steam, flash steam and binary cycle. The type of technology used depends on the natural temperature of the fluid and whether it is in a steam or water state. Dry steam power plants use geothermal fluids that are primarily in a steam state. This steam is used to produce electricity by running it through a turbine, similar to fossil fuel and nuclear plants. This is the technology used at The Geysers in Sonoma County, which is the world's largest single source of geothermal power. Flash steam power plants use geothermal fluids above that are above 400 degrees Fahrenheit. This fluid is sprayed into a tank held at a much lower pressure than the fluid, which causes the fluid to vaporize and convert to steam. The steam that is produced drives a turbine which produces electricity. However, in most cases geothermal areas contain water that is below 400 degrees Fahrenheit, making flash steam generation impossible. In these cases, the geothermal fluid is added to a secondary fluid

[40] Pace University Law School Energy Project. February 2002. Power Scorecard.
[41] Pace University Law School Energy Project. February 2002. Power Scorecard.
[42] Public Resources Code, Section 25524.1

that has a much lower boiling point that water and passed through a heat exchanger. The heat from the geothermal fluid converts the second fluid to steam, which then drives the turbines. This method, known as the binary-cycle method, allows the conversion of moderate temperature geothermal fluids which is the most common type of geothermal fluid. For this reason, binary cycle power plants will be the most common type of geothermal power plants built in the future. California has approximately 47 geothermal facilities, which produce 2,626 MW of power for the state. There are approximately 12 geothermal facilities in the Bay Area, including The Geysers in Sonoma County.

Geothermal power plants enjoy several significant advantages over fossil fuel power plants. These advantages include reliability, reduced emissions and domestic availability. Currently, geothermal energy provides approximately 2,700 MW of electric power in California, comparable to 60 million barrels of oil. Since no fossil fuels are burned to produce the electricity, geothermal displaces approximately 22 million tons of carbon dioxide per year, the equivalent of the emissions that would be produced by fossil fueled power plants producing 2,700 MW of power. Another benefit of geothermal power is that these plants are capable of running almost constantly. Unlike fossil fuel burning power plants, which are only available approximately 70 percent of the year, geothermal plants are able to run 95 percent of the year. Additionally, geothermal resources are available as an abundant domestic resource and do not require the handling and holding facilities of coal and petroleum. Since geothermal plants tap into the heat generated by the earth's core, which is an almost unlimited resource, geothermal power is a renewable resource.

The only possible impacts of geothermal are impacts to the land surrounding the facilities and the potential impact to surface waters and ground water supplies. However, since geothermal facilities do not require much land area, the land impacts can be relatively minor. The impacts to surface waters and ground water supplies can be minimized significantly by the common practice of collecting and re-injecting geothermal fluids. Geothermal plants can also result in air emission, but these emissions are generally below those levels emitted by fossil fuel powered plants.[43]

Hydropower. Hydropower plants convert the kinetic energy of falling water to mechanical energy by passing it through a turbine and then to a generator to produce electricity. These facilities are placed on rivers and run either by using the natural flow of the river or, more commonly, by storing the water behind dams and releasing the water to create energy. The large majority of hydroelectric power is produced by using dams and controlling the flow of water and the energy that is produced by releasing water from the dam. The necessary components for this type of hydroelectric power are a river, a manmade dam, pipelines, turbines, generators and transformers. The dam stores the water in a reservoir and controls the flow of the water. The pipelines carry the water from the reservoir to the turbine, which is turned by the flow of the water through the pipelines. The generator transforms the mechanical power produced by the turbine into electrical energy which is then directed to the transformer. The transformer converts the electricity produced into a usable voltage that can be conducted on the transmission lines connecting the facility to the grid. California has approximately 386 hydropower facilities which produce 14,116 MW of electricity for the state. In the Bay Area there are approximately five hydroelectric facilities in the Bay Area, which produce less than 15 megawatts of power. Additionally, California receives electricity that is produced by out of state hydropower facilities in the Pacific Northwest.

Hydropower is considered a renewable source of electricity, since it uses water flow that is replenished every year by the snow pack. Electricity produced by hydropower facilities does not produce any air emissions. However, hydropower has other disadvantages which include

[43] Pace University Law School Energy Project. February 2002. Power Scorecard.

the high capital costs of developing a facility, the significant environmental impacts that the facilities have on the area surrounding the dam and on the river that produces the power. The environmental impacts of hydropower include an increase in fish mortality, reduced upstream fish migration, degradation of water quality, flooding of upland ecosystems where the dam and the reservoir are located and altered flow regimes which both increase the flow (causing scouring) and decrease the flow (reducing or eliminating the in stream benefits of the water) at various times of year. The altered flow regime, the flooding and the blocked upstream mobility impact both terrestrial and aquatic species both upstream and downstream of the dam.

Another disadvantage of hydroelectric power is its complete dependency upon the amount of snow that an area receives during the winter months. This dependence on weather patterns makes hydropower an unreliable steady source of electricity from year to year. For example, a reduced snow pack that did not produce the normal amount of in stream river flows in the Pacific Northwest is one of the factors that reduced the electricity available for export to California in 2000.[44]

Solar power. Solar power plants convert the sun's energy into heat by using mirrors. This heat is then sent through a conventional generator, which turns it to electricity. Solar power plants have traditionally been small, producing only up to around 100 MW for grid-connected systems. However, it is possible for concentrated solar power to produce more electricity. The Department of Energy (DOE) for the federal government considers concentrated solar power systems an attractive and viable energy option in the southwest and other sunbelt regions throughout the world. In order to demonstrate the potential for solar power, the DOE states that enough electricity for the entire country could be generated by concentrating solar systems over nine percent of Nevada.[45] However, solar power is currently only supplying approximately 413 MW of electricity in California. These megawatts are produced by 14 facilities. There are no solar powered facilities in the Bay Area that supply power to the state's electricity grid.

Solar power systems are a renewable source of electricity and a perfect solution for summer peak periods, when the heat generating the demand for air conditioning can also be used to meet that demand. In fact, almost 100 percent of Southern California Edison's peak demand is met with power generated by solar facilities.[46]

Since these systems are fueled by solar energy rather than the burning of fossil fuels, they are a significantly cleaner source of electricity. Solar power plants do not emit greenhouse gases and use a renewable source of energy. However, these plants currently require large areas of land can only be located in sunbelt regions and are only as reliable as the sun, being capable of storing energy only for short periods of time, if at all. Additionally, solar powered thermal systems require can water in similar amounts as traditional thermal power plants.

Wind. Electricity is also produced by using wind turbines to capture the energy of the wind and to convert this energy into electricity. In order to generate enough bulk electricity to place on the grid, wind turbines are often grouped together in areas known as wind farms. The turbines, which are shaped like airplane propellers, are turned by the wind. This movement powers a generator and converts the mechanical energy produced by the turbine into electricity.

California has approximately 105 wind facilities which produce roughly 1,818 MW of power for the state. There are approximately 18 wind facilities located in the Bay Area. Wind plants produce no air pollution and rely on a renewable source of energy. The several wind farms that

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[44] California Public Utilities Commission. November 2000. Analysis of the Federal Regulatory Commission Order and Staff Report.
[45] United States Department of Energy. Concentrating Solar Power Overview.
[46] United States Department of Energy. Concentrating Solar Power Overview.

are located in the state significantly reduce the amount of carbon dioxide and other pollutants that would have been produced by traditional thermal power plants. A study done in 1990 found that these wind farms offset the emission of 2.5 billion pounds of carbon dioxide and 15 million pounds of other pollutants.[47]

Depending on the location and the design of the facility, wind farms can have certain environmental impacts. The three potential impacts are visual, noise and avian mortality. Proper siting and design can reduce or eliminate most of these impacts.[48] The other disadvantage of wind facilities is that they are constrained to areas that have consistent and high wind power density. Areas must have consistent winds that average at least 13 miles per hour. However, in the appropriate location, wind farms are a clean source of electricity with few negative impacts.

Waste-to-Energy Technologies. California has approximately 103 waste-to-energy facilities which produce over 1,000 MW of electricity. The Bay Area has approximately 12 waste-to-energy facilities, primarily landfill gas facilities. Waste-to-energy facilities convert various forms of waste, such as solid waste, landfill gas, biomass and anaerobic digestion to electricity. Each technology has different environmental impacts and resource requirements. The following is a brief description of the current waste-to-energy processes.

Municipal Solid Waste Power Plants. Energy produced by municipal solid waste is known as a waste-to-energy technology. In municipal solid waste facilities the waste is converted to electricity by combusting unprocessed or minimally processed waste in a boiler. The heat from the combustion process turns water into steam, which is directed to a conventional steam-turbine generator. Like fossil fuel powered plants, water is needed to condense the steam, which is then routed back to the boiler.

California has approximately six municipal solid waste plants, which produce under 100 MW or power for the state's grid. The technology uses waste as a resource, thereby reducing the demand on fossil fuels and landfill space. However the burning of municipal solid waste produces air emission, including high amounts of carbon dioxide and nitrogen oxide emissions. In addition to air pollution, the process also results in bottom and fly ash which need to be controlled and disposed of. The facilities also require cooling water and can result in localized community and biological impacts to surrounding areas.[49]

Landfill gas. Another waste-to-energy technology is the use of landfill gas to produce electricity. Landfill gas is created by the natural degradation process that breaks down solid waste. This gas is collected by drilling wells into landfills and removing the gas through pipes. In order to make it suitable for the production of electricity the gas must first be dewatered and processed prior to use.

California has over 42 landfill gas recovery facilities that collect landfill gas for the purpose of producing electricity. The combined capacity of these facilities is over 250 MW. Since landfill gas facilities remove the methane that naturally develops below landfills, these facilities significantly reduce methane emissions. Methane is a highly potent gas, responsible for global climate change and significantly more damaging to global climate than carbon dioxide. Landfill gas operations are usually small and require less water than other types of power plants.[50]

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[47] United States Department of Energy. Wind Energy Program.

[48] Pace University Law School Energy Project. February 2002. Power Scorecard.

[49] Pace University Law School Energy Project. February 2002. Power Scorecard.

[50] Pace University Law School Energy Project. February 2002. Power Scorecard.

Anaerobic Digestion. Anaerobic digestion, also known as biogass, is another waste-to-energy process that uses waste to produce electricity. The process requires three steps to produce electricity. The first step is the decomposition of plant or animal matter. The decomposed matter is then converted to organic acids, which are then converted to methane gas.

This technology is used on several hog farms in California, where the manure is converted to biogass, which fuels engine generators. These systems are capable of producing 100 kilowatts each. The farms are able to use this power to meet their electricity demands and reduce the odor, air and water pollution that is associated with unprocessed waste.

Biomass. The last waste-to-energy technology currently in use is biomass. Biomass consists of organic residues from plants and animals, such as lumber waste and agricultural waste. These materials are processed and combusted to produce gases which are then used in the same way as natural gas in traditional fossil fueled power plants.

California has over 66 combustion biomass facilities which produce over 800 MW or electricity. This process reduces the amount of waste that goes to the landfill, reduces methane that develops at landfills and reduces demand on fossil fuels. However, biomass facilities can produce high emissions of nitrogen oxide, carbon monoxide and carbon dioxide.[51]

Distributed Energy. Distributed energy consists of small, modular generating systems that range in capacity from those that can produce a few kilowatts to those that can produce up to 50 MW. These systems include diesel engines, fuel cells, solar thermal and small wind turbines. Distributed energy is used primarily for on-site back up systems and to supplement power from the grid. However, it is possible to connect distributed energy to the grid system. Whether or not the systems are connected to the grid, distributed energy can reduce demand on the power grid, particularly during peak periods and can increase reliability for those that have on-site systems.

Ancillary Facilities. In order to produce and transmit electricity, the power plants described above require ancillary facilities such as transmission lines, fuel and steam pipelines and cooling systems. The type of generating facility determines the type of ancillary facilities that will be required in order to generate and transmit the power. For example, hydropower and wind power do not require cooling systems or fuel pipelines. On the other hand, all generating facilities must be connected to the grid by transmission lines. Fossil fueled thermal power plants require transmission lines, fuel pipelines and cooling systems. The capacity or availability of these ancillary facilities, such as the capacity of the transmission lines or the availability of an ample water supply or the location of fuel pipelines, is a significant determining factor in the ability to locate a power plant. A power plant cannot locate in an area without sufficient transmission capacity or a nearby connection to the state's electricity grid.

The Electricity Grid. The electricity grid delivers all power produced from generators to users. The grid consists of two distinct systems- the high voltage system and the lower voltage system. The high voltage system delivers the electricity from the power plants and transmits it over both long and short distances. The lower voltage system draws electricity from the transmission lines to the individual user. The voltage is reduced from the transmission to the distribution lines at electrical substations.

The continental United States is divided into three main power grids. The power grid that serves California is the Western Interconnected System and includes Washington, Oregon, Nevada, Arizona, New Mexico, Colorado, Montana, Idaho, Wyoming and Utah. The Western Interconnected System is also linked to portions of Mexico and Canada. Electricity is sent across state lines within each of the three systems, allowing states to purchase electricity from out-of-

[51] Pace University Law School Energy Project. February 2002. Power Scorecard.

state generators. The ability to purchase and transmit power from one state to another increases the reliability of each states supply by diversifying the available sources of power. For example, California can purchase power that is produced by hydropower facilities in the Pacific Northwest when there is a shortage of natural gas. Conversely, Washington is able to supplement its power by purchasing power from California when a low snow pack reduces the power available from hydropower facilities.

The high voltage transmission system is the central trunk of the grid. Thousands of distribution systems branch off of this central trunk. Each generating source, whether a fossil fueled power plant, a photovoltaic system, a nuclear facility or a wind farm transmits electricity by sending it to the transmission system. In order to increase the reliability of the grid, the system is designed to be redundant. This redundancy allows the system to avoid failures due to congestion or system malfunctions. However, despite this redundancy, the transmission capacity is finite and regional shortages can result from congestion due to constraints on system capacity. Since the amount of electricity that can be transmitted to a region is constrained, generating capacity in certain regions must be adequate to meet demand. An area where the transmission capacity is inadequate to meet demand is San Francisco, where constraints on the capacity of the transmission system require that the city generate more of its own power to meet demand from the city's residents.[52] Increasing the capacity of the transmission lines into San Francisco is an alternative to generating more power, but increasing transmission capacity is considered to be more expensive and difficult than building more capacity.

The transmission system is managed by control area operators, who constantly adjust the power transmitted by the system to ensure that demand is met by supply in real time. Since electricity is very difficult and expensive to store, demand and supply must be constantly balanced to eliminate any mismatches between the two that could cause system failures. The result is that the electricity produced by a generator at any given time must be put on the transmission line at the time that it is generated and cannot be stored for transmission at a later date. California has approximately six control area operators who work with other operators throughout the western region to balance supply and demand.

The control area operators divide generators into three categories for the purposes of balancing the system. The baseload power plants must run all of the time to meet minimum power demands. These plants sign a reliability-must-run contract with the operators to ensure consistency. Nuclear power plants are almost always baseload plants because they are the most stable plants when run at full power. Intermediate power plants are used to meet intermediate loads and are commonly natural gas plants, although wind turbines are also used to meet intermediate power demands. Peaking power plants are only put into use during peak demand times such as summer afternoons. Peaking power plants are generally less efficient, more polluting and more expensive to run. Coal and petroleum fired thermal power plants are commonly used as peaker plants.

Effectively managing transmission capacity is vital to providing electricity to consumers. Shortages or blackouts affecting regions or the entire state are often caused by imbalances in the system, rather than a shortage in overall supply. Imbalances occur when the amount of electricity generated fails to meet demand or when the transmission lines are congested and power is unable to travel from generating source to the areas where there is demand.

In California prior to deregulation the utility distribution companies (UDC) such as PG&E, Edison and SDG&E owned, and in conjunction with the control area operators, operated the transmission system. After deregulation, the UDC's still own the transmission system but the operation of the system is handled by the California Independent System Operator (CalISO). The CalISO now manages the transmission system in conjunction with the control area

[52] California Energy Commission. 2002-2012 Electricity Outlook Report.

operators and is responsible for ensuring that current supply is able to meet current demand and that the transmission lines have sufficient capacity to move the power that has been scheduled by the generators. The location and capacity of the transmission system is an important factor when determining the appropriate location for a new power plant, since any new generating source must be connected to the grid and capacity must be available on the system at this location to be transmitted to demand areas without creating congestion.

Cooling Technology

1. **Once-through cooling and cooling towers.** Once-through cooling systems are used in the generation of approximately 40 percent of the electricity in California, although this percentage is decreasing due to new plants being constructed that use other cooling technologies. (See Figures 6 and 7: Cooling Water Sources for the Largest Existing Power Plants and Cooling Water Sources for 13 Recently Approved Power Plant Projects). Once-through cooling systems take water from a surface body of water, such as the ocean, bay or delta. This water is used to generate steam, and then passes through a condenser to remove some of the heat before the still-warm water is discharged back into the surface body of water. Once-through cooling systems require large amounts of water, from 15,000 gallons per megawatt hour for combined-cycle plants to 40,000 gallons per megawatt hour for steam boiler plants. The water that is discharged back into the body of water is heated to temperatures that exceed the natural temperature of the water prior to use by the power plant.[53]

   The most significant advantage to once-through cooling systems is that they have lower capital costs. Once-through cooling systems also offer a higher operating performance than other technologies, allowing plants to operate more efficiently and produce more power for distribution on the grid.[54] Despite these advantages, once-through cooling systems can have significant impacts on aquatic resources, entraining and impinging juvenile and adult fish and other aquatic organisms. In addition to the impingement and entrainment of aquatic organisms, these systems also result in disturbance to habitat areas by the intake and discharge pipelines and the structural support for these pipes, thermal discharges that are released once the water goes through the system, dredging and fill of waterbodies to accommodate the system.

   The use of cooling towers in a once-through system can eliminate the impacts associated with thermal discharge, but not the entrainment and impingement that occur during intake or the dredging and filling required to site the system. In once-through systems, cooling towers are used to remove heat from the water after it passes through the condenser. Rather than discharging heated water directly back into the source body of water, the water is directed to cooling towers where the heat is removed before the water is discharged back into the body of water. There are two types of cooling towers-mechanical draft and natural draft. The mechanical draft towers use large fans to cool the water as it is sprayed downward into holding tanks. Natural draft towers do not use fans, instead using very tall towers to create differential pressure between the cold air outside and the hot air inside.

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[53] Lee, Susan V. and James C. Henneforth. December 21, 2001. Potrero Power Plant Cooling Options Draft.
[54] California Energy Commission. February 2002. Comparison of Alternate Cooling Technologies for California Power Plants. Economic, Environmental and Other Tradeoffs.

One result of using cooling towers is that they can reduce plant efficiency by increasing the power demand of the facility. The fans and pumps associated with cooling towers use electricity, reducing the amount of electricity produced by the plant that may be placed on the grid. Cooling towers are more effective in cooler climates, where natural draft towers may be used more effectively reducing the power demand of the cooling system.

Figure 6
Cooling Water Sources for Largest Power Plants (percentage of plants)

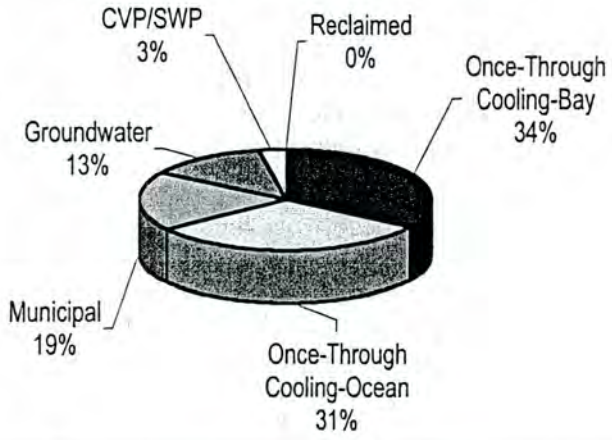
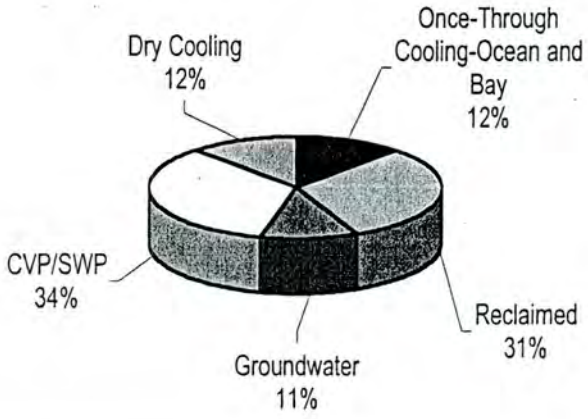


Figure 7
Cooling Water Sources for 13 Recently Approved Plants (percentage of capacity)



2. **Wet cooling.** Cooling towers are used in closed-cycle re-circulating cooling water system where the water, once cooled, is re-circulated through and re-used to cool the facility. This significantly reduces the amount of new water that must be used by the system and can reduce the water demand of a plant from 40,000 gallons per megawatt hour to just 250 gallons per megawatt hour.[55] Wet cooling systems reduce water usage by 95 percent over once-through systems. Heat is removed from the water through the use of cooling towers. The water, once cool, is available to be re-used and recycled back through to be used again for cooling purposes. Although called a closed loop system, water must be added to make up for water that is lost in the cooling towers through evaporation, blowdown or drift. Evaporation causes any impurities that are in the water to concentrate in the water that remains. The water that is used to augment the system must be of fairly high quality in order to dilute these concentrations of impurities.

   By recycling water, wet cooling systems use water much more efficiently than once-through systems. By significantly reducing the amount of water needed to cool the plant, wet cooling allows for the use of sources of water alternative to oceans, bays, deltas and estuaries, which eliminates impacts to aquatic resources. If alternative sources of water are available, such as treated wastewater from municipal wastewater treatment plants, this eliminates the need for a plant to be located along a body of water such as an ocean, bay, estuary or river. Locating a plant at an upland location eliminates the impacts to the ecological and cultural resources along the surface bodies of water, such as impacts resulting from entrainment and impingement, filling and barriers to visual and physical access. However, as described above, wet cooling can result in lower energy output than once-through cooling. In addition, wet cooling requires more water treatment to manage concentrations of impurities and capital and maintenance costs are higher than those for once-through cooling systems. But wet cooling is more efficient at removing the heat from the condensers than dry cooling systems and the capital costs are less than for those systems.[56]

3. **Dry cooling.** Dry cooling systems transfer heat to the atmosphere without the evaporative loss of water. There are two types of dry cooling systems for power plant applications: direct dry cooling and indirect dry cooling. Direct dry cooling systems utilize air to directly condense steam, while indirect dry cooling systems utilize a closed-cycle water cooling system to condense steam, and the heated water is then air cooled. The key feature of both dry cooling systems is that no evaporative cooling or release heat to surface water occurs. As a result, water consumption rates are very low compared with wet cooling or once-through systems. Dry cooling does not rely on evaporative cooling, as does a wet cooling tower. This results in a need for larger volumes of air to pass through the system and, therefore, a need for larger facilities than wet cooling towers.[57]

   Currently, there are six facilities that use dry cooling technology in the state, including the Sutter Plant in Yuba City and the Crockett co-generation facility located in Crockett. Dry cooling systems are commonly used in areas where water supplies are severely constrained, such as Nevada and South Africa. The technology reduces water use by 95 percent and does not discharge any process fluids.[58] The impacts associated with once-through cooling are all eliminated by dry cooling, including the elimination of intake

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[55] Lee, Susan V. and James C. Henneforth. December 21, 2001. Potrero Power Plant Cooling Options.

[56] California Energy Commission. February 2002. Comparison of Alternate Cooling Technologies for California Power Plants. Economic, Environmental and Other Tradeoffs.

[57] EPA. 316(b) Phase II TDD. Dry Cooling.

[58] Burns, J.M. and Wayne Micheletti. 2000. Comparison of Wet and Dry Cooling Systems for Combined-cycle Plants, Final Draft.

and discharge structures and supports, the impingement and entrainment of aquatic organisms, thermal discharge and water supply concerns. The technology is also the best option for reducing wastewater and achieving water conservation goals. Dry cooling eliminates entirely the need to locate a power plant along a major body of water, reducing the access and visual impacts associated with these facilities along oceans, bays and deltas. Plants using dry cooling technologies may be sited well inland of large bodies of water, thus avoiding the ecological and cultural impacts that result from locating these facilities in these usually sensitive locations.

The negative aspects of dry cooling include higher capital costs, reduced energy production efficiencies, larger land area disturbance and the potential for noise and visual impacts. The air cooled condensers that are part of the dry cooling technology are large and can impact the visual quality of an area. The operation of the large fans located within the condensers can create noise impacts if adjacent uses are close by and noise sensitive. The fans also require electricity, which reduces the amount of output for the grid that is produced by plants that use dry cooling technology, making these plants less efficient than those that use either once-through or wet cooling systems.[59]

4. **Hybrid cooling.** Hybrid cooling systems combine wet and dry technologies. Hybrid systems include water conservation designs and plume abatement designs. Cooling systems designed to reduce water usage use only two to five percent of the water that is used by wet cooling systems (less than 250 gallons per megawatt hour). Water is used during hot days to reduce the losses in efficiency that are experienced by dry cooling systems during hot weather. The more water that is available for use in the system, the higher the output efficiency of the power plant. The spray enhanced dry cooling system is one type of water conservation design. In spray enhanced systems the exhaust steam is cooled by water being sprayed into the system before the steam goes into an air cooled condenser. The spray enhanced system uses approximately 25 percent less water than that used by traditional wet cooling systems. The system also increases the output efficiency over that of traditional dry cooling technology.[60]

   The plume abatement system is a hybrid system that uses towers to reduce the exhaust plume that can be visible on cold, humid days. This system uses almost the same amount of water as a wet system, but adds a small amount of dry cooling to eliminate the exhaust plume. The power output efficiency is also similar to wet cooling systems. The primary purpose of plume abatement systems is to eliminate the plume that is emitted from cooling towers on cold days that have high humidity. These plumes can be seen from great distances and are considered a negative aesthetic impact that can result from the use of cooling towers.

   Hybrid systems significantly reduce the amount of water that is needed to run a power plant. The only additional water required by these systems is water needed to make up losses due to evaporation, blowdown and drift. Hybrid systems lose less water than wet systems, further reducing water demand. Additionally, power plants using hybrid systems are more efficient than dry systems alone. By providing options for meeting changes in climate, water availability and power demand, hybrid systems allow power plants that use them to increase output over the power plants that use dry cooling. As in wet and dry cooling, the reduction of water associated with using hybrid systems, allows for the use of water from sources other than surface bodies of water. Alternative

[59] California Energy Commission. February 2002. Comparison of Alternate Cooling Technologies for California Power Plants. Economic, Environmental and Other Tradeoffs.

[60] Burns, J.M. and Wayne Micheletti. 2000. Comparison of Wet and Dry Cooling Systems for Combined-cycle Plants, Final Draft.

sources of water include reclaimed water from industrial, agricultural or recreational uses and municipal water supplies. By using these alternative water sources plants can be located at less sensitive inland locations, eliminating the negative impacts associated with locating power plants along shorelines, such as fill, entrainment and impingement and the disruption of physical and visual access.

The drawbacks of hybrid systems are similar to the drawbacks of wet and dry cooling. Hybrid systems reduce the power output of the power plants that use them over the output of power plants that use once-through systems. There are higher capital and maintenance costs associated with hybrid systems than for once-through cooling systems. Hybrid cooling systems also require larger land areas, increasing the footprint of a power plant facility. In addition, there are potential visual impacts associated with the facilities and with the plumes when plume abatement technology is not used.

Demand for abundant source of water. Power plants no longer require shoreline locations, with the exception of power plants using once-through cooling systems. Wet, dry and hybrid technologies reduce the location constraints and allow for the use of alternative sources of water, such as reclaimed or municipal water. Only once-through cooling systems require such extraordinary amounts of water as to make alternative sources of water infeasible. With water requirements of up to 40,000 gallons per megawatt, it would be impossible to run plants that use once-through cooling systems using alternative sources of water. However, the significantly reduced water demands of wet (up to 250 gallons per megawatt hour), dry (less than 25 gallons per megawatt hour) and hybrid (less than 250 gallons per megawatt hour) allow plants to use municipal or reclaimed water supplies. (See Table 2: Comparison of Power Plant Cooling Systems)

In order to avoid the ecological and cultural impacts of locating power plants along the shorelines of surface bodies of water and to reduce demand on already constrained water supplies, more and more plants are being proposed with dry, wet or hybrid cooling systems. In fact, the only recent power plant proposals in California that include once-through cooling systems are existing plants that are being re-powered or expanded at a location where this technology is already in use, such as Moss Landing in Monterey County or the Potrero Power Plant in the City and County of San Francisco. No new power plant proposals include once-through cooling technology in their design.[61]

As described above, new technologies have increased efficiencies and reduced impacts. These new technologies allow for power plants to be sited inland, away from surface bodies of water. From dry and hybrid cooling systems to combustion turbines, new technologies have significantly reduced the amount of water that is required to run power plants and the amount of wastewater that is discharged from these plants. By reducing water demand, these technologies significantly reduce or eliminate the impacts to aquatic resources, water quality and water supply that were once a by product of producing electricity.

[61] California Energy Commission. July 2001. Environmental Report of California's Electric Generation Facilties.

Table 2: Comparison of Power Plant Cooling Systems

	Once-Through	Wet	Dry	Hybrid
Water Usage	15,000 to 40,000 gallons per megawatt	250 gallons per megawatt	25 gallons per megawatt	Less than 250 gallons per megawatt
Advantages	• Most efficient for power production • Lowest capital and maintenance costs • Little to no water lost in the system	• More efficient for power production than dry or hybrid • Significantly lower water demand allows for the use of alternative water sources (e.g., reclaimed) • Eliminates or reduces aquatic impacts	• Eliminates aquatic impacts • Significantly lower water demand allows for an alternative source of water to be used • Eliminates the need for a shoreline location • Can result in a significantly faster permitting process	• More efficient for power production than dry • Significantly lower water demand allows for an alternative source of water to be used • Eliminates the need for a shoreline location • Eliminates aquatic impacts • Can result in a significantly faster permit process
Disadvantages	• Aquatic impacts: entrainment, impingement, thermal discharge, dredging and fill • Significant water demand eliminates the option of an alternative source of water-shoreline location required • Longer permitting period to meet the requirements of the relevant regulations	• Requires a reliable source of water • Greater site disturbance required for cooling towers • Potential visual impacts from cooling towers • Water is lost through evaporation • Higher capital and maintenance costs than once-through cooling	• Least efficient for power production • More fuel required to produce power may increase air quality impacts • Greater site disturbance required for dry cooling system • Potential visual impacts from dry cooling equipment • Highest capital costs	• Greater site disturbance required for cooling system • Potential visual impacts • Higher capital costs than once-through and wet cooling systems

CHAPTER 4

POWER GENERATORS AND REGULATORS

The regulatory requirements for power plant projects can have a significant impact on the types of projects that are proposed, particularly air and water quality requirements, which impact the type of fuel that is used to power the plant (e.g., natural gas burns cleaner and can meet air quality standards more easily) and the type of cooling system that is incorporated (e.g., it can be difficult for once-through cooling systems to meet water quality requirements and-depending on the species in the vicinity of the plant-provisions of the Endangered Species Act). There are a myriad of agencies and organizations involved in regulation of electricity. Below is a list of the agencies and organizations involved in regulating electricity and a brief description of their respective roles.

Power Regulators and System Managers

Federal Energy Regulatory Commission ("FERC"). The FERC is an independent regulatory agency within the Department of Energy which regulates various aspects of electricity. FERC was established in 1977 and replaced the Federal Power Commission. FERC's primary responsibilities before deregulation included:

- Regulating the transmission and sale of natural gas for resale in interstate commerce;
- Regulating the transmission of oil by pipeline in interstate commerce;
- Regulating the transmission and wholesale sales of electricity in interstate commerce;
- Licensing and inspecting private, municipal, and state hydroelectric projects;
- Administering, accounting and financial reporting regulations and conduct of jurisdiction companies; and
- Approving site choices as well as abandonment of interstate pipeline facilities.

FERC's responsibilities after deregulation are essentially the same as before deregulation. However, with more and more states deregulating their power markets, FERC's involvement has increased with respect to regulating the transmission and wholesale sales between states. Additionally, oversight of CalISO was placed under FERC, increasing its involvement in the transmission and purchase of power in California.

California Public Utilities Commission ("CPUC"). The CPUC regulates publicly owned telecommunication, electric, natural gas, water, railroad, rail transit and passenger transportation companies. The CPUC is responsible for assuring that California utility customers have safe, reliable utility service at reasonable rates, protecting utility customers from fraud and promoting the health of California's economy. The CPUC sets electric rates, protects consumers, promotes energy efficiency, promotes electric system reliability and promotes electric utility financial integrity.

After deregulation the CPUC maintains essentially the same roles in the market. However, the commission's responsibilities in fulfilling these roles have increased in response to the changes resulting from deregulation. During the energy crisis, the CPUC raised rates to reflect the high prices the UDC's were paying wholesale generators for electricity and to encourage conservation to avoid blackouts. The CPUC is also involved in the investigation of the events of

the energy crisis in order to determine whether the prices that the wholesalers charged were reasonable and to ensure that the wholesalers did not engage in fraudulent activities. In addition, the CPUC's responsibilities regarding the transmission of power were decreased when CalISO was created and oversight of this new agency was given to FERC.

California Energy Commission ("CEC"). The CEC has the exclusive authority to certify the construction and operation of thermal electric power plant 50 MW or larger. The CEC certification is in lieu of any permit required by state, regional, or local agencies, and federal agencies to the extent permitted by federal law. The CEC must review AFC's to assess potential environmental impacts including potential impacts to public health and safety, potential measures to mitigate those impacts and compliance with applicable governmental laws or standards.

The CEC's siting regulations require staff to independently review the AFC and assess whether the list of environmental impacts contained is complete, and whether additional or more effective mitigation measures are necessary, feasible and available.

In addition, the CEC must assess the completeness and adequacy of the health and safety standards, and the reliability of power plant operations. The CEC is required to develop a compliance plan (coordinated with other agencies) to ensure that applicable laws, ordinances, regulations and standards ("LORS") are met. Although the CEC is the sole permitting agency for thermal power plants that produce 50 MW or greater of power, the agency is required to ensure that the project is consistent with the LORS of the other agencies that have jurisdiction over the site where the project is proposed. The CEC may approve a project that is determined to be inconsistent with another agencies LORS only if it finds that the alternative that is proposed by the agency would cause more harm to the environment or that the alternative is infeasible.

The CEC conducts its environmental analysis in accordance with the requirements of the California Environmental Quality Act ("CEQA"). An Environmental Impact Report ("EIR") is not required as the CEC's site certification program has been certified by the Resources Agency. the CEC acts in the role of the CEQA lead agency and is subject to all other portions of CEQA.[62]

California Independent System Operator ("CalISO"). The CalISO was created during the deregulation process to ensure the reliable operation of the transmission grid and the provision of open access to the grid by all market participants on a non-discriminatory basis. Overseen by FERC, the CalISO is required to balance supply and demand by ensuring that the amount of power generated each day is sufficient to meet the amount of power that will be demanded that day and that the capacity of the transmission system is sufficient to avoid congestion. Any mismatch between supply and demand or any congestion on the grid can result in regional or statewide blackouts. In order to avoid statewide blackouts or unexpected disruptions of power, the CalISO can also institute rolling blackouts. Rolling blackouts inform system users of scheduled times when power will not be available to them, usually during peak periods such as summer afternoons. Rolling blackouts allow CalISO to balance the system, avoid any unexpected disruptions of power and continue to provide power to essential users such as hospitals and fire stations.

Power Exchange ("PX"). The PX was created during deregulation as a commercial entity to facilitate the development of transparent spot prices for energy capacity and/or ancillary facilities. The main role of the PX was to manage the transactions on the spot market, working with CalISO, the wholesale generators and the UDCs to determine demand for the next day and setting the prices for that day. California was the only jurisdiction to separate the demand and pricing functions and place the management of these functions into two separate entities. Some of the problems that occurred during the energy crisis arose due to the coordination difficulties

[62] California Energy Commission. Potrero Power Plant. February 13, 2002. Final Staff Assessment.

between the PX, CalISO, the wholesale generators and the UDCs. In response to these difficulties, the PX was dissolved and is no longer part of the process. The PX will be replaced by an entity that combines the functions of an ISO and a PX, combining the demand and price functions as is done in other deregulated markets.

Federal, State, Regional and Local Jurisdictions. During the permitting process for a power plant, the CEC works closely with a variety of federal, state, regional and local jurisdictions to ensure that the proposals are consistent with the laws, ordinances, regulations and statutes (LORS) of these agencies. Below is a brief summary of the key agencies and their role in the review process:

Cities and Counties. Cities and Counties review projects to determine consistency with zoning and land use plans.

Coastal Management Agencies. The two coastal management agencies in California are the California Coastal Commission and the San Francisco Bay Conservation and Development Commission. Both coastal agencies are responsible for identifying those locations within their jurisdictions where the siting of a power plant is prohibited due to likely impacts on natural and cultural resources. The coastal agencies must also ensure that there are enough areas where power plants could be permitted to meet projected demand. Prior to deregulation, the coastal agencies worked closely with the CEC, reviewing the CEC's Electricity Report to determine the demand projected for the next ten years. However, based on a review of recent proposals, the only locations where power plant projects are likely to occur along the coast or the Bay are on existing sites. These projects will consist of re-powering or expanding existing facilities. New power plants are not likely to propose a location along the coast or the Bay due to regulatory and environmental requirements that make it more difficult to permit new once-through cooling systems.

The coastal management agencies are also responsible for reviewing power plant projects proposed for areas outside of prohibited locations. In areas outside of the prohibited locations, the coastal management agencies review the projects to ensure consistency with existing regulations and policies. The coastal management agencies are responsible for providing the CEC with a report analyzing the proposed project's consistency with existing regulations and policies. This report, which is required within 180 days of receipt of the application from the CEC, can include recommendations for redesign or the use of different technology or the use of pollution prevention strategies that would make an otherwise inconsistent project consistent with regulations. For example, a project that proposes to fill the Bay or certain waterways for a once-through cooling system when there are other cooling options that could be used would be found inconsistent with BCDC's regulations that state that fill can only be permitted when there are no other feasible alternatives available. However, this project could be found consistent if the applicant redesigns the project and adds a wet, dry or hybrid cooling system and eliminates the portion of the project that unnecessarily fills the Bay or certain waterways.

United States Environmental Protection Agency (EPA). The United States Environmental Protection Agency (USEPA) is responsible for protecting human health and safeguarding the natural environment upon which life depends. The USEPA sets national standards for a variety of environmental programs, delegating to states the responsibility for issuing permits and monitoring and enforcement to ensure compliance. In cases where national standards are not met and the states are not effective in monitoring and enforcing these standards, the USEPA can issue sanctions against those industries or individuals that are in violation of these standards.

Within California, the California Environmental Protection Agency ("CalEPA") oversees other agencies that issue permits and conduct monitoring and enforcement to ensure compliance. For power plant projects, the two most significant laws that pertain are the Clean Air Act and the Clean Water Act. In order to administer these acts, CalEPA oversees the

California Air Resources Board and the State Water Resources Control Board. Each of these agencies then delegate authority to regional boards, which do the majority of the permitting, enforcement and monitoring for projects. In the San Francisco Bay Area, the regional board for air quality is the Bay Area Air Quality Management District. The regional water quality agency is the San Francisco Regional Water Quality Control Board. A more detailed description of these agencies is below.

The USEPA may also become involved in power plant projects if it is determined that a proposal may have impacts on a federal and/or state listed threatened or endangered species. In such cases, the USEPA will initiate formal Endangered Species Act ("ESA") consultation with a regional agency, such as the National Marine Fisheries Service. A more detailed description of this process is also described below.

State Water Resources Control Board and the San Francisco Regional Water Quality Control Board. The Clean Water Act requires states to set standards to protect, maintain, and restore water quality through the regulation of point source and certain non-point source discharges to surface water. These discharges are regulated by the National Pollutant Discharge Elimination System (NPDES). In California, NPDES permitting authority is delegated to, and administered by, the nine Regional Water Quality Control Boards. The regional board in the San Francisco Bay Area is the San Francisco Regional Water Quality Control Board ("SFRWQCB"). For power plant projects, the NPDES permit regulates cooling water, other wastewater and operational stormwater discharges. Sections 316(a) pertains to thermal discharges, while 361(b) covers entrainment and impingement impacts.

Section 316(a) specifically addresses thermal discharges and cooling water intake structures. The proposed project must demonstrate that "any effluent limitation proposed for the control of the thermal component of any discharge will require effluent limitations more stringent than necessary to assure the protection and propagation of a balanced, indigenous population of shellfish, fish and wildlife in and on the body of water into which the discharge is to be made." In addition, the state may impose effluent limitations in order to assure the protection and propagation of a balanced, indigenous population of shellfish, fish and wildlife in and on that body of water.

In November 2001, the USEPA established standards for Section 316(b) of the Clean Water Act. Section 316(b) establishes the location, design, construction and capacity standards for cooling water intake structures at new facilities. The final regulation is designed to protect fish, shellfish and other forms of aquatic life from being killed or injured by cooling water intake structures. The new rule sets standards to ensure that cooling water intake structures reflect the best technology available for minimizing adverse environmental impacts. In addition to establishing standards for the cooling water intake structures, the new rule also establishes stricter standards for areas that provide significant habitat for fish and other aquatic organisms.

In addition to its responsibilities pertaining to NPDES permits, the SFRWQCB is also responsible for developing the Basin Plan for the region. The Basin Plan identifies beneficial uses (e.g., habitat, fishing, recreation, municipal supply, navigation, agricultural supply and industrial uses) and water quality objectives for the region.

In 1972, the State Water Resources Control Board adopted the "Water Quality Control plan for the Control of Temperature in Coastal and Interstate Waters and Enclosed Bays and Estuaries in California", which is also called the Thermal Plan. The Thermal Plan, which was last amended in 1975, establishes limits on the discharge of wastewaters with elevated temperatures into coastal, estuarine, and interstate waters in order to protect these water bodies from the adverse impacts associated with thermal waste. The portions of the Thermal Plan which are applicable to power plant projects proposed within San Francisco Bay are: (1) Elevated temperature waste discharges shall comply with limitations necessary to assure protection of beneficial uses. The maximum temperature of waste discharges shall not exceed

the natural temperature of the receiving waters by more than 20 degrees farenheit and (2) Thermal waste discharges having a maximum temperature greater than 4 degrees farenheit aboe the natural temperature of the receiving water are prohibited. The Thermal Plan also provides the SFRWQCB with the authority to grant exceptions to the specific water quality objectives in accordance with Section 316(a). These exceptions require the approval of the SWRCB.

Under Section 303(d) of the Clean Water Act, the SWRCB is also responsible for preparing a list which identifies the impaired waterbodies and the pollutants that are responsible for the impaired status. In 1999, the SWRCB identified Lower San Francisco Bay as an impaired waterbody and identified the pollutants as: chlordane, copper, DDT, diazinon, dieldrin, dioxin compounds, exotic species, furan compounds, mercury, nickel, non dioxin like PCBs and dioxin like PCBs.

California Air Resources Board and Bay Area Air Quality Management District. In response to growing public concern, the United States Congress enacted, and President Nixon signed into law, the Federal Clean Air Act (FCAA) of 1970. The FCAA required the establishment of national ambient air quality standards, which set allowable ambient concentrations of pollutants (i.e., criteria pollutants). The standards were set primarily to protect public health, and secondarily, to prevent damaging effects of pollutants on buildings, materials, and crops. In 1988 California adopted its own Clean Air Act (CCAA) to address California's unique air quality problems, and to establish new procedures and strategies to address the continuing nonattainment of ambient air quality standards. In addition, the California Air Resources Board established ambient air quality standards for California, which are generally set at lower limits than the national standards.

The FCAA delegated enforcement responsibilities to the Environmental Protection Agency (EPA). EPA has delegated that authority to the California Air Resources Board (ARB), who in turn has designated regional authorities, or districts, to implement rules for the purpose of achieving attainment within the district's jurisdiction. The Bay Area Air Quality Management District (AQMD) is responsible for regulating air quality in the BCDC's jurisdiction. ARB has retained authority over mobile sources of pollution, such as automobiles, trucks, trains and airplanes. To manage its attainment responsibility, ARB requires each district to prepare and submit an air quality management plan (AQMP). ARB then assembles the AQMPs from throughout the state into the State Implementation Plan (SIP). The SIP is submitted to EPA for approval and constitutes California's long term strategy for achieving and maintaining the national ambient air quality standards.

There are three types of air pollution control regulations in the SIP. These are emission limitation rules, New Source Review (NSR) rules, and Prevention of Significant Deterioration (PSD) rules. Emission limitation rules specify prohibited emission levels from various source categories and apply to new and existing sources. NSR rules establish the criteria for siting new emission sources. There are generally three basic requirements of NSR rules. These requirements are: 1) requirements to use Best Available Control Technology (BACT), 2) requirements to offset potential emission increases with real, quantifiable, surplus, permanent, and enforceable emission decreases, and 3) to conduct ambient air quality impact assessments to verify that the proposed project will not cause or contribute to a violation of ambient air quality standard by exceeding established significance levels.

PSD regulations establish the criteria for permitting new sources in areas that are attainment for the national ambient air quality standards. PSD regulations require the use of BACT (federal definition), establish increments by which a new source may degrade air quality, establish criteria for evaluating and mitigating visibility impacts on national parks and wilderness areas, and establishes evaluation criteria for otherwise unregulated pollutants.

In the Bay Area AQMD the pollutants of primary concern are ozone and its precursors of nitrogen oxides (NOx) and volatile organic compounds (VOC). While the district currently does not meet ambient federal and state air quality standards for ozone, NOx and VOC are regulated as part of the ozone attainment strategy since ozone is not emitted directly from sources. The area is non-attainment of the state PM10 standard. PM10, and NOx, VOC and sulfur dioxide (SOx) emissions as precursors to particulates, are regulated by the District. Power plants emit particulate, NOx, SOx and VOC air pollutant emissions. Additionally, power plants emits carbon monoxide (CO), carbon dioxide (CO2), and hydrogen sulfide (H2S – from geothermal plant), which are subject to emission controls and regulations.

National Fish and Wildlife Service, California Department of Fish and Game and the National Marine Fisheries Service. Federal and state agencies that protect and manage wildlife must be consulted to ensure that projects are reviewed for potential impacts to state and/or federally listed and other native species and their habitats. If a project could have impacts on a state and/or federally listed threatened or endangered species, then the agency with primary jurisdiction over the impacted species may initiate formal ESA consultation. The formal ESA consultation process includes: (1) the agency must express to USEPA its belief that the proposed project will impact Endangered Species Act listed species, (2) USEPA would need to agree, (3) USEPA would either request information from the applicant that would allow it to prepare a Biological Assessment, (4) the USEPA would then initiate Clean Water Act Section 7 consultation with the agency that initiated the formal consultation. The agency that initiated the formal consultation process would then be required to complete a Biological Opinion.

In addition to their responsibilities pertaining to the Endangered Species Act, these agencies work closely with the CEC to review proposals for potential impacts, providing the CEC with an analysis of the proposed project, the potential impacts and the appropriate actions to take to avoid these potential impacts. These actions could include relocating the facility to a different location on the property, redesigning the facility to use different technology (such as dry cooling instead of once-through cooling) or mitigation measures such as noise or pollution controls that could be added to the proposed project.

Some of the other laws that may apply to power plant projects that are administered by these agencies include the Magnuson-Stevens Fishery Management and Conservation Act, as amended in 1996, which requires that NMFS, regional fishery management councils and other federal agencies identify and protect important marine and anadromous fish habitat. The regional councils are required to delineate essential fish habitat for all managed species, which is defined as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. The California Department of Fish and Game administers the California Endangered Species Act of 1984 to protect California's rare, threatened and endangered species, several laws pertaining to the taking, possessing or destroying of nests, eggs, birds of prey or migratory non-game birds, and a law that identifies certain areas as refuges, natural sloughs, riparian areas and vernal pools that are significant wildlife habitat.

CHAPTER 5

ANTICIPATED FACILITIES WITHIN BCDC'S JURISDICTION

When designating areas where power plants would be prohibited due to natural or cultural resource conflicts, the Commission is required to coordinate with the CEC's demand forecasts. Government Code 66645(b) requires that BCDC "consider the conclusions, if any, reached by the CEC in its most recently promulgated comprehensive report...."[63] The comprehensive report that this section refers to is the CEC's Biennial Electricity Report. Before deregulation, the Electricity Report, which was required by the Warren-Alquist Act, included a 20-year demand projection, a 5-to-12 year demand forecast to be used in the planning of new facilities, a discussion of reasonable alternative technologies to meet projected demand-including demand reduction strategies and a discussion of the impacts of the facilities needed to meet projected demand.[64] After deregulation, SB110 was adopted to eliminate the requirement that the 5-to-12 year forecasts be used in determining the need for new facilities. This bill also eliminated the provision that prohibited the CEC from certifying facilities without first making specified findings relating to conformity with an integrated assessment of need for the new facility. In place of this provision, SB110 finds that any power plant proposed in the market was considered necessary for meeting future demand.

Although SB110 eliminated key provisions contained in the Electricity Report, the bill did not eliminate the projections and forecasts contained in the report. The report still includes the 20-year demand projections, the 5-to-12 year forecasts and all of the other components that were included before deregulation. The significant difference is that the 5-to-12 year projections are no longer used in determining the need for new facilities and that the CEC no longer has to find that proposed facilities are needed to meet projected demand. Without these requirements, the report is not as reliable an assessment of the potential plants that will be constructed over the next several years as it was in previous years. The CEC was required to update the report every two years to reflect changing conditions that could affect demand. In order to ensure that the demand forecasts were accurate, the CEC also worked closely with the UDCs, the municipal utilities and local jurisdictions to determine future demand in each region. The information contained within the Electricity Report provided BCDC with a different level of reliability regarding the type, size and location of new facilities. Although the CEC will continue to forecast demand in the report, the information pertaining to the type, size and location of future facilities may not be an accurate reflection of the facilities that will be proposed by wholesale generators.

Since the siting of power plants will rely entirely on the market, it will be more difficult for the CEC to make accurate forecasts of the type, size and location of new facilities. Without these accurate forecasts, it will be more difficult for BCDC and other agencies to make accurate forecasts regarding the type, size and location of the facilities that are going to be proposed within their jurisdictions. However, by reviewing the demand forecasts included within the CEC's Electricity Report, BCDC can make assumptions regarding the likelihood of a power plant being located within its jurisdiction. For example, if the Electricity Report includes a description of increased or unmet demand for the City and County of San Francisco within the next five years, then it is likely that more generating capacity will be proposed in San Francisco. By reviewing the most common types of power plants that have been recently proposed in California and in the Bay Area, BCDC can also make assumptions regarding the likely type and size of the facility that would be proposed to meet this demand.

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[63] McAteer-Petris Act, Section 66645(b)
[64] Public Resources Code, Section 25604

The most recent CEC report that contains demand projections is entitled the *2002-2012 Electricity Outlook Report* ("Outlook Report"). The Outlook Report was written in response to the 2000 energy crisis and includes an analysis of the crisis and California's significant demand response in 2001. The report describes the difficulty in determining how much supply will be needed to meet projected demand during this period of uncertainty. The reasons for the uncertainty include assessing the permanence of the demand response that occurred in 2001, the variability of available in-state and imported generating resources and the capacity of the transmission system.

The report responds to some of the theories that were generated during the energy crisis of 2000 that could affect the determination of the adequacy of the state's supplies. These theories include reports that California experienced unprecedented growth in demand and that blackouts were avoided in the summer of 2001 due to cooler than usual weather. Regarding the unprecedented demand, the CEC states that California did not experience unprecedented demand and cites statistics demonstrating that growth in power consumption remained relatively unchanged since 1996. The only year that demand substantially changed from around 3.5 percent was in 1998, where growth dropped below previous levels. In response to reports indicating that California experienced a cooler than usual summer, the CEC states that there was very little difference in temperature between the summer of 2000 and the summer of 2001. In fact, the summer of 2000 ranked as the 25th hottest summer since reporting began 106 years ago, while the summer of 2001 ranked as the 26th hottest summer. The key reason that California was able to avoid blackouts during the summer of 2001 was the significant demand response that resulted from a sweeping informational campaign regarding the importance of reducing usage during peak periods.

The Outlook Report forecasts that there will likely be sufficient resources available in the next several years to meet statewide electricity demand, if all of the permitted plants are constructed in a timely fashion. The report predicts that if all the plants anticipated to be built within the next three to four years are built on time, then the construction of this generating capacity will likely create a statewide surplus of electricity. The report states that this surplus is statewide and not regional and does not address the transmission problems of moving the electricity of major load centers to regional locations. Therefore, while supplies may be available to meet statewide demand, there may be regions that experience shortages due to capacity constraints on the transmission lines. Additionally, approved power plant projects are not being built in a timely fashion, with many projects being put on hold for economic reasons. This could have a significant impact on the supply available to meet demand and could result in shortages.

The CEC identifies Southern California, San Diego and San Francisco as areas where supply shortages could occur due to constraints on the capacity of the transmission lines that serve these regions. The City and County of San Francisco is identified as having the greatest significance level of risk for supply shortages, with an estimated supply shortfall of approximately 200 MW. The report describes the situation in San Francisco as, "[a]t peak load, San Francisco is short of its own area resources by up to 130 MW. Therefore, like San Diego, it strongly depends on the import of power. Transmission capacity to San Francisco is limited, and in cases observed in San Francisco when peak load is high or local power units are out of order, San Francisco is at risk of a power shortage, as has been experienced several times in recent years." Within the next year, the CEC finds little to no risk for Northern (including the Bay Area outside of the City and County of San Francisco) and Central California or for the areas served by the Los Angeles Department of Water and Power and the Sacramento Municipal Utility District.

The report also includes an assessment of supply adequacy during peak demand periods. The CEC predicts that over time the market will lower the reserve margins that were established by the UDCs before deregulation in an effort to meet demand during peak periods.

The CEC estimates a maximum peak load of 5000 MW over average demand, occurring less than 200 hours out of the year. Building generation capacity to keep in reserve for times of peak demand is prohibitively expensive and is not likely to be done by private generators under market conditions. In addition to being prohibitively expensive, building enough capacity to meet demand for only 200 hours out of the year could also be damaging to the environment and a waste of valuable resources, such as land and construction materials. However, without the capacity to meet peak demand periods, consumers are likely to face supply shortages during the peak periods. Shortages could be averted by consumers if they continue to reduce demand during peak periods, as they did during the summer of 2001. Although many have proposed the use of peaker plants to respond to peak demand periods, the CEC cautions against relying entirely on these facilities to meet peak demands. In describing peaker plants the report states, "[e]xcessive commitment to peakers may drive out lower cost, more environmentally friendly and economically efficient solutions." However, there is an important role for peaker plants in the mix of California's energy supply. Peaker plants are critical for ensuring that supply is reliable, particularly to users for which interrupted supply could be catastrophic, such as the elderly, the young, hospitals and other care-giving facilities.

It is difficult to determine the likely type, size and location of the power plants that will be proposed within BCDC's jurisdiction within the next five years. However, reviewing the CEC's Outlook Report and recent proposals in and near the Commission's jurisdiction provides enough information to make general assumptions about the facilities that are likely to be proposed within the next five years. The City and County of San Francisco is likely to be the location of new or expanded generating facilities in the next five years in order to make up for the current shortfall of generation and transmission capacity and to replace aging facilities such as the power plant located at Hunters Point.

By reviewing the most recently proposed projects within the Bay Area and the state, it is possible to identify the likely type and size of a facility that would be constructed in San Francisco to meet projected demand. The most common facilities recently proposed in the Bay Area and in California are combined-cycle, natural gas powered thermal power plants sited at inland locations using wet cooling technology. Very few facilities have been proposed for locations along the shorelines of surface bodies of water like the Bay, the Pacific Ocean or the delta. The only power plants that have been proposed along the Bay or Ocean shoreline are expansions or re-powering of existing facilities that were already located along the shoreline. By reviewing recent proposals, it appears unlikely that new facilities would be proposed within the Commission's jurisdiction. Moreover, it appears that a shoreline location is not necessary for the operation of a new, modern thermal power plant. Those that are proposed will most likely be expansions or re-powering of existing facilities and would probably include the replacement of existing technology with combined-cycle technology, reducing water demand and increasing plant efficiency. Where these expansions and re-powering include an increase in Bay fill to accommodate increased once-through cooling capacity, the project should be reviewed to determine whether feasible alternatives to once-through cooling are an option, such as wet, dry or hybrid technologies. New power plants or expansions of existing facilities over the next five years will likely have a capacity of over 500 MW, use combined-cycle technology and a wet cooling system. No new power plants proposals have included once-through cooling systems, while the majority of new power plants are being sited at inland locations, away from the coast and the Bay.

Renewable Resource and Co-generation Alternatives to Fossil Fueled Thermal Power Plants. In reviewing power plant proposals it is important to recognize that there are many alternatives to stand-alone, fossil-fueled, thermal power plant facilities. These alternatives use renewable or waste resources to generate electricity. The use of renewable or waste resources to fuel power plants can significantly reduce the ecological and cultural impacts associated with generating electricity with fossil-fueled thermal power plants. Renewable resources such as wind, geothermal and solar have the capability of supplying more electricity to California more

efficiently and with fewer impacts than fossil-fueled power plants. Electricity generated by using waste resources increases efficiency and diverts waste from landfills and emissions from the air and the water. Both renewable and waste powered electricity reduces the demand for fossil fuels, reducing the significant environmental impacts associated with obtaining these resources such as mining for coal and uranium and drilling for petroleum and natural gas.

The use of renewable and waste resources also diversifies California's generating capacity, reducing the state's reliance on a single source, such as natural gas, to provide the bulk of its power. Diversification increases the system's reliability and protects the state's consumers from price volatility due to shortages and scarcities. Despite all of the benefits of using renewable and waste resources to generate electricity, there is a concern that the deregulated market will leave these technologies behind and rely instead on traditional fossil fuel technologies. The Commission should encourage facilities that use of renewable or waste resources to generate electricity when at all possible, encouraging generators and supporting other agencies to promote these technologies. The Warren Alquist Act already encourages the development of co-generation facilities.[65]

Co-generation is an example of an alternative to stand-alone, fossil fuel powered thermal plants. Co-generation is defined as any technology, which simultaneously produces heat energy and electrical or mechanical power from the same fuel in the same facility. The technology allows for the recapture of waste heat from electrical generation or industrial processes for useful purposes. Topping cycle technology uses the waste heat from power plant turbines as steam for industrial processes and to heat buildings adjacent to the power plant. Bottoming cycle uses waste heat from industrial processes to produce steam that runs turbines to create electricity. By reusing wastes to produce electricity, co-generation diverts wastes that would otherwise be emitted into the environment and reduces the demand for fossil fuels, while increasing efficiencies. In some cases the heat that would otherwise be lost from the system as waste is recovered and used in industrial applications and to heat buildings. By using the heat rather than emitting it into the environment through air emissions and water discharges, thermal efficiencies increase from 35 percent to 72 percent.[66]

Given the significant reductions in ecological impacts and the significant improvements to efficiency, the Commission should encourage co-generation facilities in appropriate locations. Since these facilities are likely to be located in industrial or commercial sites it is doubtful that co-generation plants would be proposed in areas where power plants are prohibited due to conflicts with natural or cultural resources. Any co-generation facility proposed within BCDC's jurisdiction will most likely be proposed in developed areas of the shoreline, which are not designated as non-siting areas. In order to further reduce potential conflicts, co-generation facilities are not prohibited in Bay Plan designated water-related industry, airport or port priority use areas, provided that these facilities will not preclude development and operation of the water-related industry, airport or port use.

Adequacy of Potential Power Plant Sites for Anticipated Projects. By reviewing the CEC's demand projections in the *2002-2012 Electricity Outlook Report*, the types, sizes and locations of power plants proposed in California and the Bay Area in the last two years and the Commission's Power Plant Regulation and Power Plant Maps, it possible to estimate whether or not there are enough sites within BCDC's jurisdiction for the siting of power plant projects. With the alternative cooling technologies available, the regulatory framework and the large number of new power plants that are being proposed for inland locations using alternative cooling technologies, it seems unlikely that many power plants will propose and require a shoreline location within BCDC's jurisdiction. For the limited number of sites that do require the use of Bay water for cooling purposes and must be located within BCDC's jurisdiction, there

[65] Public Resources Code, Section 25004.2

[66] Environmental Protection Agency Office of Compliance. September 1997. Sector Notebook Project.

are sufficient areas available that do not prohibit the siting of power plants. Most of the areas where co-generation facilities or ancillary facilities are likely to occur are partially designated, allowing for the siting of these facilities. Thus, an adequate number of siting opportunities are available on or near the shoreline for both the smaller number of power plants and ancillary facilities that require sites within BCDC's jurisdiction.

CHAPTER 6

THE ENVIRONMENTAL IMPACTS OF FOSSIL FUELED THERMAL POWER PLANTS

The San Francisco Bay estuary includes the Suisun Bay, the San Pablo Bay and the San Francisco Bay. The estuary supports over 1,000 species of invertebrates, fish, amphibians, reptiles, mammals and birds. In the last 150 years, the San Francisco Bay and the surrounding region went from a largely undeveloped area with an incredibly biological diversity, to an intensely urbanized region that supports over seven million people. The impact of this urbanization on the Bay has been significant. The San Francisco Bay estuary is one of the most modified estuaries in the United States[67] and Lower San Francisco Bay has been identified as an impaired water body by the State Water Resources Control Board. As a result of diking and filling, the size of the Bay has been reduced and its functions have been significantly modified. Some of the habitats that have been most affected by these changes are tidal marshes, which have been reduced by almost 80 percent, moist grasslands, which have been reduced from 60,000 acres to 7,000 acres and riparian areas, which have declined from approximately 5,000 acres to approximately 700 acres.[68]

Despite the significant losses and alterations of Bay habitats, the Bay remains a thriving ecosystem, with over 1,000 resident and migratory species depending upon it for survival. These species include over 50 plants and animals that occur in or near the Bay that are listed as threatened or endangered under the state and federal endangered species acts. In recognition of the ecological importance of the Bay, there are many federal and state wildlife refuges designated within the Bay, including the San Pablo Bay National Wildlife Refuge in the North Bay and the Don Edwards San Francisco Bay National Wildlife Refuge in the South Bay. The Bay supports and is supported by a variety of habitat types, including tidal marshes, tidal flats, deep and shallow Bay, subtidal, salt ponds and managed wetlands and riparian areas. The diversity of habitats and species varies from location to location around the Bay. Generally, the Central Bay is the most heavily urbanized and has received the most filling, retaining only remnants of tidal flats and marshes. The North Bay contains tidal flats, tidal marshes, salt ponds, managed wetlands and agricultural baylands, while the South Bay contains tidal marshes, tidal flats, lots of salt ponds and some managed wetlands.

In addition to providing ecological value to the Bay Area, the Bay also contributes to the economic and recreational opportunities in the region. The Bay supports five ports, with the largest being the Port of Oakland, which had over 2,000 vessel and barge calls in 2001 and received over 900,000 total containers of goods and over 1,500,000 metric tons of bulk cargo. The Bay shoreline is also home to two of the three primary airports in the region, located in San Francisco and Oakland. Many other industries also rely on the Bay, such as oil refineries and commercial fisherman. Commuters, tourists and residents also travel across the Bay on ferries to work and to recreational areas such as Angel Island, Alcatraz and to see San Francisco Giants games at Pacific Bell Park.

In addition to these important functions the Bay and its shoreline also provides significant recreational opportunities to both visitors to and residents of the region. The Bay is enjoyed by many water-recreation enthusiasts, pursuing activities such as sailing and motor boating, fishing, kayaking, surfing and windsurfing. Others pursue land-based recreational activities

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[67] Goals Project. 1999. Baylands Ecosystem Habitat Goals. A Report of habitat recommendations prepared by the San Francisco Bay Area Wetlands Ecosystem Goals Project.
[68] Goals Project.

such as walking, running or biking along the San Francisco Bay Trail (a regional trail system that is planned to circle the entire Bay) and other public access areas, picnicking at one of the many shoreside regional parks and bird watching along the shoreline. The Bay also provides excellent opportunities for vista points both to and across the water.

In order to protect and enhance these important contributions the Bay makes to the ecological, economic and public health of the region, BCDC was created to minimize fill in the Bay to water-oriented uses, preserve regionally important adjacent land areas for uses which are dependent on the Bay and to ensure public access to and along the Bay shoreline. In order to minimize the amount of future fill that is placed in the Bay, BCDC must find that the fill is for a water-oriented use, that there is no feasible upland alternative to the fill and that the fill is the minimum amount necessary to achieve the needs of the proposed project. In order to preserve land for Bay dependent uses, the Bay Plan designates areas around the Bay for the following uses: airports, ports, water-related industries, wildlife refuges and waterfront parks. In order to protect and enhance public access to the Bay, BCDC is authorized by the McAteer-Petris Act to require projects within its jurisdiction to provide the maximum feasible public access consistent with the project.

The purpose of designating areas where the siting of power plants is prohibited is to reduce the significant environmental impacts that these facilities can have on the ecological and cultural resources that are described above. Fossil-fueled power plants can have impacts on biological resources, air quality, water quality and supply, visual and physical access, land use and the surrounding community. These impacts occur at every stage of the process, from the extracting the fuel to constructing and operating the plant. Although some of these impacts can be mitigated to reduce their effects by using pollution prevention technologies, it is usually not possible to entirely eliminate all of the impacts through mitigation. For example, though the use of combined-cycle technology can reduce the entrainment and impingement impacts of once-through cooling systems, these impacts can not be eliminated without eliminating the use of once-through cooling and may still be significant. However, many of these impacts can be significantly reduced by siting power plants and their ancillary facilities in appropriate locations. The impacts of certain habitats, species and land uses can be significantly greater if these facilities are sited in inappropriate locations, such as a power plant facility in a tidal marsh or overhead transmission lines in an area that is heavily used by migrating birds.

The McAteer-Petris Act, the Suisun Marsh Preservation Act, the Marsh Plan and the Bay Plan have specific provisions and policies that protect Bay wildlife and aquatic resource, public access, priority land use areas and recreational resources along the shoreline of the San Francisco Bay shoreline. The primary impacts to these resources that result from siting a fossil fueled thermal power plant using once-through cooling technology along the shoreline of the Bay are: impacts to biological resources, water quality, fill in the Bay for intake and discharge pipes, the surrounding community, visual resources and public access. Power plants using fossil fuels also have significant impacts on air quality, which BCDC does not directly regulate but which is of concern due to the biological, water quality and community impacts that result from impacts to air quality. The following is an overview of the environmental impacts associated with siting fossil fueled thermal power plants using once-through cooling along the shoreline of the San Francisco Bay.

Once-through Cooling System Impacts. The most significant impacts that power plants can have on the Bay are a result of the use of once-through cooling systems. The use of once-through cooling systems require fill in the Bay that results in a loss of Bay habitat, cause the entrainment and impingement of large numbers of fish and other aquatic organisms and discharge thermal waste into the Bay, altering the natural water temperature of the Bay. Impingement refers to the pinning of fish and other aquatic organisms against the intake screen. In many cases, organisms are unable to free themselves from the screen and die. Even when they are able to escape, the experience may result in death, due to the stress and injury that can

result. Entrainment occurs when a fish or other aquatic organism is taken into the cooling system through the intake pipe. The organism is drawn into the system and may be killed by damage or shock from mechanical damage, chemical exposure, high temperatures and pressure changes.

The CEC describes the current use of once-through cooling systems in its *Environmental Performance Report* as "[a] negative biological resource trend with some of the new combustion-turbine power plants is the resurgence of once-through cooling. Tons of aquatic biota are killed annually through entrainment and impingement in once-through cooling systems. In addition, aquatic habitats are damaged from the thermal discharges."

According to the CEC, the Pittsburg power plant in Contra Costa County impacts five federally listed endangered and threatened species, including the Delta smelt, Sacramento splittail, and numerous life stages of migrating Chinook salmon and steelhead trout.[69] A plant located in Delaware Bay uses 3 billion gallons of water a day and is responsible for an annual reduction of 11 percent of weakfish and 31 percent of anchovy.[70] Preliminary modeling done in response to the recent proposal to expand the Potrero Power Plant indicated that "hundreds of millions of fish larvae as well as fish eggs, invertebrate larvae, and other phytoplankton and zooplankton would be lost to the San Francisco Bay ecosystem because of entrainment in the Potrero Power Plant cooling water system."[71] At the Hunters Point Power Plant, Chinook salmon are impinged by the intake pipes.[72] Entrainment can affect even higher numbers of aquatic organisms, particularly at the larval stage. Although the use of rotating screens, smaller mesh and reduced flow velocities can reduce the number of organisms that are impacted, these measures cannot entirely eliminate the entrainment and impingement or organisms, particularly at the larval stage and the impacts remain substantial. However, impacts can be reduced using these technologies. The EPA study for Section 316(d) new facility requirements found that "performance data for modified screens and returns are somewhat variable due to site conditions and variations in unit design and operation, yet generally show at least 70 to 80 percent reductions in impingement can be achieved." On the other hand, the study found that comparable reductions in entrainment have not yet been achieved.[73]

The number of organisms that are entrained or impinged is directly related to the amount of water used by the power plant. The more water required by the power plant, the higher the number of organisms that will be harmed or killed by the system. Any measures to reduce water demand will also reduce the impacts on aquatic organisms. As described earlier in this report, nuclear power plants require the highest volumes of water per megawatt hour. Central station boiler plants are second, requiring 30,000 to 40,000 gallons per megawatt hour. This compares to the 15,000 gallons per megawatt hour required by combined-cycle plants. Power plants using closed-loop, wet cooling systems require only 200 to 250 gallons per megawatt hour and dry cooling systems can use as little as 25 to 50 gallons per megawatt hour. Simple-cycle turbine plants do not have steam boilers and use only around 75 to 200 gallons per megawatt hour.

Another way to significantly reduce the number of organisms that are entrained or impinged is to site the facility and the intake system in an area that is not heavily used by fish and other aquatic organisms. If sited in an inappropriate location, such as a tidal marsh or eel grass bed, which are heavily used by fish and other aquatic organisms, a once-through cooling system could have significant impacts on a large number and variety of species, including species that are listed as threatened or endangered. The EPA recognizes the importance of location on limiting impacts by stating, "Beyond design alternatives, an operator may be able to

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[69] California Energy Commission. July 2001. Environmental Report of California's Electric Generation Facilities.
[70] Pace University Law School Energy Project. February 2002. Electricity and the Environment. Power Scorecard.
[71] California Energy Commission. Final Staff Assessment for the Potrero Power Plant.
[72] Lee, Susan V. and James C. Henneforth. December 21, 2001. Potrero Power Plant Cooling Options.
[73] EPA. Efficacy of Cooling Water Intake Structure Technologies.

locate an intake structure in areas that minimize impingement and entrainment. It is well known that there are certain areas within every waterbody with increased biological productivity and therefore where the potential for impingement and entrainment of organisms is higher."[74]

In addition to entrainment and impingement impacts, once-through cooling systems also result in thermal discharge impacts. Thermal discharges can create elevations in temperature of 10 degrees Fahrenheit or more at the shoreline. These thermal discharges can negatively impact fish and other aquatic organisms. At certain temperatures, water becomes lethal to fish and other aquatic organisms. High temperatures result in a decrease in the amount of dissolved oxygen in the water, while increasing the metabolic rate of organisms, which increases their oxygen demand. This results in oxygen shortages to affected organisms. Additionally, high temperatures increase the susceptibility of animals to other pollutants and to disease. Increased water temperatures can also favor certain organisms over others and can encourage the development of invasive or nuisance species.

In response to the impacts that thermal discharge can have on fish and other aquatic organisms, the USEPA has requirements for the mixing zones, the areas where the thermal plume mixes with the source water at its natural temperature. The USEPA requirements state that the mixing zone: (1) cannot experience acutely toxic conditions, (2) cannot contain contaminants in concentrations great enough to form surface scum or precipitate out of solution, (3) cannot contain substances in concentrations that favor undesirable aquatic life or result in a dominance of nuisance species, (4) should avoid biologically important areas and (5) shore hugging plumes should be avoided. Again, the importance of avoiding areas of high biological activity is identified as an important criteria for avoiding significant impacts.

Once-through cooling systems also require that the Bay be dredged and filled to accommodate the intake and discharge pipes and their supports. The fill proposed for a once-through cooling system to support a recently proposed 530 MW combined-cycle power plant was approximately three acres. The result of three acres of fill would be the replacement of three acres of natural Bay habitat by artificial structures.[75] In addition, the dredging and construction would increase the turbidity of Bay waters, re-suspending sediments and could negatively affect the organisms in the area of dredging and construction.

Cooling towers can be used to reduce or eliminate the thermal discharges associated with once-through cooling systems and significantly reduce entrainment and impingement when used to support a closed-loop cooling system. However, cooling towers can also have impacts on the surrounding environment, including blowdown and drift. Blowdown is the term for the discharge of the salts and other chemicals that are concentrated in the water that circulates through the cooling towers. When the concentrations get too high, some of the water must be discharged into the source water body. By this time the water is cool and this reduces the thermal waste typically associated with once-through cooling, but results in a discharge that is slightly more toxic. The increased toxicity is due to the higher concentration of salts and the chemicals that are used to reduce corrosion and to prevent biological growth and scale build-up in the towers. However, these releases are controlled by permits from the Regional Water Quality Control Board and would probably not result in releases that would negatively impact the Bay.

Salt drift is another impact associated with cooling towers. Salt drift occurs when salt and other chemicals attach to drops of water which carry them from the site and to the surrounding environment. The degree of the impacts of salt drift depends upon the salinity of the source water. Salt drift with high salinity content can result in salt burns to vegetation. The drift also

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[74] EPA. Efficacy of Cooling Water Intake Structure Technology.

[75] California Energy Commission. Final Staff Assessment for the Potrero Power Plant.

contains chemicals that are used in cooling towers to control corrosion, bacterial growth and prevent scaling and cracking in the boilers. Like blowdown, these chemicals can adversely effect vegetation.

In addition to blowdown and drift impacts, cooling towers can also have significant, negative visual impacts. Without plume abatement technology, the towers are also accompanied by water vapor plumes. The towers and the plumes can have negative aesthetic affects, particularly if sited near residential areas or in natural, less urbanized areas.

Siting Impacts. Impacts to natural and cultural resources can vary significantly from site to site. Inappropriately sited power plants can have significant impacts on biological resources, visual resources, public access, local air quality, surrounding communities and land use. In order to reduce these impacts, the Commission's power plant regulation identify those areas where the siting of a power plant could have significant, unmitigable impacts on surrounding resources, while the Power Plant Maps depict the locations of these areas. As described above, power plants and ancillary facilities that are located in areas of high biological activity can have significantly higher impacts than those sited away from these areas. The siting of a power plant on or near a tidal marsh would result in the loss of a Bay habitat that supports a large variety of species and is increasingly rare around the Bay, with just eight percent of the historical area remaining, while almost 80 percent has been developed and otherwise destroyed. In addition, the entrainment and impingement of fish and other aquatic organisms in or near a tidal marsh would be significantly higher than in an urbanized area and the thermal impacts would likely also be more significant. Another example would be the location of overhead power lines in an area heavily used by avian species. The US Fish and Wildlife Service estimates that collisions with transmission lines kill an estimated 174 million birds annually and that more than 1,000 raptors are electrocuted each year on transmission lines and poles. However, it has been found that it is a small minority of lines that create the majority of the problem and that by siting transmission lines away from areas of high bird activity (e.g., migration, feeding, nesting and rafting areas) that the impacts could be significantly reduced.

The areas that are not designated are the more urbanized and industrial portions of the shoreline. However, siting impacts can still be significant in undesignated areas due to the proximity of residential neighborhoods or potential public access or land use conflicts. In order to avoid these impacts, power plants should be sited in industrialized locations, away from residential areas and include the appropriate pollution prevention technologies and mitigation to reduce local air quality impacts and design features to reduce visual impacts.

Construction Impacts. The effects of construction activities on natural resources can also be significant. Although construction activities are temporary and would have little or no impacts in industrial areas, these impacts could be permanent in sensitive areas, such as marshes and parks. Construction sites usually affect much larger areas than the area needed for the planned facilities. Commonly included in construction sites for power plant projects are laydown areas, storage areas, parking areas, access roads and utility corridors. The construction of a typical 500 megawatt power plant will directly, and in many cases, permanently affects substantial land areas. While the effects can be reduced by careful site planning and the use of best management practices, these effects cannot be eliminated entirely. The effects of operating heavy equipment on sensitive areas, such as tidal marshes and flats, can be so substantial that these areas may never recover or only recover many years later.

Even temporary impacts are unacceptable in certain locations. The construction phase of a power plant project can last from six months to over a year. Such a long term temporary impact could permanently displace a species that uses the area or adversely affect the public's use or a recreational resource or a public access area. In order to avoid significant impacts during construction, it may be necessary to establish time frames when construction may not be permitted due to the migration or spawning of a certain species.

Generation Impacts. One of the most significant impacts that results from the generation of electricity is to air quality. The McAteer-Petris Act requires "that the nature, location and extent of any fill should be such that it will minimize harmful effects to the Bay area, such as, the reduction or impairment of the volume of surface area or circulation of water, water quality, fertility of marshes or fish and wildlife resources, or other such conditions impacting the environment... " such as air quality.[76] The air quality impacts of power plants are substantial and include emissions of pollutants that contribute to global warming, ozone, smog, acid rain and the eutrophication of water bodies. The generation of electricity contributes to 28 percent of nitrogen oxide, 67 percent of sulfur dioxide, 36 percent of carbon dioxide and 33 percent of mercury that is emitted annually nationwide.[77] Natural gas, which is the most common fuel used to power generating facilities in California, is significantly cleaner than either coal or petroleum. Coal fired power plants account for the majority of nitrogen oxide, sulfur dioxide and carbon dioxide emissions from electricity generation. Petroleum, which is used to fuel peaker plants and plants using combustion turbine systems, also emits significant amounts of nitrogen oxides, sulfur dioxides and particulates as well as carbon dioxide, methane and heavy metals.[78]

Natural gas fired power plants emit half as much carbon dioxide, less particulate matter and substantially less sulfur dioxide as coal fired power plants. However, natural gas fueled plants can produce similar quantities of carbon monoxide and nitrogen oxide as coal and result in methane emissions, which is a significant source of global climate change.[79]

The health effects carbon monoxide (CO) include the disruption of the delivery of oxygen to the body's organs and tissues which can affect people with coronary artery disease, congestive heart failure, obstructive lung disease, the elderly, newborn infants and fetuses. The effects of particulate matter (PM) usually depend on the toxicity of its constitute pollutants, but the general effects include premature death, aggravation of respiratory and cardiovascular disease, changes in lung function and increases in respiratory symptoms, effects on lung function and impacts on the body's respiratory defense mechanisms. Certain people that are especially susceptible to nitrogen dioxide (NO_2) are asthmatics, persons with chronic bronchitis, infants and young children, cystic fibrosis, cancer patients, people with immune deficiencies and the elderly. Sulfur Dioxide (SO_2) can produce both short-and long-term health effects, such as bronchoconstriction, a narrowing of the airways, which results in labored breathing, wheezing and coughing in cases of short term exposure and an increased incidence of respiratory systems or respiratory disease, decreases in pulmonary function, and an increased risk of premature mortality for long term exposure.

Over the past 25 years the emission rates of critical air pollutants from California's generating plants have significantly decreased over past rates.[80] These improvements are largely due to increased federal and state standards such as the Clean Air Act, technological improvements in emissions controls and a shift to natural gas as the primary fuel source. However, power plants still adversely affect air quality, particularly in the areas surrounding power plant facilities. Areas that contain large concentrations of generating facilities or older plants that lack emission control technologies receive the greatest air quality impacts from electricity generation. Since power plant emissions can have adverse affects on adjacent natural and cultural resources, siting these facilities away from residential uses, recreational resources and sensitive habitat areas will reduce the impacts that impaired air quality can have on these resources.

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[76] McAteer-Petris Act, Section 66605(d)
[77] Natural Resources Defense Council. Generator Contributions to Environmental Problems.
[78] Pace University Law School Energy Project. February 2002. Electricity and the Environment. Power Scorecard.
[79] Pace University Law School Energy Project. February 2002. Electricity and the Environment. Power Scorecard.
[80] California Energy Commission. July 2001. Environmental Report of California's Electric Generation Facilities.

Community and Neighborhood Impacts. Since many of the impacts caused by thermal power plants are local, the communities where these facilities are located can be disproportionately impacted by the generation of electricity. With the potential for disproportionate impacts, there is also the potential that certain populations, such as low income and minority populations, will bear the majority of these impacts. In response to the concern that minority and low income populations often bear a disproportionate share of society's environmental risks, environmental justice was developed to battle for a more equal distribution of these risks. The U.S. EPA guidelines define environmental justice as

> The fair treatment and meaningful involvement of all people regardless of race, color, national origin or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group or people, including racial, ethnic, or socioeconomic group should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal and commercial operations or the execution of federal, state, local and tribal programs or policies.

The CEC evaluates all new power plants for environmental justice issues. This evaluation process began in 1994, when the Bayview/Hunters Point community opposed a co-generation facility proposed in their community. Despite the CEC's approval of the project, the opposition prevented the developer from securing a lease for the site from the City and County of San Francisco, which stopped the development of the power plant. As a result of this project, the CEC began reviewing each project for environmental justice issues as a part of the socioeconomic assessment that is completed for each project.

The CEC identifies projects that may raise environmental justice issues by identifying any neighborhoods within a six mile radius of a proposed project that have minority populations greater than 50 percent of the total number of residents. Between 1994 and 2001, the CEC reviewed 23 cases. Of these 23 cases, five were identified as having a minority population greater than 50 percent within a six mile radius of a proposed project. The CEC staff found that no significant, unmitigated or disproportionate adverse impacts would result from the approval of these projects. Since the review began in 1994, two projects have been the subject of complaints to the US EPA for failing to consider environmental justice impacts in the environmental review of a project. The EPA has not completed the analysis of either complaint as this time.[81]

In addition to conducting environmental justice review for individual projects, the CEC also conducted an analysis of 13 of California's oldest and largest power plants to identify any environmental justice impacts the surrounding communities as a result of their proximity to these large generating facilities. The CEC includes the following summary of this analysis in its *Environmental Performance Report*, "Negative impacts to the people and property near a power plant are difficult to quantify because other variables could also be contributing to the effects. For this report, socioeconomic and demographic characteristics of areas near selected power plants today were compared with the same characteristics when the plant was first built. The analysis of the 13 power plants did not reveal any negative trends or significant differences with nearby communities without power plants."[82]

Although the CEC's analysis both of individual proposals and the more comprehensive review of the 13 power plants have not found disproportionate impacts on low income and minority communities this does not mean that certain communities are not disproportionately impacted by specific projects. The CEC analysis focuses on socioeconomic data such as the

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[81] California Energy Commission. July 2001. Environmental Report of California's Electric Generation Facilities.
[82] California Energy Commission. July 2001. Environmental Report of California's Electric Generation Facilities.

ethnicity of the residents, median income and home ownership rates. Environmental indicators, such as air and water quality, have not been measured and therefore it is not possible to determine whether or not communities with power plants are disproportionately impacted by air and water quality emissions than are communities without such facilities. However, since many of these impacts are more severe near the power plant facilities, it is likely that communities where these facilities area located are disproportionately impacted by increased air and water emissions. Communities located near industrial areas are likely to be cumulatively impacted by emissions from both power plants and other industrial facilities.

The use of emission offsets can also increase the air quality impacts a facility has on the surrounding community. If the operator of a facility can obtain an offset, then power plant facilities are permitted to release levels of pollutants that exceed the limits for these pollutants.[83] For example, if an operator owns a facility in Contra Costa County where the emissions are below permitted levels and a power plant in San Francisco where emissions are above permitted levels, the operator can trade the available offsets from the Contra Costa County plant to the San Francisco plant. This allows for higher emissions in San Francisco, resulting in greater air quality impacts to the surrounding community. While the reduced levels of pollutants mean cleaner air for Contra Costa County residents, the offsets allow for higher levels of pollutants in San Francisco. While the offsets balance regional air basin pollution levels, they can result in higher local levels, impairing air quality in these areas.

In order to better analyze the potential for disproportionate impacts on low income and minority communities, the Commission should add demographic data to the Power Plant Maps. This would allow BCDC to review proposals against the demographic characteristics of the communities where the projects are proposed to be located and identify any disproportionate impacts that would result from locating a power plant in a community. Additionally, although the power plant maps do not identify residential areas as locations where power plants are prohibited (due to the difficultly in identifying these areas along the entire Bay shoreline) these facilities should not be located adjacent to residential communities. Future updates of this report should analyze the use of demographic data and information regarding the location of residential communities in determining the appropriate locations for siting power plants.

[83] State of California House and Senate 40709.5. Offset System.

CHAPTER 7

BCDC'S POWER PLANT PROJECT SUBMITTAL RECOMMENDATIONS

Although the CEC is the sole permitting authority for power plant projects, these projects must be consistent to the maximum feasible extent with the LORS of the agencies that have jurisdiction over the proposed project site. In order to determine consistency with these LORS, the CEC relies upon the review and analysis of these agencies. BCDC is responsible for reviewing all thermal power plant projects proposed within their jurisdiction that are over 50 megawatts and providing a report to the CEC which analyzes the consistency of the proposed project with the McAteer-Petris Act, the Suisun Marsh Preservation Act, the Marsh Plan and the Bay Plan. Upon receiving the submittal information for a project from the CEC, BCDC has 180 days to conduct the necessary analysis and complete, hold a vote on and forward this report to the CEC. [84]

Early consultation with BCDC staff can significantly expedite the review and analysis of a proposed power plant project. In addition to early consultation, the project submittal should include the information necessary for the Commission and its staff to analyze and evaluate the project and to provide the CEC with a report of its findings within 180 days. The following is a list of submittal suggestions that contains the information that is necessary for the Commission and the Commission's staff to perform this analysis and file the report with the CEC within 180 days.

1. Review the power plant non-siting regulation and maps to identify the proposed site and determine whether the project is fully designated, partially designated or not designated on the maps. Power plants are not permitted on sites that are fully designated by the power plant regulation. Certain ancillary facilities, including co-generation facilities, are permitted in partially designated areas. Both power plants and ancillary facilities can be considered for sites that are not designated on the maps.
2. Conduct an alternatives analysis to identify any feasible alternatives to proposed Bay fill and to establish whether the project requires a location within BCDC's jurisdiction. This alternatives analysis should review all available alternatives to once-though cooling systems, such as wet cooling using towers, and an alternative source of cooling water, dry cooling and hybrid cooling systems. In order for the project to be considered by the Commission, the alternatives analysis must demonstrate that there is no feasible alternative to fill associated with a once-through cooling system and that the Bay fill is necessary in order to develop the project.
3. Include technology within the plant design that reduces the water usage requirements of the once-through cooling system and the entrainment and impingement impacts of once-through cooling. Such technologies include combined-cycle systems over boiler systems and the use of cooling towers which allow for the recycling of some the water through the system and eliminate the thermal waste associated with typical once-through cooling systems. Entrainment and impingement impacts can be reduced through the use of cylindrical wedgewire screens and fine-mesh screens, which have been shown to reduce both entrainment and impingement, sometimes significantly.

[84] Public Resources Code, Section 25519 (h)

4. Incorporate a plan to mitigate any adverse Bay impacts necessary for the project. Mitigation for Bay impacts must be included in the project proposal in order for the Commission to complete its analysis and provide the report to the CEC in a timely fashion. Early consultation on mitigation issues will expedite BCDC's review and analysis.

5. Incorporate the location, size and type of maximum feasible public access that will be included in the project. Consult with the San Francisco Bay Trail staff, any established community or neighborhood groups and BCDC staff regarding the appropriate public access for the site. Early consultation regarding the location, size and type of public access will expedite BCDC's review and analysis of the project.

6. In order to mitigate for the visual and community impacts associated with the siting of a power plant project, plant design should be as aesthetically pleasing as possible. Rather than attempting to hide such a large facility, the project should be designed to be an interesting and even attractive addition to the Bay shoreline. Examples of such designs are the power plant at Indiana State University, some design features of the old Seaholm Power Plant in Texas and design ideas that were developed by the College of Architecture and Environmental Design at California Polytechnic University ("CalPoly"), San Luis Obispo. The power plant at Indiana State University and the design concepts developed by the College of Architecture and Environmental Design at Cal Poly San Luis Obispo included the provision of public visual access to certain portions of the production process and the integration of these facilities more sensitively into their environments. Designs should provide for public views to the Bay and links to the public access from surrounding areas to the Bay.

7. Due to the increased localized impacts these projects have, particularly on air quality, projects should include all available pollution prevention technology to avoid impacts to adjacent sensitive receptors, including San Francisco Bay and surrounding residential neighborhoods.

8. In order to address the impacts of the project on the surrounding community, mitigation for air quality impacts and other Bay impacts should be located, to the maximum extent practicable, within the community surrounding the project site. This includes purchasing any necessary offset credits from pollution sources that are as close to the impacted community as possible. Communities where power plants are located should not bear a greater burden than those where these facilities are not located, particularly communities that already receive impacts from existing industrial areas, urban development and roadways. Projects should be evaluated for environmental justice concerns and the mitigation for the impacts of the project should be located, to the maximum extent practicable, within the community where the impacts will be occurring. This will ensure, to the maximum extent practicable, that the project will not result in additional impacts to communities already suffering from noise, air and water pollution, a lack of open space and public access and aesthetic impacts.

APPENDIX A

THE JURISDICTION OF THE SAN FRANCISCO BAY CONSERVATION AND DEVELOPMENT COMMISSION

Specification of Areas of Jurisdiction of San Francisco Bay Conservation and Development Commission; Definition as Prescribing Jurisdiction; Construction; Areas Excluded from Jurisdiction.[1]

For the purposes of this title, the area of jurisdiction of the San Francisco Bay Conservation and Development Commission includes:

a. San Francisco Bay, being all areas that are subject to tidal action from the south end of the bay to the Golden Gate (Point Bonita-Point Lobos) and to the Sacramento River line (a line between Stake Point and Simmons Point, extended northeasterly to the mouth of Marshall Cut), including all sloughs, and specifically, the marshlands lying between mean high tide and five feet above mean sea level; tidelands (land lying between mean high tide and mean low tide); and submerged lands (land lying below mean low tide).

b. A shoreline band consisting of all territory located between the shoreline of San Francisco Bay as defined in subdivision (a) of this section and a line 100 feet landward of and parallel with that line, but excluding any portions of such territory which are included in subdivisions (a), (c) and (d) of this section; provided that the commission may, by resolution, exclude from its area of jurisdiction any area within the shoreline band that it finds and declares is of no regional importance to the bay.

c. Saltponds consisting of all areas which have been diked off from the bay and have been used during the three years immediately preceding the effective date of the amendment of this section during the 1969 Regular Session of the Legislature for the solar evaporation of bay water in the course of salt production.

d. Managed wetlands consisting of all areas which have been diked off from the bay and have been maintained during the three years immediately preceding the effective date of the amendment of this section during the 1969 Regular Session of the Legislature as a duck hunting preserve, game refuge or for agriculture.

e. Certain waterways (in addition to areas included within subdivision (a)), consisting of all areas that are subject to tidal action, including submerged lands, tidelands, and marshlands up to five feet above mean sea level, on, or tributary to, the listed portions of the following waterways:

- Plummer Creek in Alameda County, to the eastern limit of the saltponds.
- Coyote Creek (and branches) in Alameda and Santa Clara Counties, to the easternmost point of Newby Island.
- Redwood Creek in San Mateo County, to its confluence with Smith Slough.
- Tolay Creek in Sonoma County, to the northerly line of Sears Point Road (State Highway 37).
- Petaluma River in Marin and Sonoma Counties to its confluence with Adobe Creek, and San Antonio Creek to the easterly line of the Northwestern Pacific Railroad right-of-way.

[1] McAteer-Petris Act, Section 66610

- Napa River, to the northernmost point of Bull Island.
- Sonoma Creek, to its confluence with Second Napa Slough.
- Corte Madera Creek in Marin County to the downstream end of the concrete channel on Corte Madera Creek which is located at the United States Army Corps of Engineers Station No. 318+50 on the Corte Madera Creek Flood Control Project.

The definition which is made by this section is merely for the purpose of prescribing the area of jurisdiction of the commission which is created by this title. This definition shall not be construed to affect title to any land or to prescribe the boundaries of the San Francisco Bay for any purpose except the authority of the commission created by this title. The jurisdiction of the commission under this section shall not extend to the areas commonly known as the Larkspur and Greenbrae Boardwalks in the County of Marin, such areas to be defined by commission regulation.

APPENDIX B

SAN FRANCISCO BAY CONSERVATION AND DEVELOPMENT COMMISSION'S POLICIES AND PROVISIONS PERTAINING TO SENSITIVE ECOLOGICAL AND CULTURAL RESOURCES AND THE POTENTIAL IMPACTS OF POWER PLANT PROJECTS ON THESE RESOURCES.

Resource	Designation	Potential Impacts	BCDC Regulation or Policy
Wildlife Areas	**Fully Designated:** **All power plant facilities are prohibited in existing and planned (already funded) wildlife areas, except for ancillary facilities that the Commission determines would have no substantial adverse environmental effects and would not conflict with priority use areas identified in the *San Francisco Bay Plan*.**	**Siting[1], Construction[2], Entrainment, Impingement, Thermal Discharge, Drift, Blowdown, Water and Air Quality Impacts**	**McAteer-Petris Act, Section 66605(d):** "the nature, location and extent of any fill should be such that it will minimize harmful effects to the Bay area, such as, the reduction or impairment of the volume, surface area or circulation of water, water quality, fertility of marshes or fish and wildlife resources." **McAteer Petris Act, Section 66602:** Finds that wildlife refuges are one of the water-oriented land uses along the Bay that are essential to the public welfare. **San Francisco Bay Plan, Fish, Other Aquatic Organisms and Wildlife Policy 1:** To assure the benefits of fish, other aquatic organisms and wildlife in the Bay should be insured for present and future generations, to the greatest extent feasible, the Bay's tidal marshes, tidal flats, and subtidal habitat, should be conserved, restored and increased. **San Francisco Bay Plan, Fish, Other Aquatic Organisms and Wildlife Policy 2:** Specific habitats that are needed to conserve, increase or prevent the extinction of any native species, species threatened or endangered, species that the California Department of Fish and Game has determined are candidates for listing as endangered or threatened under the California Endangered Species Act, or any species that provides substantial public benefits, should be protected, whether in the Bay or behind dikes.
Parkland Areas	**Fully Designated:** **All power plant facilities are prohibited in existing and planned (already funded) parkland areas, except for ancillary facilities that the Commission determines would have no substantial adverse environmental effects and would not conflict with priority use areas identified in the *San Francisco Bay Plan*.**	**Siting[1], Construction[2] and Visual Impacts**	**McAteer-Petris Act, Section 66602:** Finds that water-oriented recreation and public assembly are one of the land uses along the Bay shoreline that are essential to the public welfare of the Bay Area. **San Francisco Bay Plan, Recreation Policy 1:** For parks, there is no practical estimate of the acreage that should be provided on the shoreline of the Bay, but it is assumed the largest possible portion of the total regional requirement should be provided adjacent to the Bay.

Resource	Designation	Potential Impacts	BCDC Regulation or Policy
Public Access Areas	Partially Designated: **Allows for the siting of underground or underwater transmission lines, intake or discharge lines and structures for cooling systems, underground or underwater fuel pipelines and underground or underwater steam pipelines. Other ancillary facilities may be located within public access areas when the Commission determines they would have no substantial adverse environmental effects and would not conflict with priority use areas identified in the *San Francisco Bay Plan*. Power plants may not be constructed within these areas.**	Siting[1], Construction[2] and Visual Impacts	**McAteer-Petris Act, Section 66607:** Requires maximum feasible public access to the Bay. **San Francisco Bay Plan, Public Access Policy 1:** A proposed fill project should increase public access to the Bay to the maximum extent feasible, in accordance with the policies for Public Access to the Bay. **San Francisco Bay Plan, Public Access Policy 2:** In addition to the public access to the Bay provided by waterfront parks, beaches, marinas, and fishing piers, maximum feasible access to and along the waterfront and on any permitted fills should be provided in and through every new development in the Bay or on the shoreline, whether it be for housing, industry, port, airport, public facility, wildlife area, or other use, except in cases where public access would be clearly inconsistent with the project because of public safety considerations or significant use conflicts, including unavoidable, significant adverse effects on Bay natural resources. In these cases, in lieu access at another location preferably near the project should be provided. **San Francisco Bay Plan, Public Access Policy 5:** Whenever public access to the Bay is provided as a condition of development, on fill or on the shoreline, the access should be permanently guaranteed. This should be done wherever appropriate by requiring dedication of fee title or easements at no cost to the public, in the same manner that streets, park sites, and school sites are dedicated to the public as part of the subdivision process in cities and counties.

Resource	Designation	Potential Impacts	BCDC Regulation or Policy
Ports and Water Related Industry Priority Use Areas	Partially Designated: A power plant or any ancillary facility may be located within a port or water –related industry priority use area when the project would not preclude or adversely affect the existing or future use of the priority use area for its primary purpose.	Siting[1] Impacts- reduces the amount of land available for ports and water-related industry	**McAteer-Petris Act, Section 66602:** Finds that ports and water-related industries are two of the land uses along the Bay shoreline that are essential to the public welfare of the Bay Area. **San Francisco Bay Plan:** Designates areas for water-related industries and ports as priority land uses that should be preserved to avoid significant Bay filling. **San Francisco Bay Plan, Water-Related Industry Policy 1:** Sites designated for both water-related industry and port uses should be reserved for those industries and port uses that require navigable, deep waters for receiving materials or shipping products by water in order to gain a significant transportation cost advantage. **San Francisco Bay Plan, Water-Related Industry Policy 2:** Linked industries, water-using industries and industries which gain only limited economic benefits by fronting on navigable water, should be located in adjacent upland areas. However, pipeline corridors serving such facilities may be permitted within water-related industrial priority use areas, provided pipeline construction and use does not conflict with present or future water-transportation use of the site.
Airport Priority Use Areas	Partially Designated: A power plant or any ancillary facility may be located within an airport priority use area when the project would not preclude or adversely affect the existing or future use of the priority use area for its primary purpose.	Siting[1] Impacts- reduces the amount of land available for airport use	**McAteer-Petris Act, Section 66602:** Finds that airports are one of the land uses along the Bay shoreline that are essential to the public welfare of the Bay Area. **San Francisco Bay Plan:** Designates airports as a priority land use that exists only in limited amount and should be preserved for this use to avoid substantial Bay filling.

Resource	Designation	Potential Impacts	BCDC Regulation or Policy
Wildlife Priority Use Areas	Fully Designated: All power plant facilities are prohibited in Wildlife Priority Use Areas, except for ancillary facilities that the Commission determines would have no substantial adverse environmental effects and would not conflict with priority use areas identified in the *San Francisco Bay Plan.*	Siting[1], Construction[2], Entrainment, Impingement, Thermal Discharge Blowdown, Drift, Water and Air Quality	**McAteer Petris Act, Section 66602:** Finds that wildlife refuges are one of the water-oriented land uses along the Bay that are essential to the public welfare. **San Francisco Bay Plan, Fish, Other Aquatic Resources and Wildlife Policy 1:** To assure the benefits of fish, other aquatic organisms and wildlife in the Bay should be insured for present and future generations, to the greatest extent feasible, the Bay's tidal marshes, tidal flats, and subtidal habitat, should be conserved, restored and increased. **San Francisco Bay Plan, Fish, Other Aquatic Organisms and Wildlife Policy 2:** Specific habitats that are needed to conserve, increase or prevent the extinction of any native species, species threatened or endangered, species that the California Department of Fish and Game has determined are candidates for listing as endangered or threatened under the California Endangered Species Act, or any species that provides substantial public benefits, should be protected, whether in the Bay or behind dikes.
Waterfront Parks Priority Use Areas	Fully Designated: All power plant facilities are prohibited in Waterfront Parks Priority Use Areas, except for ancillary facilities that the Commission determines would have no substantial adverse environmental effects and would not conflict with priority use areas identified in the *San Francisco Bay Plan.*	Siting[1], Construction[2] and Visual Impacts	**McAteer-Petris Act, Section 66602:** Finds that water-oriented recreation and public assembly are one of the land uses along the Bay shoreline that are essential to the public welfare of the Bay Area. **San Francisco Bay Plan, Recreation Policy 1:** For parks, there is no practical estimate of the acreage that should be provided on the shoreline of the Bay, but it is assumed the largest possible portion of the total regional requirement should be provided adjacent to the Bay.

Resource	Designation	Potential Impacts	BCDC Regulation or Policy
Suisun Marsh Primary Management Area	Fully Designated: All power plant facilities are prohibited in the Suisun Marsh Primary Management Area, except for ancillary facilities that the Commission determines would have no substantial adverse environmental effects and would not conflict with priority use areas identified in the *San Francisco Bay Plan.*	Siting[1], Construction[2], Entrainment, Impingement, Thermal Discharge, Blowdown, Drift, Water and Air Quality	**Suisun Marsh Preservation Act, Section 29002:** Finds that the Suisun Marsh, consisting of 55,000 acres of marshland and 30,000 acres of bays and sloughs, plays an important role in providing wintering habitat for waterfowl of the Pacific Flyway; important to waterfowl particularly in periods of drought, provides critical habitat for a diversity of species including endangered, rare and unique species, that the relatively large expanse of unbroken native habitat and diversity of vegetation are important in retaining these habitat areas and that future residential, commercial and industrial developments could adversely affect the wildlife value of the area. **Suisun Marsh Protection Plan, Environmental Policy 1:** The diversity of habitats in the Suisun Marsh and surrounding upland areas should be preserved and enhanced whenever possible to maintain the unique wildlife resources. **Suisun Marsh Protection Plan, Environmental Policy 2:** The Marsh waterways, managed wetlands, tidal marshes, seasonal marshes, and lowland grasslands are critical habitats for marsh-related wildlife and are essential to the integrity of the Suisun Marsh. Therefore, these habitats deserve special protection. **Suisun Marsh Protection Plan, Land Use and Marsh Management Policy 1:** The managed wetlands, tidal marshes, lowland grasslands and seasonal marshes should be included in a primary management area. Within the primary management area existing uses should continue and both land and water areas should be protected and managed to enhance the quality and diversity of the habitats.

Resource	Designation	Potential Impacts	BCDC Regulation or Policy
Suisun Marsh Secondary Management Area	Partially Designated: Underground or underwater electric transmission lines, intake or discharge lines and structures for cooling systems, underground or underwater fuel pipelines, underground or underwater steam pipelines.	Siting[1] Impacts-reduces the buffer area and areas available for cultivated lands and other productive uplands, visual impacts	**Suisun Marsh Preservation Act, Section 29002:** Finds that the Suisun Marsh, consisting of 55,000 acres of marshland and 30,000 acres of bays and sloughs, plays an important role in providing wintering habitat for waterfowl of the Pacific Flyway; important to waterfowl particularly in periods of drought, provides critical habitat for a diversity of species including endangered, rare and unique species, that the relatively large expanse of unbroken native habitat and diversity of vegetation are important in retaining these habitat areas and that future residential, commercial and industrial developments could adversely affect the wildlife value of the area. **Suisun Marsh Protection Plan, Environmental Policy 1:** The diversity of habitats in the Suisun Marsh and surrounding upland areas should be preserved and enhanced whenever possible to maintain the unique wildlife resources. **Suisun Marsh Protection Plan, Environmental Policy 2:** The Marsh waterways, managed wetlands, tidal marshes, seasonal marshes, and lowland grasslands are critical habitats for marsh-related wildlife and are essential to the integrity of the Suisun Marsh. Therefore, these habitats deserve special protection.
The Commission's Bay and Certain Waterway Jurisdiction other than areas otherwise identified	Partially Designated: Underground or underwater electric transmission lines, intake or discharge lines and structures for cooling systems, underground or underwater fuel pipelines, underground or underwater steam pipelines.	Siting[1] Impacts-would result in the placement of more fill than the minimum necessary for the project	**McAteer-Petris Act:** Prohibits fill unless it is the minimum necessary for the project and there are no alternative locations for the project. **San Francisco Bay Plan, Water Surface Area and Volume Policy 1:** The surface area of the Bay and the total volume of water should be kept as large as possible in order to maximize active oxygen interchange, vigorous circulation and effective tidal action.

Resource	Designation	Potential Impacts	BCDC Regulation or Policy
Marshes and Managed Wetlands	Fully Designated: All power plant facilities are prohibited in marshes, except for ancillary facilities that the Commission determines would have no substantial adverse environmental effects and would not conflict with priority use areas identified in the *San Francisco Bay Plan.*	Siting[1], Construction[2], Entrainment, Impingement, Thermal Discharge, Blowdown, Drift, Water and Air Quality and Visual Impacts	**McAteer-Petris Act, Section 66605(d):** That the nature, location and extent of any fill should be such that it will minimize harmful effects to the Bay area, such as, the reduction or impairment of the volume surface area or circulation of water, water quality, fertility of marshes or fish or wildlife resources. **San Francisco Bay Plan, Fish, Other Aquatic Resources and Wildlife Policy 1:** To assure the benefits of fish, other aquatic organisms and wildlife in the Bay should be insured for present and future generations, to the greatest extent feasible, the Bay's tidal marshes, tidal flats, and subtidal habitat, should be conserved, restored and increased. **San Francisco Bay Plan, Water Quality Policy 1:** To the greatest extent feasible, the Bay marshes, mudflats and water surface area and volume should be maintained and, whenever possible, increased. Fresh water inflow into the Bay should be maintained at a level adequate to protect Bay resources and beneficial uses. Bay water pollution should be avoided. **San Francisco Bay Plan, Tidal Marshes and Tidal Flats Policy 1:** Tidal marshes and tidal flats should be conserved to the fullest possible extent. Filling, diking, and dredging projects that would substantially harm tidal marshes or tidal flats should be allowed only for purposes that provide substantial public benefits and only if there is no feasible alternative. **San Francisco Bay Plan, Tidal Marshes and Tidal Flats Policy 2:** Any proposed fill, diking, or dredging project should be thoroughly evaluated to determine the effect of the project on tidal marshes and tidal flats, and designed to minimize, and if feasible, avoid any harmful effects. **San Francisco Bay Plan, Tidal Marshes and Tidal Flats Policy 3:** Projects should be sited and designed to avoid, or if avoidance is infeasible, minimize adverse impacts on any transition zone present between tidal and upland habitats. Where a transition zone does not exist and it is feasible and ecological appropriate, shoreline projects should be designed to provide a transition zone between tidal and upland habitats.

Resource	Designation	Potential Impacts	BCDC Regulation or Policy
Salt Ponds	Partially Designated: Underground or underwater electric transmission lines, intake or discharge lines and structures for cooling systems, underground or underwater fuel pipelines, underground or underwater steam pipelines. Power plants are prohibited in salt ponds.	Siting[1] Impacts- in the salt ponds the siting of a power plant would reduce the amount of land available for salt production and habitat and the potential for restoring these sites if they are withdrawn from production. In shell deposit areas the siting of a power plant would reduce the availability of this resource	**San Francisco Bay Plan, Salt Ponds and Other Managed Wetlands Policy 1:** As long as is economically feasible, the salt ponds should be maintained in salt production and the wetlands should be maintained in their present use. Property tax policy should assure that rising property taxes do not force the conversion of the ponds and other wetlands to urban development. In addition, the integrity of the salt production system should be respected (i.e., public agencies should not take for other projects any pond or portion of a pond that is a vital part of the production system. **San Francisco Bay Plan, Salt Ponds and Other Managed Wetlands Policy 2:** If, despite these provisions, the owner of the salt ponds or the owner of any managed wetland desires to withdraw any of the ponds or marshes from their present uses, the public should make every effort to buy these lands, breach the existing dikes, and reopen these areas to the Bay. This type of purchase should have a high priority for any public funds available, because opening ponds and managed wetlands to the Bay represents man's last substantial opportunity to enlarge the Bay rather than shrink it.
Tidal Flats	Fully Designated: All power plant facilities are prohibited in tidal flat, except for ancillary facilities that the Commission determines would have no substantial adverse environmental effects and would not conflict with priority use areas identified in the *San Francisco Bay Plan*.	Siting[1], Construction[2], Water and Air Quality and Visual Impacts.	**San Francisco Bay Plan, Tidal Marshes and Tidal Flats Policy 1:** Tidal marshes and tidal flats should be conserved to the fullest possible extent. Filling, diking, and dredging projects that would substantially harm tidal marshes or tidal flats should be allowed only for purposes that provide substantial public benefits and only if there is no feasible alternative. **San Francisco Bay Plan, Tidal Marshes and Tidal Flats Policy 2:** Any proposed fill, diking, or dredging project should be thoroughly evaluated to determine the effect of the project on tidal marshes and tidal flats, and designed to minimize, and if feasible, avoid any harmful effects. **San Francisco Bay Plan, Tidal Marshes and Tidal Flats Policy 3:** Projects should be sited and designed to avoid, or if avoidance is infeasible, minimize adverse impacts on any transition zone present between tidal and upland habitats. Where a transition zone does not exist and it is feasible and ecological appropriate, shoreline projects should be designed to provide a transition zone between tidal and upland habitats.

Resource	Designation	Potential Impacts	BCDC Regulation or Policy
Riparian Vegetation	**Fully Designated:** **All power plant facilities are prohibited in riparian vegetation areas, except for ancillary facilities that the Commission determines would have no substantial adverse environmental effects and would not conflict with priority use areas identified in the *San Francisco Bay Plan*.**	**Siting[1], Construction[2], Water and Air Quality Impacts**	**Suisun Marsh Protection Plan, Environmental Policy 1:** The diversity of habitats in the Suisun Marsh and surrounding upland areas should be preserved and enhanced whenever possible to maintain the unique wildlife resources. **Suisun Marsh Protection Plan, Environmental Policy 2:** The Marsh waterways, managed wetlands, tidal marshes, seasonal marshes, and lowland grasslands are critical habitats for marsh-related wildlife and are essential to the integrity of the Suisun Marsh. Therefore, these habitats deserve special protection.
Threatened and Endangered Species Habitat	**Fully Designated:** **All power plant facilities are prohibited in threatened and endangered species habitat, except for ancillary facilities that the Commission determines would have no substantial adverse environmental effects and would not conflict with priority use areas identified in the *San Francisco Bay Plan*.**	**Siting[1], Construction[2], Entrainment, Impingement, Thermal Discharge, Blowdown, Drift, Water and Air Quality**	**McAteer-Petris Act, Section 66605(d):** Designates endangered species habitat. The nature, location and extent of any fill should be such that it will minimize harmful effects to the Bay area, such as, the reduction or impairment of the volume surface area or circulation of water, water quality, fertility of marshes, or fish or wildlife resources. **Suisun Marsh Preservation Act, Section 29002:** Finds that the Suisun Marsh, consisting of 55,000 acres of marshland and 30,000 acres of bays and sloughs, plays an important role in providing wintering habitat for waterfowl of the Pacific Flyway; important to waterfowl particularly in periods of drought, provides critical habitat for a diversity of species including endangered, rare and unique species, that the relatively large expanse of unbroken native habitat and diversity of vegetation are important in retaining these habitat areas and that future residential, commercial and industrial developments could adversely affect the wildlife value of the area.

Resource	Designation	Potential Impacts	BCDC Regulation or Policy
Marine Mammal Haul Out Areas and Pupping Sites	Fully Designated: All power plant facilities are prohibited in marine mammal haul out areas and pupping sites, except for ancillary facilities that the Commission determines would have no substantial adverse environmental effects and would not conflict with priority use areas identified in the *San Francisco Bay Plan*.	Siting[1] and Construction[2] Impacts.	**McAteer-Petris Act, Section 66605(d):** Designates habitat areas by stating that the nature, location and extent of any fill should be such that it will minimize harmful effects to the Bay area, such as, the reduction or impairment of the volume surface area or circulation of water, water quality, fertility of marshes, or fish or wildlife resources. **San Francisco Bay Plan, Fish, Other Aquatic Resources and Wildlife Policy 1:** To assure the benefits of fish, other aquatic organisms and wildlife in the Bay should be insured for present and future generations, to the greatest extent feasible, the Bay's tidal marshes, tidal flats, and subtidal habitat, should be conserved, restored and increased. **San Francisco Bay Plan, Fish, Other Aquatic Organisms and Wildlife Policy 2:** Specific habitats that are needed to conserve, increase or prevent the extinction of any native species, species threatened or endangered, species that the California Department of Fish and Game has determined are candidates for listing as endangered or threatened under the California Endangered Species Act, or any species that provides substantial public benefits, should be protected, whether in the Bay or behind dikes.
Subtidal Areas, Migratory Fish Routes, Spawning Areas, Juvenile Fish Nurseries	Partially Designated: Overhead electric transmission lines, intake or discharge lines that pass completely through the area, underground or underwater fuel pipelines, underground or underwater steam pipelines. Other ancillary facilities may be located within these areas when the Commission determines that the facilities would not adversely affect migratory fish, their migration routes and their spawning and nursery sites, would have no other substantial adverse environmental effects, and would not conflict with priority use areas identified in the *San Francisco Bay Plan*. Power plants may not be constructed within these areas.	Entrainment, Impingement, Thermal Discharge, Water and Air Quality Impacts.	**McAteer-Petris Act, Section 66605(d):** Designates habitat areas by stating that the nature, location and extent of any fill should be such that it will minimize harmful effects to the Bay area, such as, the reduction or impairment of the volume surface area or circulation of water, water quality, fertility of marshes, or fish or wildlife resources. **San Francisco Bay Plan, Subtidal Areas Policy 1:** Any proposed filling or dredging project in a subtidal area should be thoroughly evaluated to determine the local and Bay-wide effects of the project on: (a) the possible introduction or spread of invasive species; (b)tidal hydrology and sediment movement; (c) fish, other aquatic organisms and wildlife; (d) aquatic plants; and (e) the Bay's bathymetry. Projects in subtidal areas should be designed to minimize, and if feasible, avoid any harmful effects. **San Francisco Bay Plan, Subtidal Areas Policy 2:** Subtidal areas that are scarce in the Bay or have an abundance and diversity of fish, other aquatic organisms and wildlife (e.g. eelgrass beds, sandy deep water or underwater pinnacles) should be conserved. Filling, changes in use, and dredging projects in these areas should therefore be allowed only if: (a) there is no feasible alternative; and (b) the project provides substantial public benefits.

1. Siting impacts include Bay fill, habitat destruction and displacement, land use impacts such as displacement of recreational resources like parks and public access or the displacement of a priority land use such as an area designated as a port or an airport, and noise and lighting impacts.
2. Construction impacts include temporary habitat destruction and displacement, noise and lighting impacts and temporary disruption of recreational activities and public access.

APPENDIX C

POWER PLANT STUDY'S GEOGRAPHIC INFORMATION SYSTEM DATA SOURCES

Resource	Designation	Data Sources
Parkland Areas	**Fully Designated:** **All power plant facilities are prohibited in existing and planned (already funded) parkland areas.**	**Bay Area Openspace Coverage** GreenInfo Network
Public Access Areas	**Partially Designated**	**Public Access Layer** Digitized from BCDC Permit Files Includes: Major permits 1965-2001 Minor permits 1990-2001
Ports and Water Related Industry Priority Use Areas	**Partially Designated:** **Allows for the siting of electric transmission lines, intake and discharge lines for cooling systems, fuel pipelines, steam pipelines, and co-generation facilities.**	**Priority Use Area Coverage** Digitized from San Francisco Bay Plan Maps
Airport Priority Use Areas	**Partially Designated:** **Allows for the siting of intake and discharge lines for cooling systems, underground electric transmission lines, fuel pipelines and steam pipelines.**	**Priority Use Area Coverage** Digitized from San Francisco Bay Plan Maps
Wildlife Priority Use Areas	**Fully Designated:** **All power plant facilities are prohibited in Wildlife Priority Use Areas.**	**Priority Use Area Coverage** Digitized from San Francisco Bay Plan Maps **DFG Lands Coverage** California Department of Fish and Game

Resource	Designation	Data Sources
Waterfront Parks Priority Use Areas	Fully Designated: All power plant facilities are prohibited in Waterfront Parks Priority Use Areas.	Priority Use Area Coverage Digitized from San Francisco Bay Plan Maps
Suisun Marsh Primary Manage-ment Area	Fully Designated: All power plant facilities are prohibited in the Suisun Marsh Primary Management Area.	Suisun Marsh Management Layer Digitized from BCDC "Areas Unsuitable for Power Plants" Maps, 1980
Suisun Marsh Secondary Manage-ment Area	Partially Designated: Underground or underwater electric transmission lines, intake or discharge lines for cooling systems, underground or underwater fuel pipelines, underground or underwater steam pipelines. For site in Suisun Marsh Secondary Management Area: Electric transmission lines, intake and discharge lines for cooling systems, fuel pipelines, steam pipelines, co-generation facilities.	Suisun Marsh Management Layer Digitized from BCDC "Areas Unsuitable for Power Plants" Maps, 1980
Marshes and Managed Wetlands	Fully Designated: All power plant facilities are prohibited in marshes and managed wetlands.	EcoAtlas San Francisco Estuary Institute

Salt Ponds	Partially Designated: Underground or underwater electric transmission lines, intake or discharge lines for cooling systems, underground or underwater fuel pipelines, underground or underwater steam pipelines. Power plants are prohibited in salt ponds.	**EcoAtlas** San Francisco Estuary Institute
Tidal Flats	Fully Designated	**EcoAtlas** San Francisco Estuary Institute
Threat-ened and Endangered Species Habitat	Fully Designated: All power plant facilities are prohibited in threatened and endangered species habitat.	**California Natural Diversity Database** California Department of Fish and Game **Least Tern Habitat** Environmental Sensitivity Index, NOAA **California Black Rail Habitat** Environmental Sensitivity Index, NOAA **Brown Pelican Habitat** Environmental Sensitivity Index, NOAA **Salt Marsh Harvest Mouse Habitat** Environmental Sensitivity Index, NOAA **Chinook Salmon Fry Habitat** Environmental Sensitivity Index, NOAA
Marine Mammal Haul Out and Pupping Sites	Fully Designated: All power plant facilities are prohibited in marine mammal haul out and pupping sites.	**Pinnipied Haul Out Sites** Coastal Change Analysis Program, NOAA and California State Lands Commission
Subtidal Areas, Migratory Fish Routes, Spawning Areas, Juvenile Fish Nurseries	Partially Designated	**Eelgrass Beds** Coastal Change Analysis Program, NOAA and California State Lands Commission **Fish Spawning Streams** Environmental Sensitivity Index, NOAA

APPENDIX D

POWER PLANT NON-SITING REGULATION

Regulation Section 11021

Add the following regulation:

11021. **Power Plant Siting.** The Commission has designated the following areas within its jurisdiction where the siting of thermal power plants that would generate 50 or more megawatts of power, and some or all ancillary facilities, would be precluded or limited.

(a) **Full Designation:** the following areas are fully designated as non-siting areas where neither power plants nor ancillary facilities may be constructed, except for ancillary facilities that the Commission determines would have no substantial adverse environmental effects and would not conflict with priority use areas identified in the *San Francisco Bay Plan.*

- Existing and proposed public parks;
- Existing and proposed public and private wildlife refuges;
- Existing and proposed Bay habitat restoration sites;
- Wildlife Priority Use Areas;
- Waterfront Park or Beach Priority Use Areas, including marinas, fishing piers and boat launching ramps;
- Suisun Marsh Primary Management Area;
- Tidal marshes, tidal flats and managed wetlands;
- Riparian vegetation;
- Habitat of species that are listed by a fish and wildlife management agency as threatened or endangered; and
- Marine mammal haul-out and pupping sites.

(b) **Partial Designation:** the following categories are partially designated as non-siting areas where the siting of power plants and ancillary facilities is limited, precluded or conditioned.

- **Category A**
  - Category A includes the following areas designated by the *San Francisco Bay Plan.*
    - Water-related industry priority use areas;
    - Port priority use areas; and

- Airport priority use areas.

- A power plant and any ancillary facility may be located within a Category A area when the project would not preclude or adversely affect the existing or future use of the priority use area for its primary purpose.

(2) **Category B**

- Category B includes the following areas:
  - The Commission's Bay and certain waterway jurisdiction other than the areas identified in subsections (a) and (b)(3);
  - The Suisun Marsh Secondary Management Area;
  - Salt ponds; and
  - Existing and proposed public access areas, including the San Francisco Bay Trail, when alternative access is provided during construction and the original access is restored thereafter.
- The following ancillary facilities may be located within Category B areas. Other ancillary facilities may be located within Category B areas when the Commission determines they would have no substantial adverse environmental effects and would not conflict with priority use areas identified in the *San Francisco Bay Plan*. Power plants may not be constructed within these areas.
  - Underground or underwater electric transmission lines;
  - Intake or discharge lines and structures for cooling systems;
  - Underground or underwater fuel pipelines; and
  - Underground or underwater steam pipelines.

(3) **Category C**

- Category C includes the following areas identified by the McAteer-Petris Act, the *San Francisco Bay Plan* and the *Suisun Marsh Protection Plan* and not otherwise designated in subsections (a) and (b)(2).
  - Subtidal areas;
  - Migratory fish routes;
  - Spawning areas; and
  - Nursery sites for juvenile fish and other aquatic organisms.

- The following ancillary facilities may be located within Category C areas when the project would not adversely affect migratory fish, their migration routes, and their spawning and nursery sites. Other ancillary facilities may be located within Category C areas when the Commission determines that the facilities would not adversely affect migratory fish, their migration routes and their spawning and nursery sites, would have no other substantial adverse environmental effects, and would not conflict with priority use areas identified in the *San Francisco Bay Plan.* Power plants may not be constructed within these areas.
    - Overhead electric transmission lines;
    - Intake or discharge lines for cooling systems that pass completely through the area;
    - Underground or underwater fuel pipelines; and
    - Underground or underwater steam pipelines.

- **Definitions.** For the purposes of this section, the following definitions apply:

  (1) "Proposed parks," "proposed wildlife refuges," "proposed Bay habitat restoration sites" and "proposed public access areas" mean parks, wildlife refuges, restoration sites and public access areas for which funding has been acquired.

  (2) "Ancillary facility" means a facility that will be required in order to generate and transmit power from a power plant. Such facilities include transmission lines, intake and discharge lines and structures, and fuel and steam pipelines.

- Despite the provisions of subsections (a) and (b), the Commission may advise the California Energy Commission that it does not object to a proposed project when either:
    - Due to the designations in this section there is a lack of areas available for the siting of a power plant in which case the Commission shall apply the following order of priorities for identifying the most appropriate sites:
        - The project would expand facilities within existing power plant sites;
        - The project would develop a new site adjacent to an existing power plant site;
        - The project would develop a new site in otherwise undesignated areas; or

- The project would develop a new site in partially designated areas only after a determination that: (i) the Bay site has greater relative merit than available inland sites; (ii) the proposed development is consistent with the primary use of the land; (iii) there will be no substantial adverse environmental effects; (iv) approval by any public agency having ownership or control of the land is obtained; and (v) opportunities consistent with the first four priorities are not feasible; or
- The project would avoid all adverse effects on the resource areas and would otherwise comply with the Commission's laws and policies.

Authority: Sections 66632(f) and 66645, Government Code; and Section 29201(e), Public Resource Code.

Reference: Section 66645, Government Code; the *San Francisco Bay Plan*; the *Suisun Marsh Protection Plan;* and Sections 25507 and 25523, Public Resource Code.