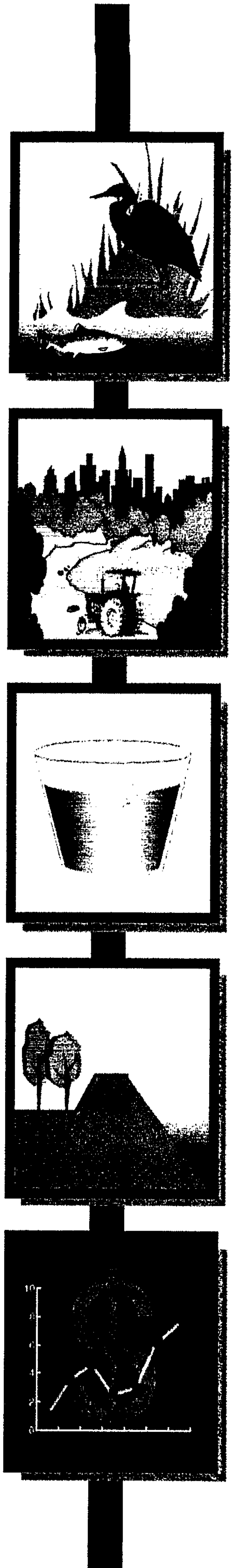


CALFED
BAY-DELTA
PROGRAM

Affected Environment and Environmental Impacts

Power Production Economics

Draft Technical Report
September 1997

CALFED/710

C-002678

CALFED BAY-DELTA PROGRAM
AFFECTED ENVIRONMENT
POWER PRODUCTION AND ENERGY

1.0 SUMMARY

This document describes the affected environment for Power Production and Energy with emphasis on key assessment variables. These variables are available capacity and sales, energy generation and sales, project energy use, and capacity and energy rates. Historical and existing conditions are described in the report. Table 1 provides a concise summary of existing conditions for key assessment variables based on a typical normal water year. Figure 1 depicts the average monthly energy generation and project use under existing conditions based on a typical normal water year. Both Table 1 and Figure 1 reflect combined system-wide conditions for the Central Valley Project (CVP) and State Water Project (SWP).

Table 1
Summary of Existing Power Production and Energy Conditions
For the Combined CVP and SWP
(1995 Level of Development - Average Water Year)

Nameplate Capacity (MW)	Energy Generation (MWh)	Annual Energy Use (MWh)	Average Energy ($/MWh)
3,678	9,627,000	9,975,000	21.48

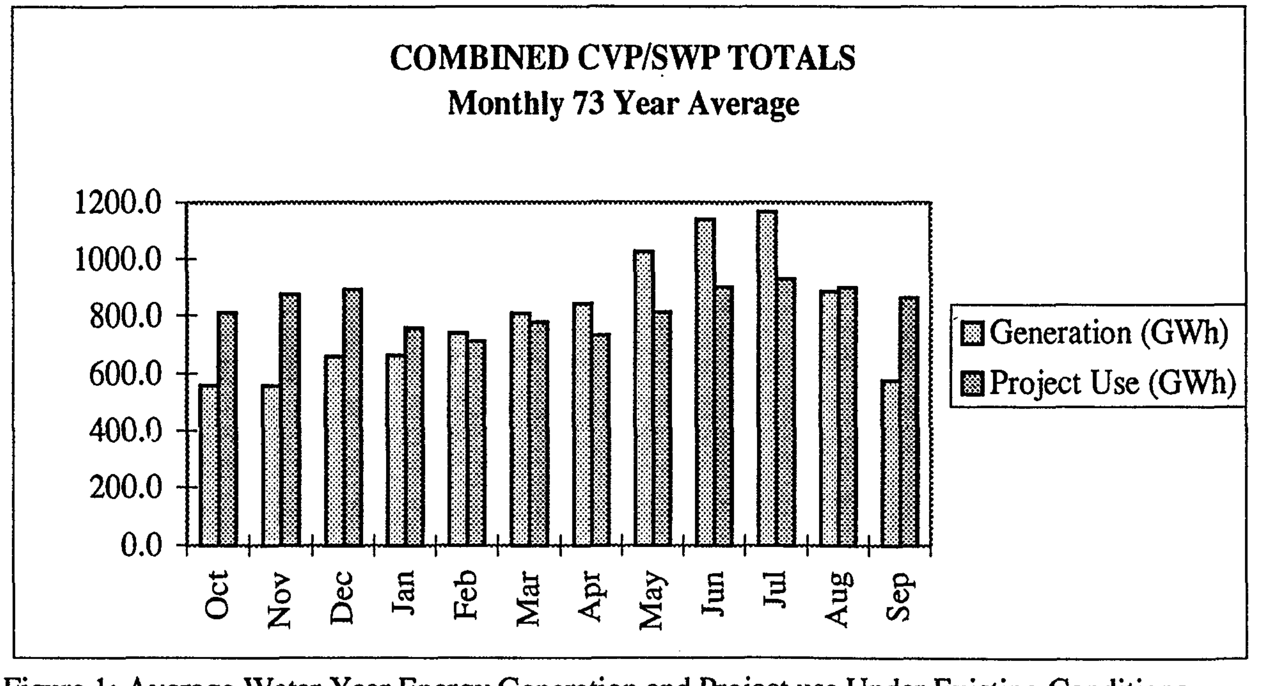


Figure 1: Average Water Year Energy Generation and Project use Under Existing Conditions (Monthly Averages)

2.0 INTRODUCTION

The purpose of this technical report is to provide a description of the affected environment for resources associated with power production and energy. In order to accurately describe the affected environment for power production and energy it will be necessary to define not only current conditions but also historical conditions. The historical conditions are described to place current conditions in perspective. The report describes the relevant regulatory context, historical power production and energy trends, and existing power production and energy conditions for the study area. The current and historic conditions will be described in this report for each of the five regions within the study area: Delta Region, Bay Region, Sacramento River Region, San Joaquin River Region, and State Water Project (SWP) Service Areas outside the Central Valley. The executive summary contained in this technical report in conjunction with other information, data, and modeling developed during pre-feasibility will be used to prepare the affected environment section of the Programmatic Environmental Impact Report/Environmental Impact Study (EIR/EIS).

This report and the Power Production and Energy Impact Analysis Technical Report focus on the major power and energy assessment variables listed below.

- Available Power Capacity and Energy Generation at CVP and SWP Hydroelectric Power Plants
- CVP and SWP Project Energy Use
- CVP and SWP Capacity and Energy Sales
- CVP and SWP Power Production and Replacement Costs
- CVP and SWP Power Rates

3.0 SOURCES OF INFORMATION

The system operations model used during this EIR/EIS study (DWRSIM) includes a power module that defines available power capacity, energy generation, and project energy use (primarily pumping requirements) for each of the major CVP and SWP power and pumping facilities. The DWRSIM results for the existing conditions model scenario was the source of information for the following types of existing conditions data included in this report: system-wide available power capacity, energy generation, and project energy use.

U.S. Bureau of Reclamation (Reclamation), Western Area Power Administration (Western), and California Department of Water Resources (DWR) documents and staff were the sources of information for historical data on power facilities, regulatory background information, power prices, power and energy sales, and power customer names and locations.

Various Federal Energy Regulatory Commission (FERC), California Public Utilities Commission (CPUC), California Energy Commission (CEC), and Western States Coordinating Council (WSCC) documents related to electric utility industry restructuring and deregulation were used to prepare the related regulatory context section.

4.0 ENVIRONMENTAL SETTING

4.1 STUDY AREA

The study area covered by this report consists of those areas where the major types of potential power- and energy-related impacts could occur as a result of implementing the CALFED alternatives. Map 1 shows the geographic boundaries of the CALFED regions. Map 2 shows the location and name of each of the existing CVP and SWP hydroelectric and pumping facilities and the boundaries of the CALFED regions used in this analysis. Additional information regarding the power and pumping facilities that could be impacted is provided in Sections 4.3 through 4.8.

4.2 REGULATORY CONTEXT

This section includes regulatory- and institutional-related background information that is provided to help the reader better understand the material in this technical report and the related information in the Power Production and Energy Impact Analysis Technical Report.

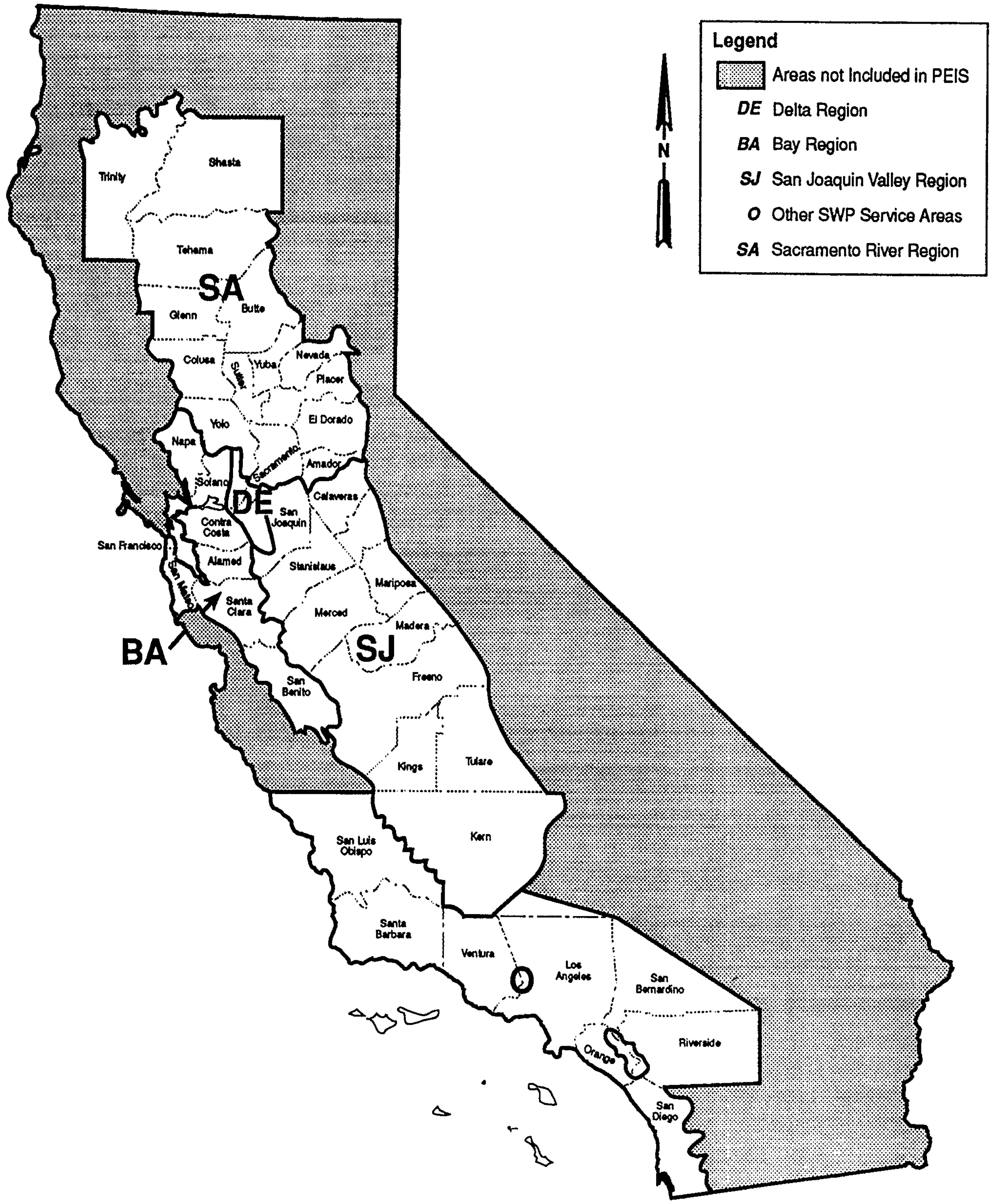
4.2.1 AUTHORIZATION FOR CVP POWER AND ENERGY SALES AND RELATED POWER CONTRACTS AND RATES

CVP facilities have been constructed and are operated under Reclamation Law and the authorizing legislation for each facility. Initially, Reclamation projects were authorized under the Reclamation Act of 1902. The Act of 1902 authorized projects to be developed solely for irrigation and reclamation purposes.

In 1906, Reclamation Law was amended to include power as a purpose of the projects if power was necessary for operation of the irrigation water supply facilities, or if power could be developed economically in conjunction with the water supply projects. The Act of 1906 allowed sale of surplus power under the terms of 10-year contracts. Surplus power was described as power that exceeds the capacity and energy required to operate the Reclamation facilities (Project Use Load). The Act of 1906 included the "preference clause". The preference clause stipulated that surplus power would be sold with "preference" to municipalities and public corporations or agencies. If additional power was available after the preference power loads were met, the additional power could be sold to private industries or utilities.

Power supply was first authorized as a purpose for some CVP facilities in the Rivers and Harbors Act of 1937 that included authorization for federal funding of the initial CVP facilities. The Act of 1937 defined the priorities for the purposes of the CVP as: 1) navigation and flood control, 2) irrigation and municipal and industrial water supplies, and 3) power supply.

The Reclamation Project Act of 1939 modified Reclamation Law for all Reclamation facilities, including the CVP. This act changed the maximum term of Reclamation's water supply and power contracts to a period of 40 years, reconfirmed the preference clause, and included the policy that the federal government would market power to serve the public interest rather than to obtain a profit. The Act of 1939 changed the methodology of calculation of interest rates to be applied to surplus power contracts.



Map 1
CALFED Region Boundaries

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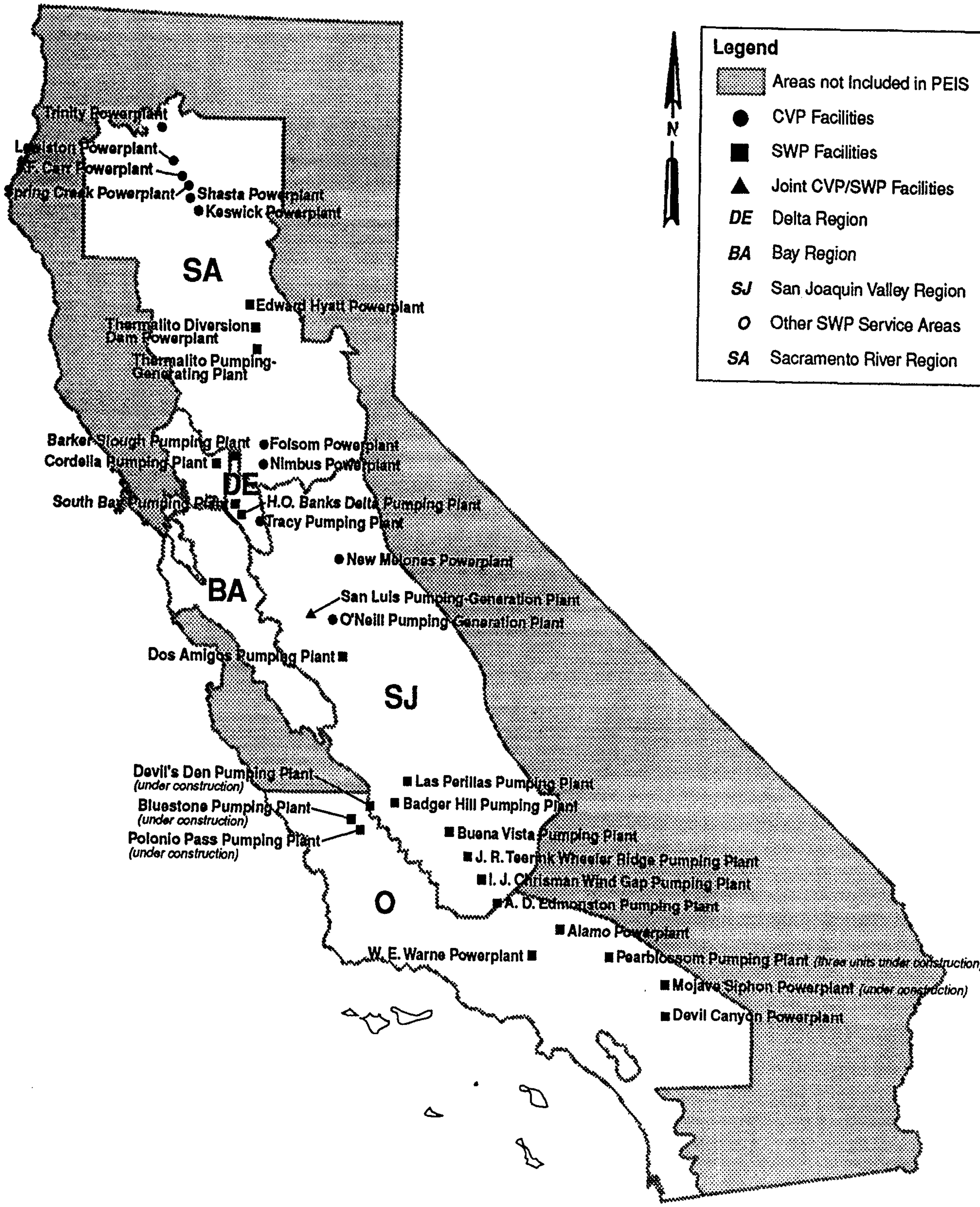

Map 2
Potentially Affected Power and Energy Resources

Until 1977, Reclamation operated the CVP power generation and transmission facilities and marketed the power generated by the CVP facilities. In 1977, the Western Area Power Administration (Western) was established as part of the Department of Energy. Western operates, maintains, and upgrades the transmission grid that was constructed by the CVP. Western also dispatches and markets CVP power to the CVP, Preference Power Customers, and other utilities. Western, as part of their marketing function, ensures that CVP Project Use Loads are met at all times by using a mix of generation resources including CVP generation and other purchased resources.

4.2.2 AUTHORIZATION FOR SWP POWER AND ENERGY SALES AND RELATED POWER CONTRACTS AND RATES

The California State Legislature authorized, in 1951, the construction of a water storage and supply system to capture and store runoff in northern California and deliver it to areas of need in northern and southern California, the San Francisco Bay Area, and the San Joaquin Valley. Eight years later, the Legislature passed the Burns-Porter Act, which provided the mechanism for obtaining funds necessary to construct the initial facilities. In 1960, California voters approved an issue of $1.75 billion in general obligation bonds, as authorized in the act, thereby obtaining funds to build the State Water Project (SWP).

In addition to providing approximately two-thirds of California residents with at least part of their drinking water, and irrigation water to 600,000 acres of farmland, the SWP was designed and built to control floods, generate power, provide recreational opportunities, and enhance habitats for fish and wildlife. The development of the SWP provides the managing agency, the Department of Water Resources (DWR) with the ability to fund the project through the sale of water and power. The DWR has developed a power resources program to guide the development and use of SWP power resources.

The goals of the SWP power resources program are to:

- Obtain reliable, environmentally sensitive, and competitively priced power sources and transmission services sufficient for operating the SWP.
- Develop and manage power resources to minimize the cost of water deliveries to SWP contractors.
- Minimize impacts on the SWP when major contractual power arrangements begin to expire in 2004.
- Meet responsibilities and criteria of the Western System Coordinating Council.
- Conform with regulations of the California Energy Commission and the Federal Energy Regulatory Commission.

To achieve these goals, DWR constructed its own power facilities and contracted for long-term power resources with many electric utilities. In addition, DWR arranged for transmission service between the SWP power resources and pumping loads and inter-connected utilities. The power resources program also takes advantage of the SWP water storage and conveyance capacities that can allow DWR to operate pumps somewhat independently of water delivery needs. This pumping load and generation control enables DWR to enter into advantageous agreements with other electric utilities. Those agreements complement the use of SWP generation to meet SWP power requirements.

4.2.3 BACKGROUND ON ELECTRIC INDUSTRY RESTRUCTURING

The electric industry in California is undergoing a comprehensive restructuring, the objective of which is to reduce electric rates and provide electric consumers with more choices. This process has significant implications for future power values relevant to the evaluation of the CALFED alternatives. The following description of the elements of this restructuring are provided as background.

Open Access Transmission - At the federal level, the Energy Policy Act of 1992 initiated the restructuring process by mandating that access to electric transmission service at the wholesale level be available to all eligible customers. The FERC, which regulates wholesale power and transmission transactions, issued Order No. 888 which provides for "open access" transmission service, and the recovery of wholesale "transition" costs, or "stranded" costs.

With open access transmission, low-cost power suppliers have access to new customers, thereby increasing wholesale competition and creating an opportunity for reduced power costs.

California Restructuring Legislation (AB 1890) - At the state level, retail electric service is regulated by the CPUC, which has been pursuing electric restructuring for three years. AB 1890 was signed into law in September, 1996, and largely confirmed the policies proposed by the CPUC. Under the AB 1890 plan, PG&E,SCE, and SDG&E will continue to own their transmission facilities, but will turn operation of these facilities over to an Independent System Operator or ISO, which will be regulated by FERC. The ISO, functioning like an air traffic controller for energy, will operate the state's transmission system to ensure reliable electric service to all customers. The ISO also will make sure all parties have equal access to the transmission grid.

A Power Exchange (PX) regulated by FERC will also be established, and PG&E, SCE, and SDG&E must initially sell their power through the Power Exchange. Municipal utilities, independent power producers, irrigation districts, and out-of-state producers may also sell power through the Power Exchange. Electric consumers will be allowed "direct access" to alternative suppliers beginning January 1, 1998, although some kind of phase-in schedule may be implemented. These direct access customers will be obligated to pay a "competition transition charge" or CTC to allow PG&E, SCE, and SDG&E to recover the cost of uneconomic power resources.

With retail competition will come opportunities to buy "green" or environmentally safe power supplies, and many other pricing and service options. Retail customers will be able to band together and "aggregate" their loads and negotiate arrangements on the basis of their aggregated load. In addition to PG&E, SCE, and SDG&E, many other companies will provide power supply and related services.

PG&E, SCE, and SDG&E must buy power from the Power Exchange for four years to resell to retail customers who continue to buy electricity from the utilities. They will pay a price determined by the Power Exchange based on the market

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demand for power. This is intended to assure fair competition between utilities and other electricity suppliers. AB 1890 guarantees an initial rate reduction of 10 percent to the retail customers of PG&E, SCE, and SDG&E.

PG&E, SCE, and SDG&E will continue to operate lower voltage "distribution" lines, and will be responsible for reliable, safe distribution of power. The CPUC will continue to make sure they fulfill these responsibilities, and will regulate transmission and distribution rates using performance-based, rather than cost-of-service ratemaking.

Plans for the ISO and PX have been developed through a participatory process involving regulators, investor-owned utilities, power marketers, municipal utilities, irrigation districts, and customer advocates. On March 31, 1997, the Trustee for the ISO and PX filed a comprehensive plan with FERC, on which comments and protests are due by June 6.

The PX will develop "balanced" schedules of loads and resources that will be submitted to the ISO. Other "scheduling coordinators," such as municipal utilities or others who wish to enter transactions outside the PX, will also be able to submit balanced schedules to the ISO.

Implications for Power Rates -The restructuring of the California electric industry will significantly affect the value of power resources. Historically, rates have reflected dependable (also referred to as "firm") capacity and energy. While the dependable capacity of hydroelectric resources potentially affected by the CALFED alternatives during critical dry years will remain a relevant indicator of value, the pricing of power resources, by which the capability of a hydroelectric resource might be measured, will be changed in several ways.

In the new market structure, energy suppliers will bid into "day-ahead" and "hour-ahead" markets, and rather than long term contracts for unit-contingent or "firm" capacity supported by system resources, markets for "ancillary" services will be conducted. These ancillary services include regulation, operating reserves (including "spinning" and "non-spinning" reserves), replacement reserves, black start capability, and voltage support.

Of these ancillary services, only "replacement reserves" represent a new product. The WSCC requires that its members maintain operating reserves (which must be available to serve load within ten minutes) to assure reliable service as customer loads fluctuate. In the new market structure, utilities will be able to procure operating reserves and the other ancillary services from the Independent System Operator (ISO). Alternatively, certain of the ancillary services may be "self-provided" by certain parties.

Another significant difference arises due to the operation of the transmission grid by the ISO. Most schedules will be accepted by the ISO, but transmission is a limited resource, and under certain conditions some transmission paths will be congested. If two "zones" are separated by a congested transmission path, then the ISO will assign the limited available transmission capacity to those who place the highest value on its use. Market-clearing prices for energy and ancillary services will differ by location, and as a result, the relative value of the energy and ancillary services that may be impacted by the CALFED alternatives might appropriately be distinguished by location, through these location-based differentials.

4.3 OVERALL STUDY AREA ENVIRONMENTAL SETTING

This section presents historical and existing conditions for the study area as a whole. This overall perspective is useful for many of the power and energy assessment variables. Related data are often reported on a system-wide basis, for example CVP and SWP system-wide energy generation and sales and system-wide project energy use.

4.3.1 HISTORICAL PERSPECTIVE

This section provides a brief description of historical CVP and SWP system-wide available capacity and energy generation, system-wide power and energy sales, power rates and project energy use from 1960 through 1995.

The interrelated nature of the power facilities within the CVP and SWP prevents the development of useful analyses on a regional basis. This section, and subsequent sections, provides quantitative analyses of the CVP and SWP on a system-wide basis only. Regional descriptions (beginning in Section 4.4) will be limited to a discussion of the facilities that are physically located in each region.

CVP History

CVP power generation facilities were initially developed based on the premise that power could be generated to meet project use loads. The Reclamation Act of 1939 provided for surplus power to be sold first to preference customers. Preference power customers include irrigation and reclamation districts, cooperatives, public utility districts, municipalities, California educational and penal institutions, and federal defense and other institutions. Surplus commercial firm power may be sold to non-preference utilities. The first commercial power generated by the CVP (at the Shasta powerplant) was sold to PG&E in 1945. The initial power preference customers began to take delivery in the late 1940s.

CVP power is not necessarily generated at the appropriate times to meet peak power needs of project use and preference customers. In addition, power generation is frequently reduced due to droughts and changes in minimum stream flow requirements. To maximize the beneficial use of CVP power, Western frequently exchanges, or banks, power with PG&E and purchases power from PG&E and other entities, such as suppliers in the Pacific Northwest, to meet project use and preference customer loads.

Power rates for preference customers are determined by Western. Western completes an annual Power Repayment Study to determine if revenues from power sales will be sufficient to pay all costs assigned to the CVP power purposes, including operation and maintenance and interest expenses. The revenues must be sufficient to recover the investment of the CVP facilities within a 50-year period after the facilities become operational or as provided by federal law. The revenues must also be sufficient to recover the investment in federal transmission facilities and the cost of replacement of all power facilities within the service life of the facilities up to a maximum period of 50 years.

SWP History

Water deliveries from the SWP were initially provided in 1962 to Alameda and Santa Clara Counties through the South Bay

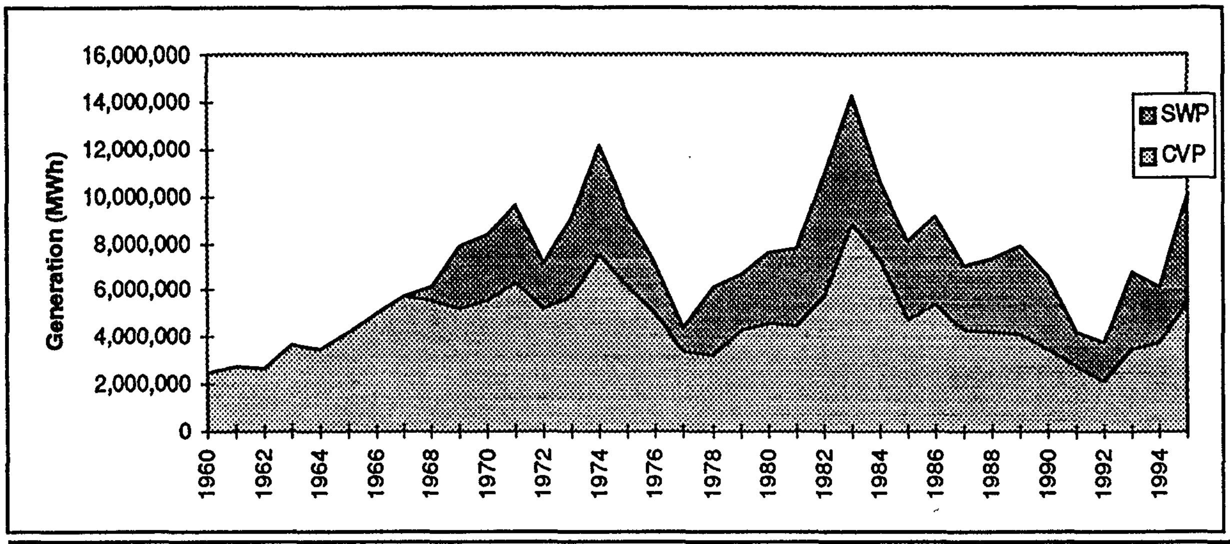
Aqueduct. Power generation from SWP facilities was first realized in 1968 with the operation of the Hyatt-Thermalito facilities downstream of Lake Oroville. The primary purpose of the SWP generation facilities has always been to provide power for project use, primarily to project pumping plants.

SWP power is not, however, necessarily generated at the appropriate times to meet peak power needs of project use. Conversely, power generation at off-peak periods of project use can exceed project use power needs and provide an opportunity for the sale of excess power. Starting in 1968, SWP power was provided to the power grid of California's large investor-owned utilities, with whom the SWP had agreements to provide and receive power. SWP net generation was provided to the utilities and "banked" so that the SWP received an in-kind credit from the utilities for power to be used at project pumping plants during times of peak project use.

DWR began selling SWP power directly to customers in 1983. While energy exchanges with the investor-owned utilities remained in place, contracts were executed that provided for the bilateral sale of power between DWR and various power customers.

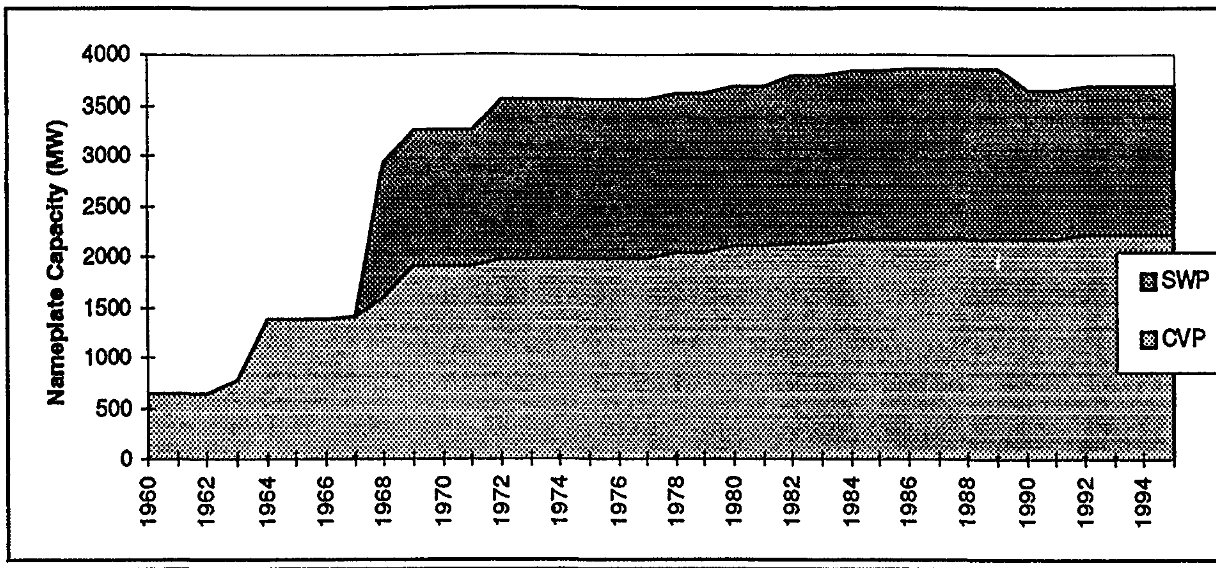
4.3.1.1 System-Wide CVP and SWP Capacity and Energy Generation

Figure 2 summarizes the historical system-wide energy generation attributable to the CVP and SWP power systems. Figure 3 summarizes the historical system-wide nameplate capacity attributable to the CVP and SWP power systems.



/1 - Totals are net of station service.
/2 - Totals include station service.
Sources: Reclamation Power Program
Western, Sierra Nevada Regional Office
DWR, Bulletin 132

Figure 2 - Historical System-Wide Generation

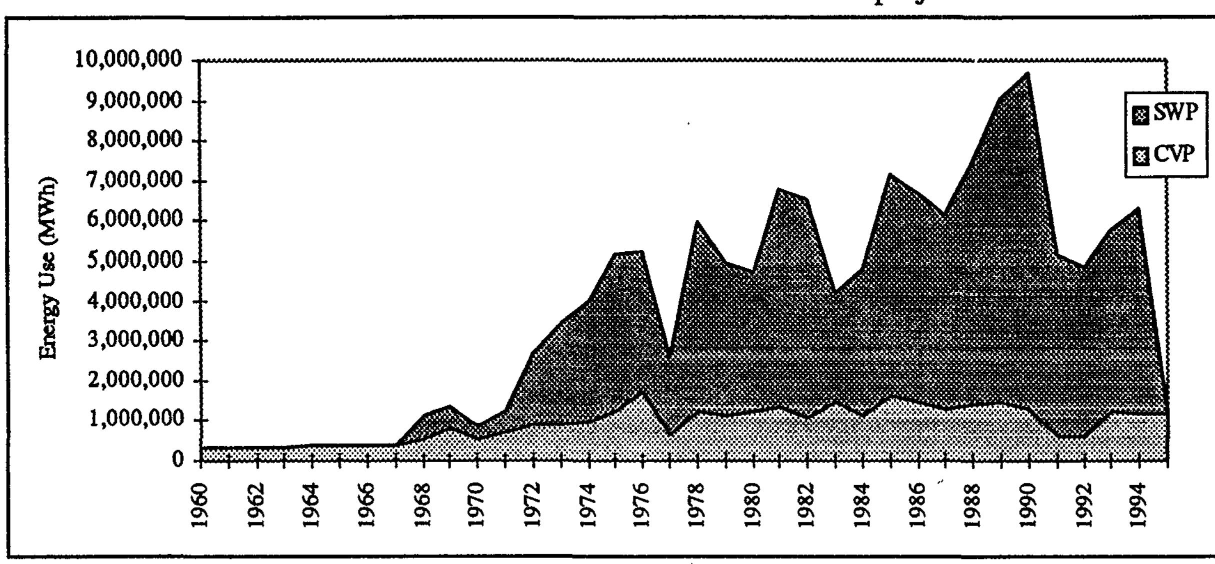


SWP - Capacity is estimated based on current nameplate capacity and year of initial service. Early years may be overestimated if substantial uprates have occurred.
Sources: Reclamation Power Program
Western, Sierra Nevada Regional Office
DWR, Bulletin 132

Figure 3 - Historical System-Wide Nameplate Capacity

4.3.1.2 System-Wide CVP and SWP Project Energy Use

Figure 4 summarizes the historical system-wide project energy use of the CVP and SWP water projects.

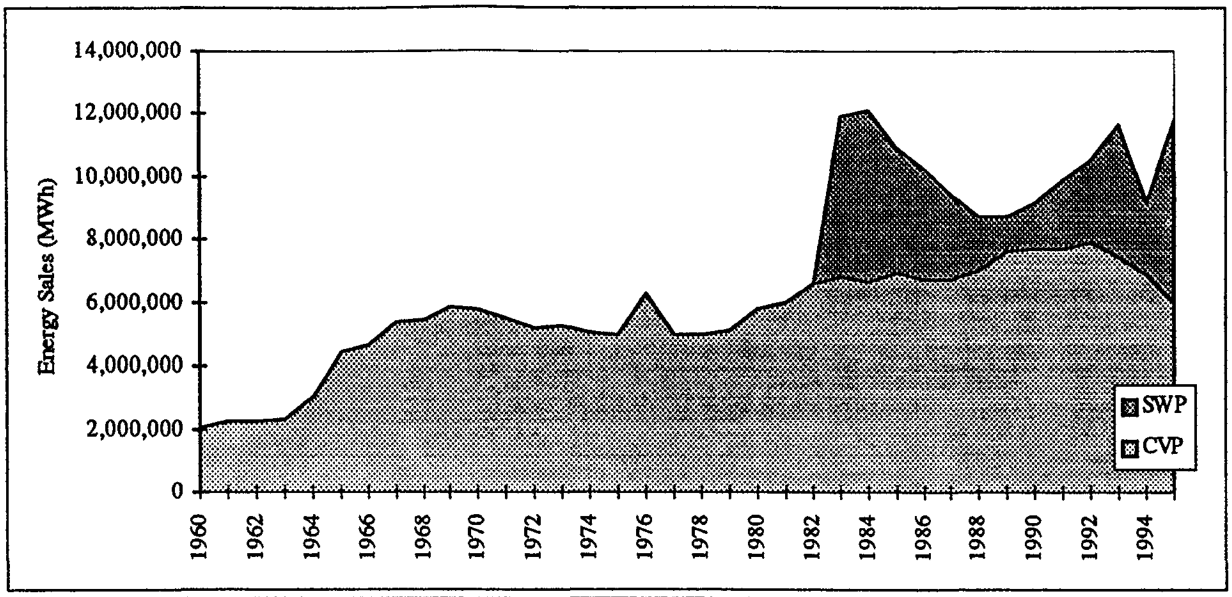


Sources: Western, Sierra Nevada Regional Office
DWR, Bulletin 132

Figure 4 - Historical System-Wide Project Energy Use

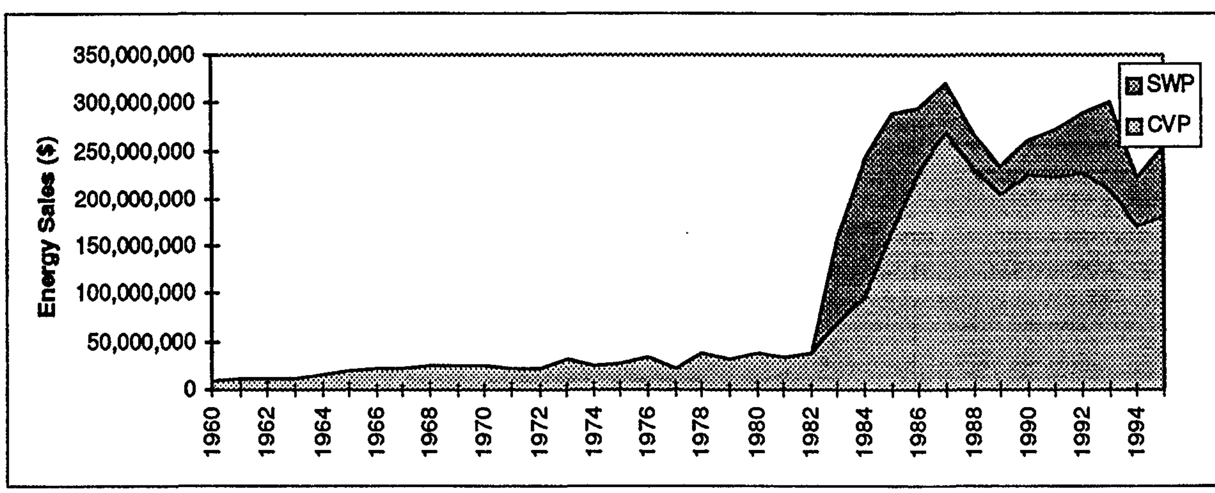
4.3.1.3 System-Wide CVP and SWP Power and Energy Sales

Figure 5 summarizes the historical system-wide hydroelectric energy sales (in MWh) from the CVP and SWP power systems. Figure 6 summarizes the historical system-wide hydroelectric energy sales (in $) from the CVP an SWP power systems. Figure 7 summarizes the historical system-wide capacity sales (in $) from the CVP and SWP systems.



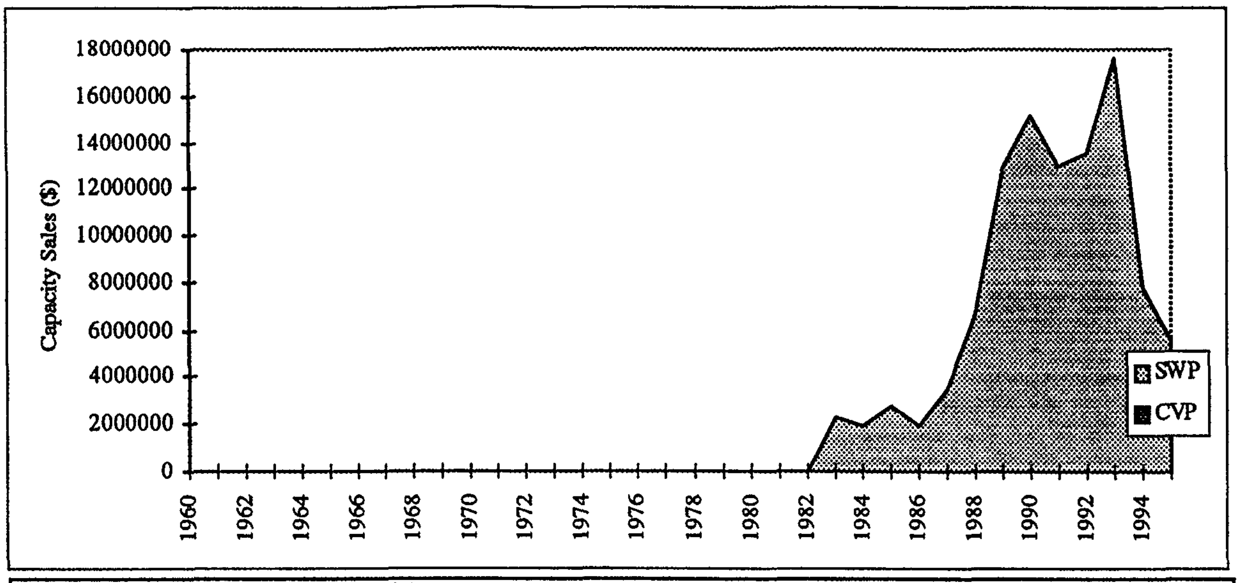
CVP - Energy sales are for firm commercial only. Prior to 1965, some CVP energy was sold as non-firm. These sales are not reflected here.
SWP - Energy sales were initiated by DWR in 1983.
Sources: Western, Sierra Nevada Regional Office
DWR, Bulletin 132

Figure 5 - Historical System-Wide Energy Sales (MWh)



CVP - Energy sales are for firm commercial only. Prior to 1965, some CVP energy was sold as non-firm. These sales are not reflected here.
SWP - Energy sales were initiated by DWR in 1983.
Sources: Western, Sierra Nevada Regional Office
DWR, Bulletin 132

Figure 6 - Historical System-Wide Energy Sales ($)



CVP -This information is being prepared by Western staff.
SWP - Includes sales of capacity, emergency service, and transmission.
Sources: Western, Sierra Nevada Regional Office
DWR, Bulletin 132

Figure 7 - Historical System-Wide Capacity Sales ($)

(Note: Western is providing capacity sales information. When the information is made available, Figure 7 will be updated.)

4.3.1.4 CVP and SWP Power Rates

Table 2 summarizes the historical system-wide power and energy rates for CVP and SWP power and energy sales. The SWP is a water delivery project and does not include a calculation of capacity payments to its customers. Since they do not charge for capacity in the traditional sense, no capacity rate is calculated.

4.3.1.5. Power and Energy Impacts at Other Hydroelectric Power Plants.

Hydroelectric power plants within the study area, but not operated as part of the CVP or SWP, may be impacted by changes in operation of water flows in the study area. Those potentially impacted will be discussed by region.

4.3.2 CURRENT RESOURCE CONDITIONS

Hydroelectric generation facilities associated with the CVP and SWP have a total nameplate capacity of approximately 3,678 MW. In an average water year, 9,627,000 MWh of energy are estimated to be generated and 9,975,00 MWh are consumed by project use (primarily surface water pumping).

A summary of energy generation and use in an average water year is provided in Table 1. Monthly averages of generation and sales in an average water year is presented graphically in Figure 1.

Table 2
Historical System-Wide Power and Energy Rates

Year	CVP		SWP
	Capacity Rate ($/MW-month)	Energy Rate ($/MWh)	Energy Rate[1] ($/MWh)
1960-1973	750	3.00	
1974	1/1-3/31 750 4/1-12-31 1,150	3.00	
1975-1977	1,150	3.00	
1978	1/1-5/24 1,150 5/25-12-31 2,000	1/1-5/24 3.00 5/25-12/31 4.20	
1979	2,000	1/1-10/31 4.20 11/1-12/31 5.11	
1980-1982	2,000	5.11	
1983	1/1-5/24 2,000 5/25-12/31 3,750	1/1-5/24 5.11 5/25-12/31 8.53	17.02
1984	3,750	1/1-9/30 13.74 10/1-12/31 18.95	26.35
1985	3,750	1/1-10/31 18.95 11/1-12/31 27.97	31.38
1986	3,750	1/1-9/30 27.97 10/1-12/31 31.44	19.08
1987	3,750	31.44	19.68
1988	1/1-4/30 3,750 5/1-12-31 6,860	1/1-4/30 31.44 5/1-12/31 14.43	21.61
1989	1/1-9/30 6,860 10/1-12/31 7,490	1/1-9/30 14.43 10/1-12/31 15.76	26.48
1990	7,490	15.76	24.58
1991	1/1-9/30 7,490 10/1-12/31 7,740	1/1-9/31 15.76 10/1-12/31 16.30	22.25
1992	7,740	16.30	24.57
1993	1/1-4/30 7,740 5/1-9/30 6,450 10/1-12/31 6,220	1/1-9/31 16.30 10/1-12/31 17.97	22.39
1994	6,220	1/1-4/30 17.97 Base 16.99 Tier 30.87	23.23
1995	1/1-9/30 6,220 10/1-12/31 4,030	Base 14.83 Tier 25.90	12.27

[1] Calculated based on total energy sales in both $ and MWh.
Sources: Western, Sierra Nevada Regional Office
DWR, Bulletin 132

4.4 DELTA REGION

The Delta Region is defined as the 738,238 acre legal Delta and the 127,485 acre Suisun Marsh and Bay. Due to the interrelated nature of CVP and SWP power facilities across CALFED regions, regional analyses will not be undertaken. This section provides a description and qualitative discussion of the facilities that are physically located within the defined Delta Region.

4.4.1 CVP GENERATION FACILITIES

No CVP generation facilities are located in the Delta Region.

4.4.2 SWP GENERATION FACILITIES

No SWP generation facilities are located in the Delta Region.

4.4.3 CVP SURFACE WATER PUMPING

Tracy Pumping Plant

The Tracy Pumping Plant is located in San Joaquin County near the City of Tracy. The plant moves water from the Delta Region into the San Joaquin River Region by pumping Delta water into the Delta-Mendota Canal.

4.4.4 SWP SURFACE WATER PUMPING

Barker Slough Pumping Plant

In the northern section of the Delta, the Barker Slough Pumping Plant diverts water for delivery to Napa and Solano Counties through the North Bay Aqueduct, which was completed in 1988.Barber Slough has nine units with a total motor rating of 4,800 horsepower (hp), providing a total flow at design head of 228 cfs.

Banks Pumping Plant

In the southern Delta, water is diverted to the Clifton Court Forebay for delivery south of the Delta. The Harvey O. Banks Delta (Banks) Pumping Plant is located in San Joaquin County, just south and west of the CVP's Tracy Pumping Plant. The plant lifts water from Clifton Court Forebay into Bethany Reservoir. Most of the water from Bethany Reservoir flows into the Governor Edmund G. Brown California Aqueduct, delivering water to the San Joaquin River Valley and southern California. Banks has 11 units with a total motor rating of 333,000 hp, providing a total flow at design head of 10,668 cfs.

South Bay Pumping Plant

The South Bay Pumping Plant lifts some water from Bethany Reservoir to the South Bay Aqueduct. Water in the South Bay Aqueduct is supplied to Alameda and Santa Clara Counties. South Bay has nine units with a total motor rating of 27,800 hp providing a total flow at design head of 330 cfs.

4.4.5 CVP POWER CUSTOMERS

Seven CVP preference power customers have a service area located wholly or partially within the Delta Region. These customers make up 37.4 percent of total CVP preference customer energy sales. The following preference power customers have service areas located wholly or partially in the Delta Region.

- Sacramento Municipal Utility District
- Travis AFB
- California Medical Facility, Vacaville
- Tracy Defense Distribution Depot
- UC - Davis
- Naval Radio Station, Dixon

- Lodi

In addition, Pacific Gas & Electric purchases CVP non-preference power.

4.4.6 SWP POWER CUSTOMERS

Of the 24 SWP power customers, two have a service area located wholly or partially within the Delta Region. These customers make up 29.0 percent of total SWP energy sales. The following SWP power customers have service areas located wholly or partially in the Delta Region.

- Pacific Gas and Electric Company
- Sacramento Municipal Utility District

4.5 BAY REGION

The Bay Region is defined as including Napa, San Francisco, San Mateo, Alameda, Santa Clara, and San Benito Counties, and the parts of Solano and Contra Costa County not included in the Delta. This section provides a description and qualitative discussion of the facilities that are physically located within the defined Bay Region.

4.5.1 CVP GENERATION FACILITIES

No CVP generation facilities are located in the Bay Region.

4.5.2 SWP GENERATION FACILITIES

No SWP generation facilities are located in the Bay Region.

4.5.3 CVP SURFACE WATER PUMPING

No CVP surface water pumping facilities are located in the Bay Region.

4.5.4 SWP SURFACE WATER PUMPING

Cordelia Pumping Plant

The Cordelia Pumping Plant is located on the North Bay Aqueduct and moves water diverted from the Delta to destinations in Napa and Solano Counties. Cordelia has 11 units with a total motor rating of 5,600 hp, providing a total flow at design head of 138 cfs.

Del Valle Pumping Plant

The Del Valle Pumping Plant is located on the South Bay Aqueduct and moves water diverted from the Delta to destinations in Alameda and Santa Clara Counties. Del Valle has four units with a total motor rating of 1,000 hp, providing a total flow at design head of 120 cfs.

4.5.5 CVP POWER CUSTOMERS

Eighteen CVP preference power customers have a service area located wholly or partially within the Bay Region. These customers make up 32.7 percent of total CVP preference customer energy sales. The following preference power customers have service areas located wholly or partially in the Bay Region.

- Alameda
- Naval Shipyard, Mare Island
- Palo Alto
- Naval Weapons Station, Concord
- Santa Clara
- East Contra Costa Irrigation District
- East Bay Municipal Utility District
- Onizuka AFB
- Santa Clara Valley Water District
- DOE, Lawrence Berkeley National Laboratory
- West Side Irrigation District
- DOE, Lawrence Livermore National Laboratory
- Bay Area Rapid Transit District
- DOE, Site 300

- Ames Research Center (NASA)
- DOE, Stanford Linear Accelerator
- Moffett Federal Airfield (NASA)
- Parks Reserve Forces Training Area

In addition, Pacific Gas & Electric and the City of San Francisco purchase CVP non-preference power.

4.5.6 SWP POWER CUSTOMERS

Of the 24 SWP power customers, three have a service area located wholly or partially within the Bay Region. These customers make up 8.7 percent of total SWP energy sales. The following SWP power customers have service areas located wholly or partially in the Bay Region.

- Hetch Hetchy Water and Power
- Pacific Gas and Electric Company
- City of Santa Clara

4.6 SACRAMENTO RIVER REGION

The Sacramento River Region is defined as including Trinity, Shasta, Tehama, Glenn, Butte, Colusa, Sutter, Yuba, Nevada, Yolo, Placer, El Dorado, and Amador Counties, and the portion of Sacramento County no included in the Delta. Due to the interrelated nature of CVP and SWP power facilities across CALFED regions, regional analyses will not be undertaken. This section provides a description and qualitative discussion of the facilities that are physically located within the defined Sacramento River Region.

4.6.1 CVP GENERATION FACILITIES

Shasta Powerplant

The Shasta Powerplant is located on the western bank of the Sacramento River below Shasta Dam, nine miles northwest of Redding, California. The powerplant contains seven generating units, including two station service units. The powerplant, initially operated in 1944, has been expanded from the original nameplate capacity of 379 MW to a current installed capacity of 539 MW provided by five main generation units. The powerplant is a peaking plant. Its power is dedicated first to Project Use. The remaining energy is marketed to various preference customers in northern California.

Keswick Powerplant

The Keswick Powerplant at Keswick Dam was constructed nine miles downstream of the Shasta Powerplant as an afterbay. The afterbay regulates, or dampens, the rapid flow fluctuations that occur when the Shasta Powerplant operations change suddenly to meet changing power loads. The powerplant, initially operated in 1949, was expanded (in 1992) from the original nameplate capacity of 75 MW to a current installed capacity of 117 MW. The powerplant is a run-of-the-river plant and is dedicated first to Project Use. The remaining energy is marketed to various preference customers in northern California.

Trinity Powerplant

The Trinity Powerplant at Trinity Dam is located on the Trinity River, nine miles upstream from Lewiston, California. The powerplant has two units, and includes both high head and low head turbines to allow for adjustments with variable power pool elevations. The powerplant, initially operated in 1964, was expanded (in 1984) from the original nameplate capacity of 100 MW to a current installed capacity of 140 MW. The powerplant is a peaking plant and is dedicated first to Project Use. The remaining energy is marketed to various preference customers in northern California.

Trinity County has first preference to the power benefit to the CVP from Trinity Powerplant.

Lewiston Powerplant

After flowing through the Trinity Powerplant, water empties into Lewiston Reservoir. Water released from Lewiston Reservoir flows through the Lewiston Powerplant and on into either the Trinity River or the Clear Creek Tunnel. The powerplant, initially operated in 1964, has an installed capacity of 350 kW. The powerplant is a run-of-the-river plant and provides station service to Trinity Powerplant and power to local fish hatchery loads. Energy in excess of hatchery loads is sold to PG&E at 15 mills per kWh.

Judge Francis Carr Powerplant

Water diverted from the Clear Creek Tunnel passes through the Judge Francis Carr Powerplant before entering Whiskeytown Lake. The powerplant is located on Clear Creek, at the outlet of Clear Creek Tunnel on the northwestern extremity of Whiskeytown Lake. The powerplant, initially operated in 1963, was uprated (in 1984) from the original nameplate capacity of 143.68 MW to a current installed capacity of 154.4 MW. The actual operating capability is limited by operating conditions of the Clear Creek Tunnel. Mineral deposits in the tunnel reduce the capacity of the tunnel and the related generation capability. Tunnel operations are suspended periodically in the spring months to allow the mineral deposits to be removed naturally. Generation capabilities are restored as the tunnel is self-cleaned. The average generation capabilities range from 147 to 158 MW. The powerplant is a peaking plant and is dedicated first to Project Use. The remaining energy is marketed to various preference customers in northern California. Trinity County has first preference to the power benefit to the CVP from the Judge Francis Carr Powerplant.

Spring Creek Powerplant

The Spring Creek Powerplant is located on the Spring Creek arm of Keswick Reservoir, near Redding, California. The powerplant, initially operated in 1964, was uprated (in 1981-82) from the original nameplate capacity of 150 MW to a current installed capacity of 180 MW. The actual operating capability is determined by hydraulic capacity of the Spring Creek Tunnel. In a manner similar to the Clear Creek Tunnel, tunnel operations become limited due to mineral deposits and periodic cleaning operations. Powerplant operation is tied to flow regimes aimed at minimizing the building of metal concentrations in the Spring Creek arm of the Keswick Reservoir. The powerplant is a peaking plant and is dedicated first to Project Use. The remaining energy is marketed to various preference customers in northern California. Trinity County has first preference to the power benefit to the CVP from the Spring Creek Powerplant.

Folsom Powerplant

The Folsom Powerplant is located on the north bank of the American River at the foot of Folsom Dam, about 20 miles northeast of Sacramento, California. The powerplant, initially operated in 1955, was uprated (in 1972) from the original nameplate capacity of 162 MW to a current installed capacity of 198.72 MW. The powerplant is a peaking plant and is dedicated first to Project Use. The remaining energy is marketed to various preference customers in northern California. The powerplant also provides power for the pumping plant, which supplies the local domestic water supply. Folsom Powerplant is being increasingly relied upon to support local loads during system disturbances.

Nimbus Powerplant

The Nimbus Powerplant was initially operated in 1955 as an afterbay for the Folsom Powerplant. The Powerplant is located on the right abutment of Nimbus Dam on the north side of the American River, about seven miles downstream from Folsom. The installed capacity of the powerplant is 13.5 MW. The powerplant is a run-of-the-river plant and provides station service backup for Folsom Powerplant. Nimbus Dam also includes a diversion structure to convey water to the Folsom South Canal.

4.6.2 SWP GENERATION FACILITIES

Hyatt-Thermalito Plant Complex

The Edward Hyatt Pumping-Generating Plant , the Thermalito Pumping-Generating Plant, and the Thermalito Diversion Dam Powerplant are located along the Feather River below Oroville Dam near Oroville, California. The plants, initially operated in 1968, have a total installed capacity of 903 MW. In addition to generation, the Hyatt Plant pumps water to the Thermalito Diversion Dam Reservoir. After passing through the Thermalito Diversion Dam Powerplant, water flows through the Thermalito Pumping-Generating Plant and is pumped to the Thermalito Afterbay for release into the Feather River. The primary purpose of the facility is to generate power for project use. Remaining energy is marketed primarily to customers in the Pacific Northwest and northern California.

4.6.3 CVP SURFACE WATER PUMPING

No CVP pumping facilities are located in the Sacramento River Region.

4.6.4 SWP SURFACE WATER PUMPING

Hyatt-Thermalito Plant Complex

The SWP operates two pumping-generating plants in the Sacramento River Region, the Edward Hyatt Pumping-Generating Plant and the Thermalito Pumping-Generating Plant. Descriptions of these facilities were provided in Section 4.6.2.

The pumping component of Hyatt has three units with a total motor rating of 519,000 hp, providing a total flow at design head of 5,610 cfs. The pumping component of Thermalito has three units with a total motor rating of 120,000 hp, providing a total flow at design head of 9,120 cfs.

4.6.5 CVP POWER CUSTOMERS

Twenty-one CVP preference power customers have a service area located wholly or partially within the Sacramento River Region. These customers make up 53.4 percent of total CVP preference customer energy sales. The following preference power customers have service areas located wholly or partially in the Sacramento River Region.

- Biggs
- Gridley
- Healdsburg
- Redding
- Roseville
- Shasta Lake
- Plumas - Sierra Rural Electric Cooperative
- Ukiah

- Beale AFB
- Sonoma County Water Authority
- Trinity County Public Utility District
- Glenn-Colusa Irrigation District
- Provident Irrigation District
- Lassen Municipal Utility District
- Tuolumne Public Power Agency
- McClellan AFB
- California State Parks & Recreation
- California State Prison, Folsom
- San Juan Water District
- CSU, Sacramento
- Sacramento Municipal Utility District

In addition, Pacific Gas & Electric purchases CVP non-preference power.

4.6.6 SWP POWER CUSTOMERS

Of the 24 SWP power customers, four have a service area located wholly or partially within the Sacramento River Region. These customers make up 38.2 percent of total SWP energy sales. The following SWP power customers have service areas located wholly or partially in the Sacramento River Region.

- Lassen Municipal Utility District
- Northern California Power Agency
- Pacific Gas and Electric Company
- Sacramento Municipal Utility District

4.7 SAN JOAQUIN RIVER REGION

The San Joaquin River Region is defined as including Calaveras, Stanislaus, Tuolumne, Merced, Mariposa, Madera, Fresno, Kings, Tulare, and Kern Counties, and the portion of San Joaquin county not included within the Delta. Due to the interrelated nature of CVP and SWP power facilities across CALFED regions, regional analyses will not be undertaken. This section provides a description and qualitative discussion of the facilities that are physically located within the defined San Joaquin River Region.

4.7.1 CVP GENERATION FACILITIES

San Luis Pumping-Generating Plant

The San Luis Pumping-Generating Plant is located on San Luis Creek, 12 miles west of Los Banos, California. The San Luis Pumping-Generating Plant is a joint Federal-State facility. The facility is operated and maintained by the State of California under an operation and maintenance agreement with Reclamation. The facility (also known as the William R. Gianelli Pumping-Generating Plant) lifts water by pump turbines from the O'Neill forebay into the San Luis Reservoir. During the irrigation season, water is released from San Luis Reservoir back through the pump turbines to the forebay and energy is reclaimed. Each of the eight pumping-generating units has a capacity of 63,000 horsepower as a motor and 53 MW as a generator. As a pumping station to fill San Luis Reservoir, each unit lifts 1,375 cfs at 290 feet total head. As a generating plant, each unit passes 1,640 cfs at the same head. The powerplant, initially operated in 1968, has an installed capacity of 424 MW, of which 202 MW are apportioned as Reclamation's share. The remaining 222 MW are apportioned to DWR. The primary purpose of the facility is to pump CVP water for off-stream storage.

O'Neill Pumping-Generating Plant

The O'Neill Pumping-Generating Plant is located on San Luis Creek, 2.5 miles downstream from San Luis Dam. The O'Neill Pumping-Generating Plant consists of an intake channel leading off the Delta-Mendota Canal and six pump-generating units. Normally these units operate as pumps to lift water from 45 to 53 feet into the O'Neill forebay. Water is occasionally released from the forebay to the Delta Mendota Canal, and these units then operate as generators. When operating as pumps and motors, each unit can discharge 700 cubic feet per second and has a rating of 6,000 horsepower. The powerplant, initially operated in 1967, has an installed capacity of 25.5 MW. The primary purpose of the facility is to pump CVP water for off-stream storage and only generates part of the year. The authorizing legislation for O'Neill states that power generated at the facility can not be used for commercial purposes. The generation produced at O'Neill is allocated as Project Use power for the CVP and the cost associated with generation is allocated to the irrigation component of the CVP.

New Melones Powerplant

The New Melones Powerplant is located on the Stanislaus River in Tuolumne County, California. The powerplant, initially operated in 1979, has an installed capacity of 300 MW. The powerplant is a peaking plant and is dedicated first to Project Use. The remaining energy is marketed to various preference customers in northern California.

4.7.2 SWP GENERATION FACILITIES

San Luis (William R. Gianelli) Pumping-Generating Plant

The San Luis Pumping-Generating Plant is a joint SWP-CVP facility. A description of the facility is provided in Section 4.7.1.

4.7.3 CVP SURFACE WATER PUMPING

The CVP operates two pumping generating plants in the San Joaquin River Region, the San Juan Pumping Generating Plant and the O'Neill Pumping Generating plant. Descriptions of these facilities were provided in Section 4.7.1.

4.7.4 SWP SURFACE WATER PUMPING

San Luis (William R. Gianelli) Pumping-Generating Plant

The San Luis Pumping-Generating Plant is a joint SWP-CVP facility. A description of the facility is provided in Section 4.7.1.

Dos Amigos Pumping Plant

The Dos Amigos Pumping Plant is located on the California Aqueduct, south of the San Luis (Gianelli) Pumping-Generating Plant, and raises water in the aqueduct as it flows south through the San Joaquin Valley. Dos Amigos has six units with a total motor rating of 240,000 hp, providing a total flow at design head of 15,450 cfs.

Las Perillas Pumping Plant

The Las Perillas Pumping Plant is located at the juncture of the California Aqueduct and the Coastal Branch Aqueduct, which currently serves agricultural areas west of the California Aqueduct and is being extended to serve municipal and industrial water users in San Luis Obispo and Santa Barbara Counties. The Las Perillas Pumping Plant diverts water from the California Aqueduct to the Coastal Branch Aqueduct. Las Perillas has six units with a total motor rating of 4,000 hp, providing a total flow at design head of 461 cfs.

Badger Hill Pumping Plant

The Badger Hill Pumping Plant is located on the Coastal Branch Aqueduct, and currently serves agricultural areas west of the California Aqueduct. Badger Hill has six units with a total motor rating of 11,800 hp, providing a total flow at design head of 454 cfs.

Buena Vista Pumping Plant

The Buena Vista Pumping Plant is located on the California Aqueduct, at the south end of the San Joaquin Valley, and is the northernmost of three successive pumping plants that raise water in the aqueduct as it nears the foot of the Tehachapi Mountains. Buena Vista has ten units with a total motor rating of 144,500 hp, providing a total flow at design head of 5,405 cfs.

J.R. Teerink Wheeler Ridge Pumping Plant

The J.R. Teerink Wheeler Ridge Pumping Plant is located on the California Aqueduct, at the south end of the San Joaquin Valley, and is the second of three successive pumping plants that raise water in the aqueduct as it nears the foot of the Tehachapi Mountains. Wheeler Ridge has nine units with a total motor rating of 150,000 hp, providing a total flow at design head of 5,445 cfs.

I.J. Chrisman Wind Gap Pumping Plant

The I.J. Chrisman Wind Gap Pumping Plant is located on the California Aqueduct, at the south end of the San Joaquin Valley, and is the last and southernmost of three successive pumping plants that raise water in the aqueduct as it nears the foot of the Tehachapi Mountains. Wind Gap has nine units with a total motor rating of 330,000 hp, providing a total flow at design head of 4,995 cfs.

A.D. Edmonston Pumping Plant

The A.D. Edmonston Pumping Plant is located on the California Aqueduct, at the northern foot of the Tehachapi Mountains. Remaining water in the aqueduct at this point is to be delivered to southern California, and must cross the Tehachapi Mountains to do so. The A.D. Edmonston Pumping Plant lifts the water in the aqueduct 1,926 feet, the highest single lift of any pumping plant in the world. Edmonston has 14 units with a total motor rating of 1,120,000 hp, providing a total flow at design head of 4,480 cfs.

4.7.5 CVP POWER CUSTOMERS

Fifteen CVP preference power customers have a service area located wholly or partially within the San Joaquin River Region. These customers make up 3.0 percent of total CVP preference customer energy sales. The following preference power customers have service areas located wholly or partially in the San Joaquin River Region.

- Avenal
- Northern California Youth Center
- Naval Communication Station, Stockton
- Byron-Betheny Irrigation District
- Sharpe Defense Distribution Depot
- Deuel Vocational Institute
- Calaveras Public Power Agency
- Sierra Conservation Center
- Patterson Water District
- West Stanislaus Irrigation District
- Banta-Carbona Irrigation District
- San Luis Water District
- Modesto Irrigation District
- Reclamation District 2035
- Turlock Irrigation District

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In addition, Pacific Gas & Electric purchases CVP non-preference power.

4.7.6 SWP POWER CUSTOMERS

Of the 24 SWP power customers, three have a service area located wholly or partially within the San Joaquin River Region. These customers make up 13.1 percent of total SWP energy sales. The following SWP power customers have service areas located wholly or partially in the San Joaquin River Region.

- Pacific Gas and Electric Company
- Modesto Irrigation District
- Turlock Irrigation District

4.8 SWP SERVICE AREAS OUTSIDE THE CENTRAL VALLEY

The SWP Service Areas Outside the Central Valley are defined as including San Luis Obispo, Santa Barbara, Ventura, Los Angeles, and Orange Counties, and the western valley sections of San Bernardino, Riverside, and San Diego Counties. Due to the interrelated nature of CVP and SWP power facilities and customers across CALFED regions, regional analyses will not be undertaken. This section provides a description and qualitative discussion of the facilities and customers that are physically located within the defined SWP Service Areas Outside the Central Valley.

4.8.1 CVP GENERATION FACILITIES

No CVP generation facilities are located outside the Central Valley.

4.8.2 SWP GENERATION FACILITIES

Alamo Powerplant

The Alamo Powerplant is located in the northwest corner of Los Angeles County, south of the Tehachapi Mountains. The powerplant, initially operated in 1986, has an installed capacity of 15 MW. The powerplant is dedicated first to Project Use. The remaining energy is marketed to customers in the L.A. Basin area.

W.E. Warne Powerplant

The Warne Powerplant is located in the northwest corner of Los Angeles County, downstream of the Alamo Powerplant. The powerplant, initially operated in 1982, has an installed capacity of 78 MW. The powerplant is dedicated first to Project Use. The remaining energy is marketed to customers in the L.A. Basin area.

Devil Canyon Powerplant

The Devil Canyon Powerplant is located in San Bernardino County, near the City of San Bernardino. The powerplant, initially operated in 1972, has an installed capacity of 240 MW. The powerplant is dedicated first to Project Use. The remaining energy is marketed to customers in southern California and the Desert Southwest.

Mojave Siphon Powerplant

The Mojave Siphon Powerplant is under construction on the East Branch Aqueduct in San Bernardino County. It will be located just upstream of Silverwood Lake. The powerplant will have an installed capacity of 28 MW. The powerplant is dedicated first to Project Use. The remaining energy will be marketed to customers in southern California and the Desert Southwest.

4.8.3 CVP SURFACE WATER PUMPING

No CVP pumping facilities are located outside the Central Valley.

4.8.4 SWP SURFACE WATER PUMPING

Oso Pumping Plant

The Oso Pumping Plant is located at the juncture of the California Aqueduct and the West Branch Aqueduct, which delivers water primarily to users in Los Angeles County. The Oso Pumping Plant diverts water from the California Aqueduct to the West Branch Aqueduct. Oso has eight units with a total motor rating of 93,800 hp, providing a total flow at design head of 3,252 cfs.

Pearblossom Pumping Plant

Water not diverted to the West Branch Aqueduct from the California Aqueduct flows to the East Branch Aqueduct. The Pearblossom Pumping Plant is located on the East Branch Aqueduct, which delivers water primarily to users in San Bernardino and Riverside Counties. Pearblossom pumps water from the Antelope Valley into Silverwood Lake in the San Bernardino Mountains. Pearblossom has nine units with a total motor rating of 203,200 hp, providing a total flow at design head of 2,575 cfs.

Devil's Den Pumping Plant

The Devil's Den Pumping Plant is under construction and is located on the Coastal Branch Aqueduct, west of the Badger Hill Pumping Plant. Its purpose will be to serve municipal and industrial water users in San Luis Obispo and Santa Barbara Counties. Devil's Den will have six units with a total motor rating of 10,500 hp, providing a total flow at design head of 150 cfs.

Bluestone Pumping Plant

The Bluestone Pumping Plant is under construction and is located on the Coastal Branch Aqueduct, west of the Devil's Den Pumping Plant. Its purpose will be to serve municipal and industrial water users in San Luis Obispo and Santa Barbara Counties. Bluestone will have six units with a total motor rating of 10,500 hp, providing a total flow at design head of 150 cfs.

Polonio Pass Pumping Plant

The Polonio Pass Pumping Plant is under construction and is located on the Coastal Branch Aqueduct, west of the Bluestone Pumping Plant. Its purpose will be to serve municipal and industrial water users in San Luis Obispo and Santa Barbara Counties. Polonio Pass will have six units with a total motor rating of 10,500 hp, providing a total flow at design head of 150 cfs.

4.8.5 CVP POWER CUSTOMERS

Twelve CVP preference power customers have a service area located wholly or partially within SWP Service Areas Outside the Central Valley. These customers make up 4.0 percent of total CVP preference customer energy sales. The following preference power customers have service areas located wholly or partially in SWP Service Areas Outside the Central Valley.

- Broadview Water District
- James Irrigation District
- Naval Air Station, Lemore
- Cawelo Water District
- Lindsay-Strathmore Irrigation District
- Lower Tule River Irrigation District

- Rag Gulch Water District
- Kern-Tulare Water District
- Terra Bella Irrigation District
- Delano-Earlimart Irrigation District
- Arvin-Edison Water District
- Lompoc

4.8.6 SWP POWER CUSTOMERS

Of the 24 SWP power customers, seven have a service area located wholly or partially within the SWP Service Areas Outside the Central Valley. These customers make up 1.2 percent of total SWP energy sales. The following SWP power customers have service areas located wholly or partially in SWP Service Areas Outside the Central Valley.

- Southern California Edison Company
- Los Angeles Department of Water and Power
- City of Burbank
- City of Glendale
- City of Pasadena
- City of Riverside
- City of Vernon

5.0 REFERENCES

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CALFED BAY-DELTA PROGRAM
ENVIRONMENTAL IMPACTS/CONSEQUENCES
POWER PRODUCTION AND ENERGY

1.0 INTRODUCTION

The intent of the CALFED Bay-Delta Program (Program) is to develop long-term solutions to problems affecting the San Francisco Bay/Sacramento-San Joaquin Delta estuary in Northern California. Overall, the effect of the Program is expected to be beneficial. However, specific Program components may have potentially adverse impacts.

The purpose of this technical report is to document, in a programmatic manner, the potential impacts of the Program on power and energy resources. The objective is to describe and analyze effects on power and energy resources that could result from the no action alternative or implementing any of the three Program alternatives. This report discusses potential impacts that may occur on a system-wide basis, and in the five regions within the study area including the Delta Region, Bay Region, Sacramento River Region, San Joaquin River Region, and the State Water Project (SWP) Service Areas Outside the Central Valley. The report also contains a brief description of potential mitigation strategies designed to reduce Program impacts to a less than significant level. The executive summary contained in this technical report in conjunction with other information, data, and modeling developed during pre-feasibility will be used to prepare the environmental impacts section of the Programmatic EIR/EIS.

The program alternatives would impact power and energy resources and related economic factors. This report addresses these potential impacts by focusing on the assessment variables listed below.

- Available Power Capacity and Energy Generation at CVP and SWP Hydroelectric Power Plants
- Power and Energy Impacts at Other Hydroelectric Power Plants
- CVP and SWP Project Energy Use
- CVP and SWP Power and Energy Sales
- CVP and SWP Power Production and Replacement Costs
- CVP and SWP Power Rates
- CVP and SWP Customer Power Costs

Some additional power and energy resource assessment variables are addressed in this report in less detail. These types of impacts involve assessment variables that will be assessed in more detail in subsequent project-level assessments. They include changes in energy use caused by: construction of facilities, changes in water treatment requirements, changes in water use efficiency, and traffic and navigation impacts.

The potential impacts of the program alternatives (also referred to as the CALFED alternatives) are described in Section 5.0 of this report. Section 2.0 is an executive summary while Section 3.0 defines the assessment methods used to conduct the analysis. Section 4.0 defines the significance criteria used in the impact analysis.

2.0 EXECUTIVE SUMMARY

(This section will be completed once the analysis is finished. The types of figures listed below will be used to show the key energy generation and sales results. The other types of major results of the analysis will be presented in a table similar to Table 1)

- *Figure 1: Average Water Year Energy Generation and Sales Under Existing Conditions, No Action Conditions and Alternative 1 (Monthly Averages)*
- *Figure 2: Average Water Year Energy Generation and Sales Under Existing Conditions, No Action Conditions and Alternative 2 (Monthly Averages)*
- *Figure 3: Average Water Year Energy Generation and Sales Under Existing Conditions, No Action Conditions and Alternative 3 (Monthly Averages)*

Table 1
Summary of Major Power Production and Energy Impact Analysis Results

Assessment Variables		
Alternatives	**Annual Energy Generation at CVP and SWP Facilities (000 MWh)**	**Annual CVP and SWP Project Energy Use (000 MWh)**
No Action	10,909	14,582
Alternative I		
Scenario 1	10,909	14,582
Scenario 2	11,047	15,395
Alternative II		
Scenario 3	10,763	14,885
Scenario 4	11,047	15,395
Scenario 5	10,843	14,963
Alternative III		
Scenario 6	10,737	15,053
Scenario 7	10,957	15,959
Scenario 8	10,957	15,959

3.0 ASSESSMENT METHODS

3.1 ASSESSMENT METHODS COMMON TO EACH POWER PRODUCTION AND ENERGY ASSESSMENT VARIABLE

The methods defined in this section were used to assess impacts related to all of the power production and energy assessment variables. Conditions associated with each CALFED action alternative, the No Action Alternative and existing conditions were all defined separately and documented. Conditions associated with the CALFED action alternatives were then compared to No Action Alternative conditions to define the impacts of the action alternatives. The significance criteria were applied to determine if mitigation would be required.

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Ranges of impacts were defined to represent the types of impacts that could result from the CALFED action alternatives. Examples of potential alternative components were used to develop the representative ranges of impacts because the specific components of the CALFED action alternatives have not been defined for the purpose of this programmatic review.

3.2 HYDROELECTRIC CAPACITY AND ENERGY GENERATION

The CALFED alternatives would change the existing capacity of state and federal hydroelectric power plants in the study area as well as the amount of energy generated at the facilities. Impacts on other hydroelectric facilities in the Sacramento-San Joaquin basin other than those which are included in the SWP and the CVP may also result. The methods used to assess potential physical impacts on power facilities and impacts on such facilities during operation are described below.

3.2.1 PHYSICAL IMPACTS TO POWER PLANTS

The CALFED action alternatives may include physical modifications to existing hydroelectric power plants and the construction of new hydroelectric power plants. The impacts of these changes were identified by first defining which power plants may be modified and which new power plants may be constructed under each alternative. The existing and proposed nameplate capacity ratings of these power plants were defined in megawatts (MW) and summarized in a table along with information regarding the location of the affected facilities and the name of the related management agencies. Changes in power capability of these facilities were defined when determining the impacts of changes in operation.

3.2.2 CAPACITY AND ENERGY GENERATION IMPACTS DURING OPERATION

The next step of the analysis consisted of defining how the operation of SWP and CVP hydroelectric power facilities would change in the future after (1) the proposed physical modifications to power plants are completed, (2) the projects included in the No Action Alternative scenario are implemented, and then (3) the proposed system operational changes included in the CALFED action alternatives are fully implemented. The proposed system operational changes included in the CALFED action alternatives primarily consist of operation of new storage and conveyance facilities and changes in releases from state and federal reservoirs and are primarily designed to meet the ecosystem restoration and water quality objectives of the CALFED program.

The following types of operational impacts were assessed:

- changes in available average capacity (average capacity on an annual and monthly basis based on the existing level of development and an average hydrologic year).
- changes in available average energy generation (the average annual and monthly energy generation based on the existing level of development and an average hydrologic year).
- changes in potential to provide ancillary services, such as regulation, reserves and reactive power support.

The California Department of Water Resources' (DWR's) system operational model (DWRSIM) was used to define changes in available capacity and energy generation at affected state and federal hydroelectric facilities. Specifically, the DWRSIM Output Analysis System provides CVP Power Operation Tables and SWP Power Operation Tables. These output exhibits provided estimates of average monthly energy that would be available to meet the SWP pumping energy requirements, and the Project Use and preference power requirements of CVP power customers from affected hydroelectric facilities. Average monthly storage by reservoir was used, together with estimated power output by reservoir level, to estimate the average maximum capacity output within that month.

A total of eight operational scenarios have been defined to characterize the range of operational results for the CALFED action alternatives. The DWRSIM output analysis has been relied on to establish a range of operational impacts for each Alternative. Table 2 describes the relationship between the operational scenarios used in this analysis and both the DWRSIM case number and CALFED Alternatives that correspond to the scenario.

The impacts of the CALFED alternatives on both CVP and SWP power production and energy generation is completed on an incremental basis by following the steps listed below.

- The monthly maximum instantaneous capacity is estimated based on average reservoir levels by month, by facility, in average year conditions, for each of the CVP and SWP hydroelectric power plants.

Table 2
Relationship of Operational Scenarios, DWRSIM Cases, and CALFED Alternatives

Operational Scenario	DWRSIM Case #	CALFED Alternatives
---	469	Existing Conditions
---	472	No Action
1	472	1A, 1B
2	510	1C
3	472B	2A, 2C
4	510	2B, 2E
5	498	2D
6	475	3A, 3C
7	500	3B, 3D, 3G, 3H
8	500	3E, 3F, 3I

- The monthly energy generation is estimated by month, by facility, in average year conditions.

- The difference in monthly maximum instantaneous capacity and average monthly energy, in average year conditions, is calculated.

By comparing the available capacity and energy generation under the applicable range of operational results for each of the three CALFED action alternatives to No Action Alternative conditions, the incremental impacts of the three CALFED action alternatives were determined. Tables and graphs were prepared to display the results of the analysis.

Potential impacts on locally-owned hydroelectric facilities downstream of state and federal reservoirs were also assessed. This analysis was conducted in less detail because such impacts will be assessed in subsequent project-level studies when more information on specific operational changes will be available.

3.3 CVP AND SWP POWER PRODUCTION AND REPLACEMENT COSTS

Power generation from the CVP is used to meet CVP pumping requirements (CVP Project Use), and for sales to preference customers at power rates established by Western. The direct impact of the CALFED alternatives on the production costs of the CVP is estimated based on available information regarding variable costs of operation and maintenance, and any operating cost impact of facility modifications required due to the CALFED alternatives.

The production costs of new facilities are estimated based on available cost information and typical allowances for operation and maintenance.

Other impacts may result due to the need to obtain replacement capacity and energy to offset reductions in capacity and energy available from hydroelectric facilities as a result of the CALFED alternatives.

The operation of the CVP power resources are integrated with Pacific Gas and Electric Company (PG&E) by agreement (Contract 2948A). This agreement provides for the sale, interchange, and transmission of capacity and energy between Western and PG&E. DWR has entered into a number of power purchase, transmission and exchange agreements through which the pumping energy requirements of the SWP are met.

Replacement power impacts for both Western and DWR would need to be considered in the context of those existing agreements. Given the long term perspective of the CALFED process, and that all these agreements have specific termination dates, the value of replacement power was estimated based on market prices that are expected to be present under a deregulated market.

3.4 CVP AND SWP POWER RATES

Two types of power assessments were conducted during this analysis. The first addressed the question: would changes in power production costs require Western to change power rates or DWR to revise statements of charges to SWP water customers? The second type of analysis involved projecting future power rates in the California power market after de-regulation of the markets. These power rates are important because they will determine the cost of potential replacement sources for power providers and power customers. Future power rates in the market as a whole may also affect the rates that Western can charge for CVP power, and would thus affect the competitiveness of affected hydroelectric facilities.

The steps listed below were taken to project the future price of power in California's power markets.

- Publicly available analyses of future power values in the restructured industry were evaluated, together with market power analyses prepared by the California investor-owned utilities and the CEC, to develop an estimated range of values for the Power Exchange.

- Estimated capacity values based on a simple cycle combustion turbine were developed to provide an indicator of the *long-term* value of capacity, and to provide a basis for estimating the value of ancillary services.

- Estimated transmission losses and charges, including consideration of congestion costs, were developed in estimating reasonable allowances for delivering replacement power to end-users.

- The forecasted market rate of power is the sum of the estimated capacity value, energy value, and any additional value attributed to ancillary services

The CALFED alternatives also may cause changes in retail electric service by changing pumping or treatment demands. The cost of these services were estimated based on the following additional steps:

- The cost of distribution service, competitive transition charge (CTC), and the public goods charges were estimated to provide estimates of the cost of any changes in retail electric service resulting from the CALFED alternatives.

- The total cost of unbundled retail electric service is the sum of the market clearing energy and ancillary services prices, transmission, distribution, CTC, and public goods charge.

Regional differences in power rates were defined and the rates presented in tables. These rates were used to determine impacts on power revenues for Western and DWR by multiplying the relevant rates by the different types of capacity and energy available for sale from facilities impacted by the CALFED alternatives.

Re-operation of the affected hydro facilities may result in changes to peak project capabilities, the annual quantity of electric energy produced, its inter- and intra-month distribution, and the distribution of energy on a seasonal, monthly, and daily basis. Energy production may also shift to ancillary services. Figure 4 conceptually illustrates the variables which may be impacted by hydro project re-operation. Re-operation will affect reservoir levels, which will change the peak capability (in MW) of those hydroelectric projects with storage. Re-operation will also affect the timing of energy generation. Potential to provide ancillary services is represented by the difference between the peak capability (adjusted for reservoir storage levels) and actual energy generation. As the profile of energy generation changes (represented by the curve in Figure 4), the ability to provide ancillary services will be affected.

The change in revenues from power sales, and the change in costs to the consumer, result from the change in project operations and the value of the power sold or bought. This section presents an estimate of the wholesale power values in the restructured California electric market. Energy and some ancillary services will become competitively procured by buyers, as sellers seek to recover their fixed and variable costs from that competitive market. Transmission, distribution, and related costs will continue to be recovered through regulated cost-of-service rates.

A range in long run market clearing prices (MCP) has been developed to evaluate impacts of the CALFED alternatives. One end of this range is based on the all-in cost of a new combined cycle facility. The other end of the range is based on an administratively determined projection of the wholesale MCP for energy developed through proceedings before the California Public Utilities Commission on electric restructuring.

Another consideration in the value of power is the timing of energy generation or demand. Market clearing energy prices will likely be higher during on-peak periods, and lower during off-peak periods. Historically, pumping demands have been scheduled during off-peak periods, and generation during on-peak periods, to the extent possible, as limited by environmental operating constraints and limits of conveyance and storage. Finally, ancillary service costs are based on utility filings which are themselves cost based. This somewhat simplified MCP determination approach is consistent with the simplifications embodied in the re-operation estimation itself.

Estimating the Impact of Re-operation

The effects of project re-operation were estimated by the DWRSIM model. The difference between a status quo case and the various re-operation cases demonstrates the net impact of the re-operation plans on project capability and energy production.

The DWRSIM model projects monthly operational changes and provides no information regarding weekly, daily or hourly changes within a month. Thus, the impact of re-operation on on-peak versus off-peak power and energy production capability is not directly available. These effects are assessed qualitatively.

Power Value in the Restructured California Market

The power value is measured by the price a seller will receive for energy sold into the wholesale market. The California wholesale power market under the Power Exchange will operate under a single part bid method; there will be only energy bids in the Power Exchange, and no separate capacity bid. Generators will recover all of their fixed costs from the difference between their variable costs and the MCP, as adjusted for losses.

Hydro projects are expected to be price takers, with variable production costs significantly less than the MCP. This assessment assumes that re-operation will not itself affect the short-run MCP, although the presence or absence of hydro energy, or the variation in available energy due to varying water conditions will affect the short-run MCP.

For power purchasers, the price paid will consist of the market clearing price for energy, plus retail adders for public purpose programs, transmission and distribution related costs, and other transaction costs associated with power provision.

In the long run, the competitive market must permit recovery of both fixed and variable costs. For the market to support new or re-powered base, or near base-load facilities, this means the long-run average market price can fall no lower than the "all-in" cost of constructing, owning, and operating the facilities that must be built to support load growth and retirement of existing facilities as they reach the end of their useful lives.

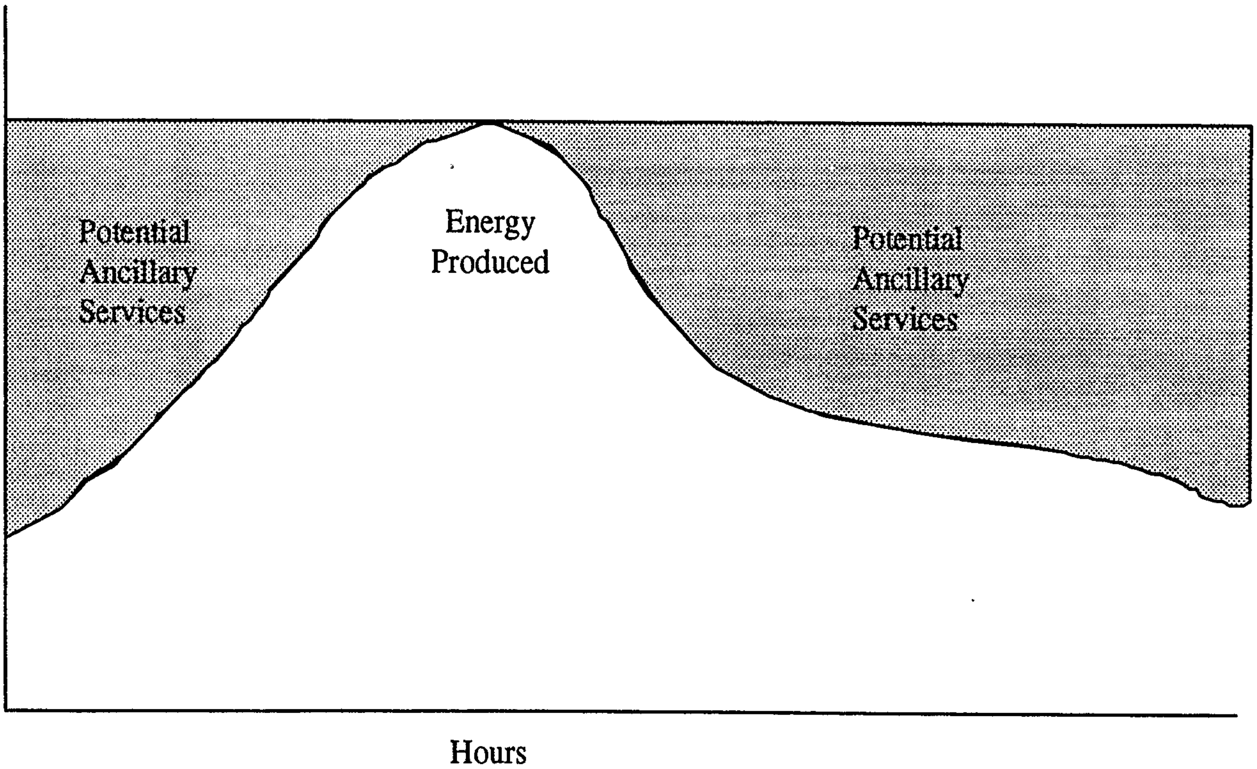

Figure 4 - Hydro Project
Effect of Reoperation

Absent detailed market assessment, the intra-year variation in market prices cannot be directly estimated. A qualitative assessment can be made based on historic seasonal variation in energy prices using the qualifying facility short run avoided cost as an index value. Table 3 presents an index based on the PG&E 1996 avoided energy payments. The index represents the ratio of each monthly price to the weighted annual average price.

Table 3
Monthly MCP Index

Month	Price	Index
January	2.54	1.37
February	1.96	1.06
March	1.91	1.03
April	1.92	1.03
May	1.88	1.02
June	1.84	1.00
July	1.64	0.89
August	1.56	0.84
September	1.59	0.86
October	1.65	0.89
November	1.98	1.07
December	2.06	1.11
Annual Average	1.85	
Based on 1996 PG&E QF Energy Prices		

Need for New Capacity

The draft 1996 Electricity Report issued by the California Energy Commission ("CEC") forecasts a physical need for new capacity to serve the California market in about 2001 (after allowing for 2,377 MW of spot, or peaking, capacity).[1] The CEC proposes to deem "needed" up to 6,737 MW by 2007 (beyond the 2,377 MW), but without a restriction on when in the interim proposed projects may begin operation. The CEC proposes to let the market decide when that capacity should be built.[2]

Current expectations are that simple cycle combustion turbines, or gas fired combined cycle facilities will provide the bulk of the new or re-powered capacity for the foreseeable future. Environmental restrictions, fuel price forecasts, continuing pipeline availability, further technological improvement all suggest that gas-fired capacity will continue to be the preferred alternative for new California central station generating capacity.

Power Value Forecast

The precise timing and technology (simple or combined cycle) of new resource additions will be market driven. In the long term, base load combined cycle, for example, projects will be needed. They may also be cost effective in the near term as replacement for existing capacity. The long term power value forecast, therefore, is assumed to be the full, all-in cost of a modern combined cycle facility.

With existing technology, combined cycle facilities range in cost from 2.5 to 3.5 mills cents per kilowatt hour (¢/kWh), including fuel, O&M, and debt service and capital recovery. The range derives from differing assumptions regarding fuel, and fuel transportation price, and cost of debt and equity. For example, the capital and O&M costs of a combined cycle facility in 1997 dollars is approximately 15 mills with fuel costs, including transportation in the PG&E service territory representing another 1.7 ¢/kWh, for a total of 3.2 ¢/kWh.[3]

The CPUC has adopted a proxy market clearing price of 2.4 ¢/kWh for use in determining CTC balances in 1998. This 2.4 ¢/kWh value reflects an expectation about the nature of the market in 1998, and provides a reasonable basis for establishing the estimated lower range of power values. A range of value of approximately 15 percent has been established based on the historic relationship between on-peak and off-peak incremental heat rates for PG&E, leading to a range of 2.25 ¢/kWh (off-peak) to 2.6 ¢/kWh (on-peak) in the low forecast, and 3.0 ¢/kWh (off-peak) to 3.4 ¢/kWh (on-peak) in the high forecast. These projections are intended to provide a reasonable range for planning purposes of the long term average power prices.

Ancillary Services

The California market under the ISO will separately procure Ancillary Services, such as spinning and non-spinning reserves, reactive support, and black start capability. These will either be procured at cost based rates, or at market rates, if a competitive market is determined to be operating.

PG&E provided in its March 31 Phase II filing to the FERC an analysis of its cost of providing Ancillary Services.[4] These costs are shown in Table 4

Table 4
Ancillary Services Forecast

Ancillary Service	Cost (¢/kWh)
Spinning Reserves	0.740
Non-spinning Reserves	0.790
Reactive/Voltage Support	0.017
Automatic Generation Control	0.770
Black Start	NA

The ancillary service values are not additive since they cannot all be provided simultaneously. These are cost based rates from a combination of thermal, and hydro capital costs, and O&M costs. A representative value of 0.75 ¢/kWh is adopted herein for ancillary services revenues.

The unique characteristic of hydro projects to ramp quickly and generally supply additional capacity for some period when needed makes them exceptionally valuable for ancillary service purposes. For this analysis, ancillary services are assumed provided from that hydro project capacity which is not supported by energy. Figure 5 shows the relationship between project capability, energy produced, and ancillary services.

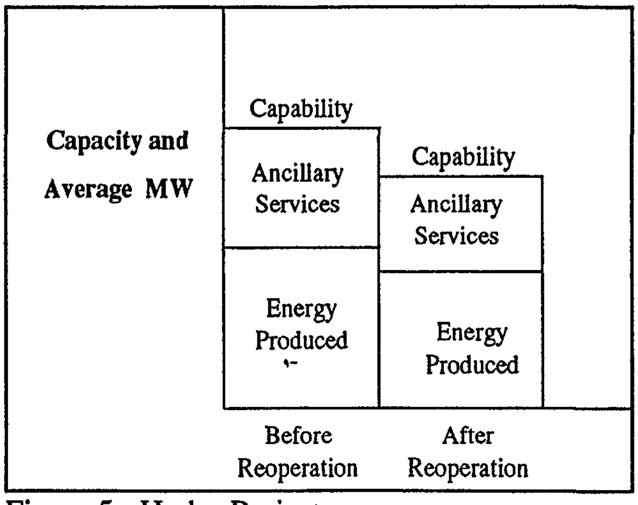

Figure 5 - Hydro Project
Effect of Reoperation ; Period Average Basis

Ancillary service revenues may be a significantly larger proportion of hydro project revenues than for thermal plants. New combined cycle plants will be most economic at high capacity factors, so will have relatively little remaining capability to provide ancillary services. To the extent the combined cycle plant is off-line it may be configured to provide operating reserves, but the dominate product will still be energy, and therefore from where most project revenues will derive.

3.5 CVP AND SWP PROJECT ENERGY USE AND OTHER PUMPING ENERGY IMPACTS

Changes in energy use at affected surface water pumping plants was assessed using the related output of DWRSIM. DWRSIM defines changes in pumping at the major surface water pumping plants of both the CVP and SWP. Typical operational scenarios and the representative examples of groundwater projects were used to describe potential changes in regional groundwater pumping requirements.

Energy use impacts during the operation of major treatment plants were broadly defined by first determining what types of potential changes in water deliveries to M&I customers could occur, and thus the amount of water requiring treatment. This information was provided by the CALFED Water Resources analysis.

It is assumed that both potential groundwater pumping and treatment-related energy impacts will be assessed in more detail in subsequent project-level studies.

3.6 ENERGY IMPACTS DURING CONSTRUCTION OF NEW

FACILITIES AND IMPLEMENTATION OF PROGRAMS

The construction of new reservoirs, conveyance facilities and levee systems would increase the use of energy during construction periods as would the implementation of other elements included in the CALFED alternatives: ecosystem restoration, water quality and water efficiency actions. Broad ranges of energy use impacts caused by the construction of structural facilities were defined by applying typical energy use factors to ranges of construction traffic and vehicle estimates provided by the Traffic and Navigation analysis. The typical energy use factors were developed from construction industry sources *(citation to be added)*. Additional assumptions were made regarding the length of time such construction equipment and vehicles as bulldozers and cranes would be used, and regarding the fuel efficiency of construction vehicles. The analysis of energy used during construction focused on the gallons of fuel needed to run construction vehicles. The amount of electricity needed to run equipment was not quantified. The energy used during the implementation of the other components of the CALFED alternatives was assessed qualitatively. Ranges of representative energy use impacts during construction were defined to show the types of impacts that would likely occur. These types of impacts of potential mitigation requirements will be assessed in more detail in subsequent project-level studies.

Estimated energy requirements for initial fill of major new reservoirs are also estimated. These estimates give consideration to operational restrictions on diversions to such new storage, and a range in the time required to fill such reservoirs is applied. Based on the approximate average lift, the amount of energy required for initial fill is approximated, and the cost of that energy is estimated. *(Analysis to come.)*

3.7 ENERGY USE ASSOCIATED WITH CHANGES IN THE EFFICIENCY OF WATER USE

The energy use impacts caused by the water efficiency program included in each of the CALFED action alternatives were assessed broadly and qualitatively, with some quantitative examples defined to provide an overview of the types of energy use impacts that could occur. The specific impacts can not be determined at this time since local water districts will eventually be responsible for deciding how the broad water efficiency program policies included in the CALFED action alternatives will be implemented with specific measures.

3.8 ENERGY USE ASSOCIATED WITH TRAFFIC AND NAVIGATION IMPACTS AFTER CONSTRUCTION

The positive environmental impacts of the CALFED alternatives have the potential to increase opportunities for a wide range of different types of recreation at reservoirs, in and along streams, and in the Delta. The results of the Recreation and Traffic and Navigation analyses were used to assess the related energy use impacts and to give the reader a broad overview of the types of representative energy impacts that could occur after construction.

4.0 SIGNIFICANCE CRITERIA

The following significance criteria have been defined for use in this analysis.

4.1 HYDROELECTRIC CAPACITY AND ENERGY GENERATION IMPACTS

Impacts on the capacity of power facilities and the amount of energy generated at such facilities would be significant and adverse if such impacts increased the cut of power from affected facilities to above-market levels, thereby threatening repayment of capital and operating costs in a competitive market.

4.2 POWER RATE AND COST IMPACTS

Impacts on power rates and costs would be significant and adverse if power costs for existing power customers increase to the point that they cause a significant reduction in the net income of power customers.

The CALFED alternatives could increase power costs for existing power customers if they cause increases in power prices, or cause existing power customers to switch to more costly power sources as a result of a reduction in the availability of power supplies. Customer power cost increases would be significant if they would significantly reduce the net income of power customers by either (1) causing the power customer to reduce power consumption, thereby reducing the production of agricultural, commercial or industrial power customers, or (2) increasing the production costs of such customers. The significance of changes in net income for agricultural power customers will be determined by the Agricultural Economics study, for M&I power customers by the M&I Economics study and to the regional economy by the Regional Economics study.

(The criteria above need to be finalized after additional discussions with CALFED staff and the team members performing the agriculture and M&I economics studies.)

4.3 ENERGY USE IMPACTS DURING CONSTRUCTION, OPERATION AND MAINTENANCE

CVP and SWP system-wide energy use impacts during operation of the CALFED action alternatives would be significant and adverse if:

- such use is wasteful and not normal for the type of energy use under consideration and feasible conservation measures are available but have not been incorporated into the related operation procedures; or
- existing energy resources are not available and sufficient to support the type of energy use under consideration and new energy resources would need to be developed.

The significance of other types of energy use impacts (during construction of state, federal and local facilities and operation of local pumping and treatment facilities) will be assessed in subsequent project-level studies when more detailed information about the specific construction projects and changes in operations is available.

5.0 ENVIRONMENTAL IMPACT ANALYSIS

Due to the interrelated nature of CVP and SWP facilities throughout the entire study area, quantitative impact analyses have been developed for the overall study area only and not on a regional basis.

The majority of the quantitative analysis is provided within Section 5.3.1, Overall Study Area Comparisons. The remaining regional analyses (sections 5.3.2 through 5.3.6) will provide a qualitative discussion of the potential impacts to facilities and customers within each region, as compared to the No Action Alternative.

5.1 DESCRIPTION OF NO ACTION RESOURCE CONDITIONS

Conditions that would exist under the No Action Alternative are those conditions that would be present in the study area of this EIR/EIS if none of the CALFED action alternatives are implemented. The No Action conditions are similar to the existing conditions identified in the Power Production and Energy Affected Environment. The No Action Alternative, however, reflects the expected state of power production and energy economics under a 2020 level of development.

This section provides a brief overview of the power production and energy resource conditions present under the No Action Alternative, that are absent in existing conditions. The No Action Alternative is the baseline against which all other alternatives will be compared.

5.1.1 OVERALL STUDY AREA NO ACTION RESOURCE CONDITIONS

In addition to conditions present in the existing conditions (as described in the Power Production and Energy Affected Environment), the No Action Alternative will include the following conditions that may impact power and energy resources within the overall study area.

- Implementation of the Central Valley Project Improvement Act (CVPIA).
- Dedication of more storage space for flood control at Folsom Reservoir as a result of the interim re-operation of the reservoir.
- Implementation of the Monterey Agreement, revising the allocation of SWP water.
- Development of the New Melones Conveyance Project, which conveys water to the Stockton area.
- Completion of the Coastal Aqueduct (and related pumping plants) to provide SWP 89,000 AF of M&I water per year to San Luis Obispo and Santa Barbara Counties.
- Pumping at the Banks and Tracy Pumping Plants are no longer limited to comply with D-1485 criteria for striped bass survival.
- The January 5, 1987 interim agreement between DWR and the California Department of Fish and Game, limiting SWP pumping to 2,000 cfs in any May or June in which storage withdrawals from Oroville Reservoir are required, is no longer in effect.
- CVP water may may be wheeled to meet Cross Valley Canal demands when unused capacity is available at Banks Pumping Plant.
- The 2020 water demand level is assumed to be fixed at full entitlement of 4.2 MAF. MWDSC's monthly demand patterns assume the completion of the Eastside Reservoir and an Inland Feeder pipeline in accordance with a July 26, 1995 memorandum from MWDSC.

- CVP water demands via the Contra Costa Canal increase by 62,000 AF per year.

- CVP water demands via the San Luis Unit increase by 187,000 AF per year.

5.1.2 DELTA REGION NO ACTION RESOURCE CONDITIONS

In addition to conditions present in the existing conditions (as described in the Power Production and Energy Affected Environment), the No Action Alternative will include the following conditions that may impact power and energy resources within the Delta Region.

- Implementation of the Central Valley Project Improvement Act (CVPIA).

- Implementation of the Monterey Agreement, revising the allocation of SWP water.

- Pumping at the Banks and Tracy Pumping Plants are no longer limited to comply with D-1485 criteria for striped bass survival.

- CVP water may may be wheeled to meet Cross Valley Canal demands when unused capacity is available at Banks Pumping Plant.

5.1.3 BAY REGION STUDY AREA NO ACTION RESOURCE CONDITIONS

In addition to conditions present in the existing conditions (as described in the Power Production and Energy Affected Environment), the No Action Alternative will include the following conditions that may impact power and energy resources within the Bay Region.

- Implementation of the Central Valley Project Improvement Act (CVPIA).

- Implementation of the Monterey Agreement, revising the allocation of SWP water.

- CVP water demands via the Contra Costa Canal increase by 62,000 AF per year.

5.1.4 SACRAMENTO RIVER REGION No Action Resource Conditions

In addition to conditions present in the existing conditions (as described in the Power Production and Energy Affected Environment), the No Action Alternative will include the following conditions that may impact power and energy resources within the Sacramento River Region.

- Implementation of the Central Valley Project Improvement Act (CVPIA).

- Dedication of more storage space for flood control at Folsom Reservoir as a result of the interim re-operation of the reservoir.

- The January 5, 1987 interim agreement between DWR and the California Department of Fish and Game, limiting SWP pumping to 2,000 cfs in any May or June in which storage withdrawals from Oroville Reservoir are required, is no longer in effect.

5.1.5 SAN JOAQUIN RIVER REGION NO ACTION RESOURCE CONDITIONS

In addition to conditions present in the existing conditions (as described in the Power Production and Energy Affected Environment), the No Action Alternative will include the following conditions that may impact power and energy resources within the San Joaquin River Region.

- Implementation of the Central Valley Project Improvement Act (CVPIA).
- Development of the New Melones Conveyance Project, which conveys water to the Stockton area.
- CVP water demands via the San Luis Unit increase by 187,000 AF per year.

5.1.6 SWP SERVICE AREAS OUTSIDE THE CENTRAL VALLEY No Action Resource Conditions

In addition to conditions present in the existing conditions (as described in the Power Production and Energy Affected Environment), the No Action Alternative will include the following conditions that may impact power and energy resources in SWP Service Areas Outside the Central Valley.

- Implementation of the Central Valley Project Improvement Act (CVPIA).
- Implementation of the Monterey Agreement, revising the allocation of SWP water.
- Completion of the Coastal Aqueduct (and related pumping plants) to provide SWP 89,000 AF of M&I water per year to San Luis Obispo and Santa Barbara Counties.
- The 2020 water demand level is assumed to be fixed at full entitlement of 4.2 MAF. MWDSC's monthly demand patterns assume the completion of the Eastside Reservoir and an Inland Feeder pipeline in accordance with a July 26, 1995 memorandum from MWDSC.

5.2 DESCRIPTION OF ALTERNATIVE RESOURCE CONDITIONS

This section provides a brief overview of the power production and energy resource conditions present under the various CALFED Alternatives, that are absent in the No Action Alternative.

5.2.1.1.1 Configuration 1A

5.2.1.1.2 Configuration 1B

5.2.1.1.3 Configuration 1C

5.2.1 OVERALL STUDY AREA ALTERNATIVE RESOURCE CONDITIONS

(to be completed)

5.2.1.1 Alternative 1: Existing System Conveyance

5.2.1.2 Alternative 2: Modified Through Delta Conveyance

5.2.1.3 Alternative 3: Dual Delta Conveyance

5.2.2 DELTA REGION ALTERNATIVE RESOURCE CONDITIONS

(to be completed)

5.2.2.1 Alternative 1: Existing System Conveyance

5.2.2.2 Alternative 2: Modified Through Delta Conveyance

5.2.2.3 Alternative 3: Dual Delta Conveyance

5.2.3 BAY REGION ALTERNATIVE RESOURCE CONDITIONS

(To be completed. It is anticipated at this time that No Action Alternative power and energy conditions do not need to be presented for this region)

5.2.4 SACRAMENTO RIVER REGION ALTERNATIVE RESOURCE CONDITIONS

(to be completed)

5.2.4.1 Alternative 1: Existing System Conveyance

5.2.4.2 Alternative 2: Modified Through Delta Conveyance

5.2.4.3 Alternative 3: Dual Delta Conveyance

5.2.5 SAN JOAQUIN RIVER REGION ALTERNATIVE RESOURCE CONDITIONS

(to be completed)

5.2.5.1 Alternative 1: Existing System Conveyance

5.2.5.2 Alternative 2: Modified Through Delta Conveyance

5.2.5.3 Alternative 3: Dual Delta Conveyance

5.2.6 SWP SERVICE AREAS OUTSIDE CENTRAL VALLEY

(to be completed)

5.2.6.1 Alternative 1: Existing System Conveyance

5.2.6.2 Alternative 2: Modified Through Delta Conveyance

5.2.6.3 Alternative 3: Dual Delta Conveyance

5.3 Summary of Comparisons By Region (Impacts of the CALFED Action Alternatives)

This section provides a quantitative analysis of the CALFED Alternatives for the entire study area (Section 5.3.1) and qualitative analyses for each of the individual regions (sections 5.3.2 through 5.3.6). The regional impacts are summarized for each of the key assessment variables in tables 5 through 7. The key variables that are reviewed are energy generation and capacity impacts, project energy use impacts, and customer power cost impacts.

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Table 5
Energy Generation and Capacity Impacts Compared to the No-Action Alternative

Region	No Action	Alternatives							
		Alt 1		Alt 2			Alt 3		
		1a & 1b	1c	2a & 2c	2b & 2e	2d	3a & 3c	3b,3d,3g, 3h	3e, 3f, 3I
		Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7	Scenario 8
Overall Study Area	Similar to existing conditions	No change	1.3% increase in mwh generated	1.3% decrease in mwh generated	1.3% increase in mwh generated	0.6% decrease in mwh generated	1.6% decrease in mwh generated	0.4% increase in mwh generated	0.4% increase in mwh generated
Delta	Similar to existing conditions	No change	No change	No change	No change	No change	No change	No significant change	No significant change
Bay	Similar to existing conditions	No change	No change	No change	No change	No change	No change	No change	No change
Sacramento River	Similar to existing conditions	No change	Additional surface storage	No change	Additional surface storage	No change	No change	Additional surface storage	Additional surface storage
San Joaquin River	Similar to existing conditions	No change	Additional surface storage	No change	Additional surface storage	Additional surface storage	No change	Additional surface storage	Additional surface storage
SWP Service Areas	Similar to existing conditions	No change	No change	No change	No change	No change	No change	No change	No change

C-002720

Table 6
Project Energy Use Impacts Compared to the No-Action Alternative

Region	No Action	Alternatives							
		Alt 1		Alt 2			Alt 3		
		1a & 1b	1c	2a & 2c	2b & 2e	2d	3a & 3c	3b,3d,3g, 3h	3e, 3f, 3I
		Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7	Scenario 8
Overall Study Area	Similar to existing conditions	No change	6.6% increase in mwh used	2.6% increase in mwh used	5.6% increase in mwh used	2.6% increase in mwh used	3.2% increase in mwh used	9.4% increase in mwh used	9.4% increase in mwh used
Delta	Similar to existing conditions	No change	Additional groundwater storage. Increased capacity of export pumps	Increased capacity of export pumps	Additional groundwater storage. Increased capacity of export pumps	Increased capacity of export pumps	Increased capacity of export pumps	Additional groundwater storage. Increased capacity of export pumps	Additional groundwater storage. Increased capacity of export pumps
Bay	Similar to existing conditions	No change	No change	No change	No change	No change	No change	No change	No change
Sacramento River	Similar to existing conditions	No change	Additional surface storage. Additional groundwater storage	No change	Additional surface storage. Additional groundwater storage	No change	No change	Additional surface storage. Additional groundwater storage	Additional surface storage. Additional groundwater storage. Isolated conveyance facility
San Joaquin River	Similar to existing conditions	No change	Additional surface storage. Additional groundwater storage	No change	Additional surface storage. Additional groundwater storage	Additional surface storage	Isolated conveyanc e facility	Additional surface storage. Additional groundwater storage	Additional surface storage. Additional groundwater storage. Isolated conveyance facility
SWP Service Areas	Similar to existing conditions	No change	No change	No change	No change	No change	No change	No change	No change

Table 7
Customer Power Cost Impacts Compared to the No-Action Alternative

Region	No Action	Alternatives							
		Alt 1		Alt 2			Alt 3		
		1a & 1b	1c	2a & 2c	2b & 2e	2d	3a & 3c	3b,3d,3g, 3h	3e, 3f, 3I
		Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7	Scenario 8
Overall Study Area	Similar to Existing Conditions								
Delta	Similar to Existing Conditions								
Bay	Similar to Existing Conditions								
Sacramento River	Similar to Existing Conditions								
San Joaquin River	Similar to Existing Conditions								
SWP Service Areas	Similar to Existing Conditions								

5.3.1 OVERALL STUDY AREA COMPARISONS

This section covers potential power and energy resource impacts that are best assessed from the perspective of the overall study area. Impacts related to these topics include system-wide impacts and would be caused by the combined effects of more than one of the programs included in the CALFED alternatives. For example, changes in the capacity of hydroelectric facilities, or the amount of pumping at diversion facilities, would be caused by a combination of operational changes necessary to implement the ecosystem restoration elements of the alternatives in different regions as well as to operate new water storage and conveyance facilities that may be built in various regions.

The impacts described in the sections below were defined by comparing the conditions summarized in Table 8 as well as more detailed tables included in the remaining sub-sections of Section 5.3.1. The more detailed tables include information that is unique to some of the power and energy resource assessment variables and is needed to assess related impacts.

5.3.1.1 Alternative 1: Existing System Conveyance

5.3.1.1.1 Hydroelectric Capacity and Energy Generation Impacts

Hydroelectric capacity and energy generation impacts to existing SWP and CVP facilities would occur as a result of several changes in operations that are part of Alternative 1. As part of the Common Programs, changes in stream flows and requirements for habitat restoration may alter capacity and generation by CVP and SWP hydroelectric power plants. Annual increases of 300,000 to 500,000 acre-feet of critical-period flows are expected as a result of stream flow alterations defined within the Common Programs. The timing of diversions will also be altered in order to avoid entrainment effects. In addition, habitat restoration identified in the Common Programs requires additional water deliveries in order to restore and maintain various habitat types within the Bay and Delta regions. The impacts of these additional water deliveries are reflected in the DWRSIM results for monthly energy output by plant.

Impacts are estimated based on the results of specified DWRSIM scenario runs, as explained in Section 3.2.2. Two different DWRSIM scenarios are defined for the three different defined configurations of Alternative 1. Table 2 summarizes the relationship of the various CALFED Alternatives to the corresponding DWRSIM operational scenarios. Alternative configurations 1A and 1B are represented as DWRSIM Scenario 1. Operational impacts from DWRSIM Scenario 1 result from changes in operation due to implementation of the Common Programs. Alternative configuration 1C is represented as DWRSIM Scenario 2. Scenario 2 includes additional conveyance facilities, enlarged Delta Channels, and new surface and groundwater storage facilities. Table 9 and Figure 6 compares monthly energy generation in an average water year for SWP and CVP facilities under DWRSIM Scenarios 1 and 2 and the No Action Alternative (DWRSIM Study 472).

Table 8
Comparison of Power Production and Energy Conditions in Overall Study Area

Assessment Variables	Existing Conditions	No Action Alternative Conditions	Alternative 1 Conditions	Alternative 2 Conditions	Alternative 3 Conditions
Available Capacity and Energy Generation	As described in Affected Environment	Similar to Existing Conditions			
Project Energy Use	As described in Affected Environment	Similar to Existing Conditions			
Power Rates	As described in Affected Environment	Similar to Existing Conditions			

Table 9
Alternative 1
Average Water Year System-Wide Energy Generation Impacts

Month	Total Energy (000 MWh)			Change (in 000 MWh) From No Action to	
	No Action	Scenario 1	Scenario 2	Scenario 1	Scenario 2
October	788	788	788	0	0
November	598	598	613	0	15
December	572	572	571	0	(1)
January	440	440	504	0	64
February	522	522	571	0	49
March	780	780	763	0	(17)
April	846	846	851	0	5
May	1,789	1,789	1,767	0	(22)
June	1,384	1,384	1,361	0	(23)
July	1,402	1,402	1,457	0	55
August	1,089	1,089	1,106	0	17
September	699	699	696	0	(3)
TOTAL	10,909	10,909	11,047	0	138

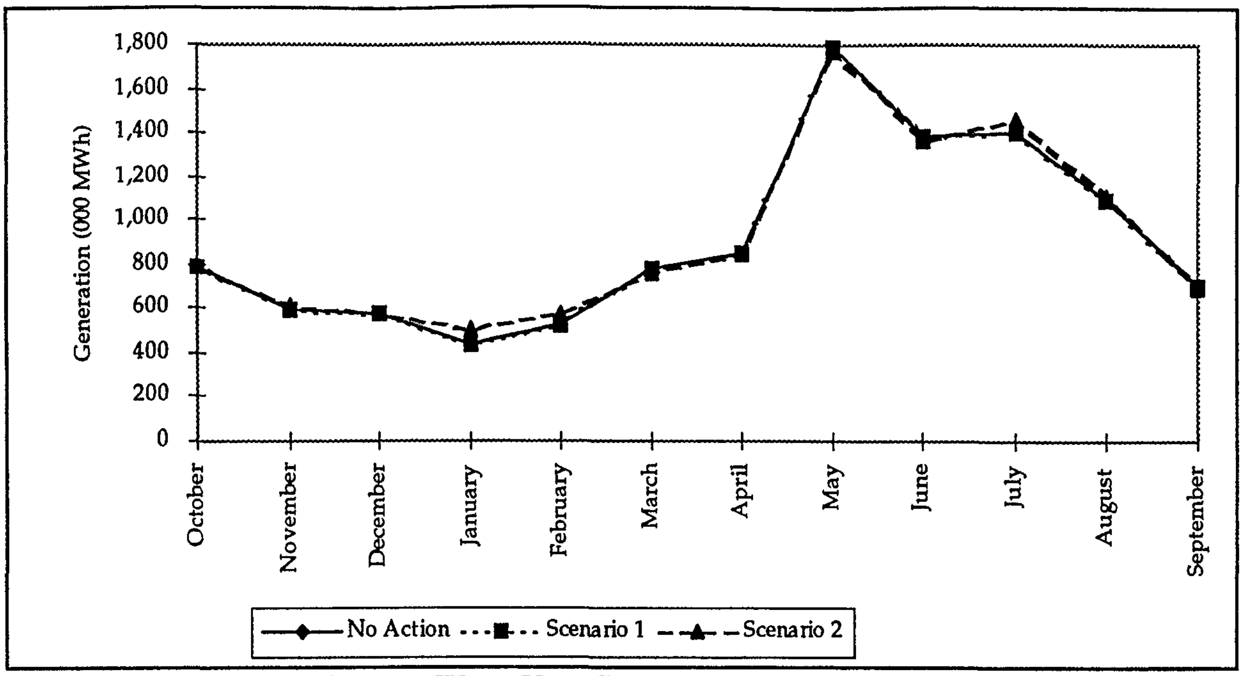

Figure 6 : Alternative 1, Average Water Year CVP and SWP System-Wide Energy Generation

Based on an estimated price range of $2.25 per MWh to $3.00 per MWh for energy generated by the CVP and SWP, the annual value of the system generation impact was calculated for each operating scenario.

Figure 7 depicts the dollar value range of generation impacts for each operative scenario. As seen in Figure 7, Scenario 1 creates no impact, while Scenario 2 impacts range from $311,000 to a gain of $415,000.

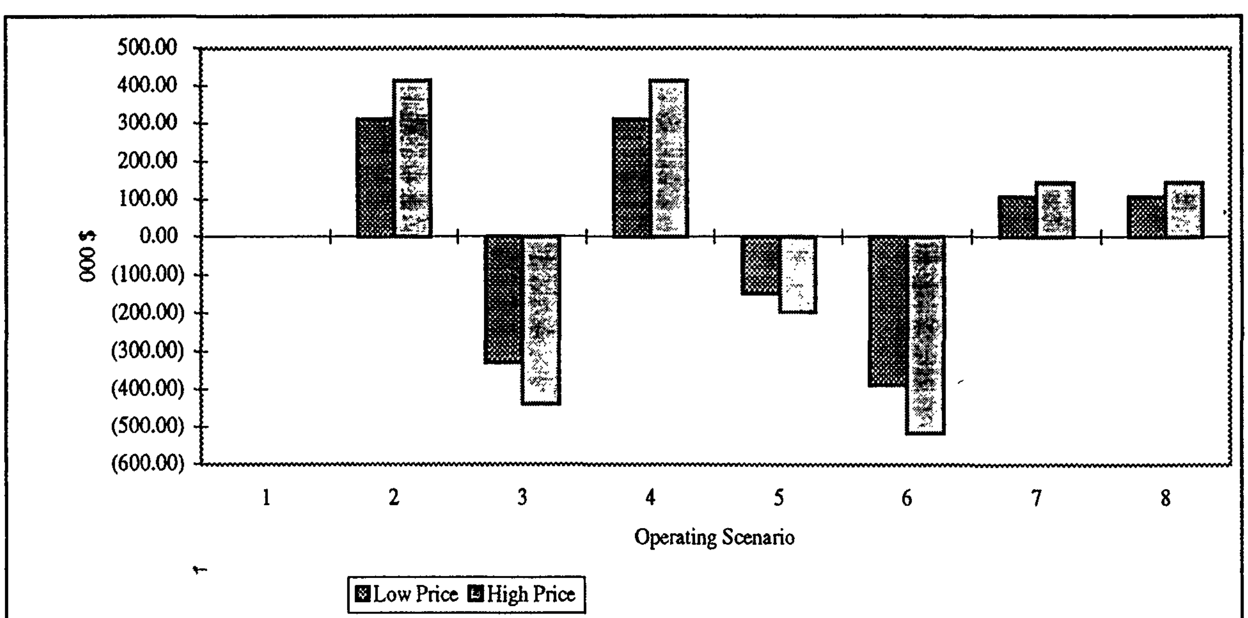

Figure 7 - Power Value of Generation Impacts Based on Expected Price Range

In addition to annual and monthly impacts, the timing of releases, diversions, and flows may impact the availability of energy within particular months. As an example, stream flow alterations within the Common Programs will include pulse flows designed to enhance anadromous fish habitat. These pulse flows are seasonal and will occur at various times of the year and for differing periods depending on the enhancement target and the environmental conditions (dry, normal, or wet year).

5.3.1.1.2 CVP and SWP Power Production and Replacement Costs

Operational changes identified for Alternative 1 in Section 5.2.1.1 provide the basis for determining impacts to Alternative 1 power production and replacement costs. Power providers could experience changes in such costs as they incur capacity and generation impacts, or have to replace lost capacity or energy.

In the short-term, power providers are expected to replace lost capacity and energy with power from the open, or "spot" market. This will help minimize adverse and short-term production cost impacts caused by the CALFED alternatives since power rates on the open market are expected to be relatively flat for some time as the transition to a competitive electric market continues. By minimizing their production and replacement costs, power providers such as Western and DWR can delay rate increases for as long as possible. In the long-term, after current surplus power conditions end, power rates are expected to reflect the costs of constructing and operating the most economic generation projects

(This section to be completed later with comparisons of related conditions under Alternative 1 to No Action conditions.)

5.3.1.1.3 CVP and SWP Power Rates

Alternative 1 is not expected to have an impact on CVP or SWP power rates for the reasons explained below.

Power rates in California's deregulated market will be based on regional supply and demand conditions that reflect the availability of power resources in the western U.S. power market (all of California, the Pacific Northwest, portions of the Rocky Mountain states and Southwest). Previously, power rates were primarily determined by the production and delivery costs of power providers. In the near future, a relative surplus of power will be available to power providers and customers on the open market. The impacts of the CALFED action alternatives on available capacity and energy generation at CVP and SWP facilities are expected to be minimal in comparison to the regional energy and ancillary services that will soon be available to CVP and SWP power customers on the open market. Since regional energy conditions and ancillary services will be the primary determinant of power rates, and the impacts of the alternatives assessed in this EIR/EIS will have little or no influence on regional conditions and services, the alternatives are not expected to impact competitively determined market clearing prices.

5.3.1.1.4 CVP and SWP Project Energy Use Impacts

Impacts to energy use at existing SWP and CVP pumping facilities would occur as a result of several changes in operations that are included in Alternative 1. Changes in operation that occur as a part of the Common Programs were discussed in Section 5.2.1.1. Those same operational changes that impact capacity and generation of SWP and CVP facilities are likely to impact pumping facility requirements.

Impacts are estimated based on the results of specified DWRSIM scenario runs. Two different DWRSIM scenarios are defined for the three different defined configurations of Alternative 1. Alternative configurations 1A and 1B are represented as DWRSIM Scenario 1. Operational impacts from DWRSIM Scenario 1 result from changes in operation due to implementation of the Common Programs. Alternative configuration 1C is represented as DWRSIM Scenario 2. Scenario 2 includes additional conveyance facilities, enlarged Delta Channels, and new surface and groundwater storage facilities. Table 10 and Figure 8 compare monthly energy requirements in an average water year for SWP and CVP surface water pumping facilities under DWRSIM Scenarios 1 and 2 and the No Action Alternative (DWRSIM Study 472).

Table 10
Alternative 1
Average Water Year System-Wide Energy Use Impacts

Month	Total Energy (000 MWh)			Change (in 000 MWh) From No Action to	
	No Action	Scenario 1	Scenario 2	Scenario 1	Scenario 2
October	1,144	1,144	1,153	0	9
November	1,137	1,137	1,154	0	17
December	1,193	1,193	1,282	0	89
January	1,022	1,022	1,346	0	324
February	1,069	1,069	1,331	0	262
March	1,489	1,489	1,494	0	5
April	1,354	1,354	1,340	0	(14)
May	1,264	1,264	1,330	0	65
June	1,156	1,156	1,179	0	23
July	1,167	1,167	1,207	0	40
August	1,190	1,190	1,199	0	10
September	1,397	1,397	1,379	0	(18)
TOTAL	14,582	14,582	15,395	0	813

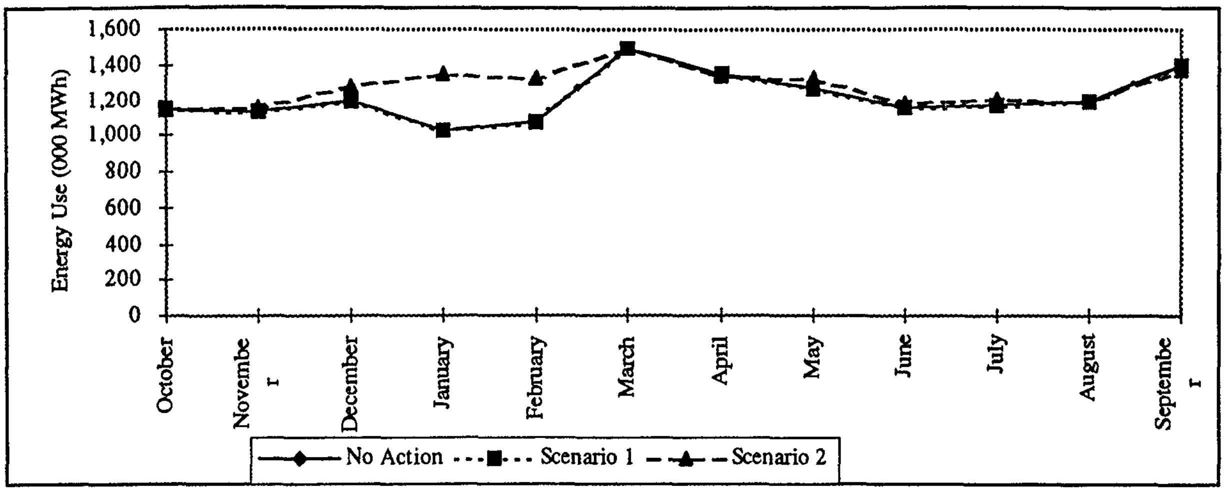

Figure 8 : Alternative 1, Average Water Year CVP and SWP System-Wide Energy Use

Based on an estimated price range of $2.60 per MWh to $3.40 per MWh for energy used by the CVP and SWP, the annual value of the system-wide energy use impactures calculated for each operating scenario. Figure 9 depicts the dollar value range of energy use impacts for each operating scenario. As seen in Figure 9, Scenario 1 creates no impact, while Scenario 2 impacts range from a cost of over $2.1 million to almost $2.8 million.

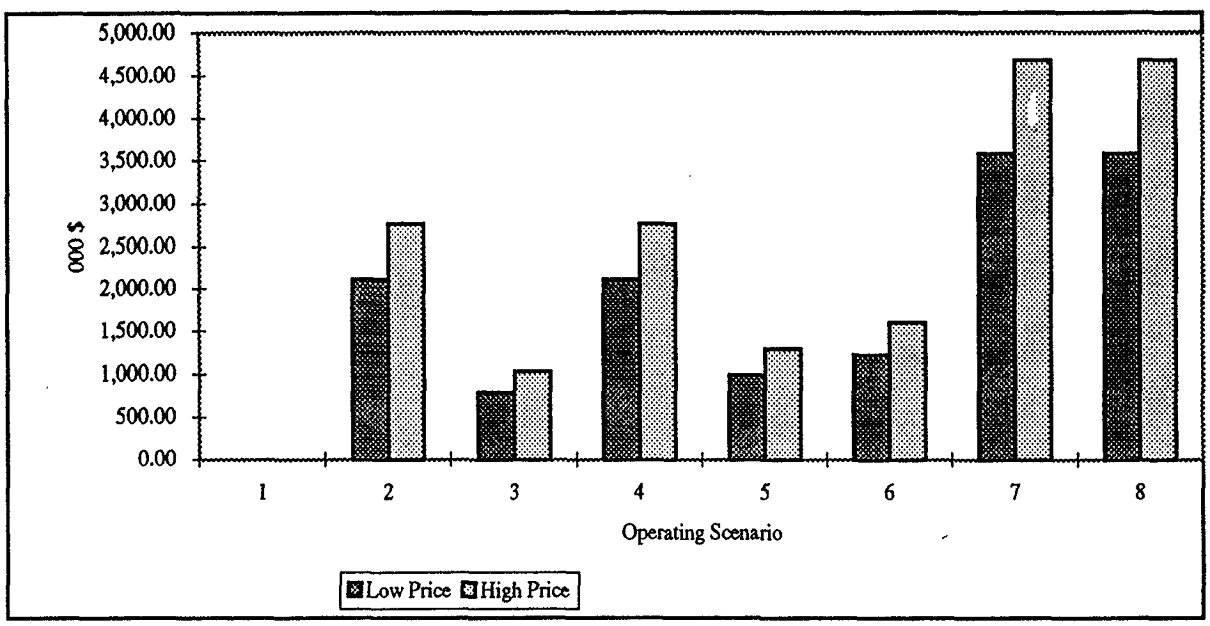

Figure 9 - Power value of Energy Use Impacts Based on Expected Price Range

5.3.1.1.5 Other Types of Energy Use Impacts During Operations in the Overall Study Area

Energy Use at Groundwater Pumping Plants

(This section will briefly and qualitatively provide a regional overview of how energy use at groundwater pumping plants could be affected by this alternative. It will be noted that subsequent project-level studies are more

appropriate to assess this type of impact in more detail.)

Energy Use at Water Treatment Plants

(This section will briefly and qualitatively provide a regional overview of how energy use at water treatment plants could be affected by this alternative. It will be noted that subsequent project-level studies are more appropriate to assess this type of impact in more detail.)

5.3.1.1.6 CVP and SWP Customer Power Costs

(This section to be completed later with comparisons of related conditions under Alternative 1 to No Action conditions.)

5.3.1.1.7 Energy Use Associated With Traffic & Navigation Impacts After Construction

The CALFED action alternatives are expected to cause major environmental improvements in the study area. This would increase recreation opportunities for many types of recreationists (boating enthusiasts at reservoirs, fishermen, hunters, bird watchers, etc.) As recreation use increases in the areas where environmental improvements occur, recreation-related traffic also would increase in the areas where the recreationists drive their vehicles. This would cause an indirect increase in the amount of fuel that is used in the study area and in the areas that recreationists travel from.

(If related data is developed by the Traffic & Navigation resource category, this section will conclude by providing a regional overview of traffic and navigation-related energy use impacts. It will be noted that subsequent project-level studies are more appropriate to assess this type of impact in more detail.)

5.3.1.1.8 Energy Use Associated With the Common Programs

This section provides a broad overview of the types of energy impacts that would likely occur under each of the common programs. Each of the common programs are included in all 3 of the CALFED action alternatives.

Water Use Efficiency Actions

The water use efficiency actions that are implemented by CALFED are expected to lead to reductions in M&I water use, but may lead to increases in agricultural power use.. The specific water efficiency measures would be determined by local water districts and users. While specific measures and their specific impacts can not be defined at this time, it is likely that such measures would lead to beneficial and long-term energy savings. The amount of energy used directly and indirectly by water users would be reduced as their water use declines. Examples of the types of energy-related impacts that would likely occur once the measures are successfully implemented are listed below.

- Urban water users would experience reductions in water heating requirements as their water use declines. Most of the energy savings would be in the form of reductions in the amount of natural gas that is used to power water heaters.
- Reductions in urban water demands also would reduce pumping and treatment requirements for M&I water districts, thus saving additional energy

- More efficient use of environmental diversions also would reduce pumping requirements in certain areas and would lead to more energy savings

- The water recycling element of the program would potentially delay the construction of new supply projects and the related energy use during construction, operation and maintenance

- Agricultural water users may substitute power for water by switching from flood to sprinkler irrigation.

In the short-term, energy use would increase during the implementation phase of the specific measures. Over the long term, the installation of conservation devices and implementation of other elements of the program may decrease energy use in the study area, depending on the extent to which increased agricultural pumping in support of sprinkler irrigation is implemented.

Ecosystem Restoration Actions

Energy use would likely increase during implementation with construction activities related to wetlands creation. Some increase in energy use to maintain restored areas is likely, principally including pumping energy requirements to deliver water to restored wetlands.

Water Quality Actions

A primary focus of the water quality common program is source control, in which mine drainage, urban and industrial runoff, and agricultural drainage are addressed. These elements may have indirect energy impacts, depending on the measures by which they are implemented.

Levee System Integrity Actions

This type of common program would cause more direct energy impacts during construction than any of the other common programs. Levee system modifications are relatively energy-intensive activities during their construction phases as energy is needed to power construction equipment, worker vehicles, pumps, etc. While the levee modifications would require the use of energy in the short-term, they could avoid long-term levee maintenance procedures that would have to be conducted without major improvements to the system. This would be a beneficial impact in the long-term and could help offset the additional use of energy in the short-term.

5.3.1.2 Alternative 2: Modified Through Delta Conveyance

5.3.1.2.1 Hydroelectric Capacity and Energy Generation Impacts

In addition to the Hydroelectric Capacity and Energy Generation impacts to existing SWP and CVP facilities that occur as a result of the Common Programs (see Section 5.3.1.1.1 for a discussion), operational changes are identified in Alternative 2 as a result of a variety of storage and through-Delta conveyance modifications.

Impacts are estimated based on the results of specified DWRSIM scenario runs, as explained in Section 5.3.1.1.1. Three different DWRSIM scenarios are defined for the five different defined configurations of Alternative 2. Alternative configurations 2A and 2C are represented as DWRSIM Scenario 3. Operational impacts from DWRSIM Scenario 3 result from changes in operation due to implementation of the Common Programs and conveyance modifications. Alternative configurations 2B and 2E are represented as DWRSIM Scenario 4. Scenario 4 includes a substantial increase in additional storage (up to 6.5 MAF) through new surface and groundwater storage facilities. Alternative configuration 2D is represented as DWRSIM Scenario 5. Scenario 5 includes a lesser increase in additional storage (up to 2.0 MAF) through new surface storage facilities. Table 11 and Figure 10 compare monthly energy generation in an average water year for SWP and CVP facilities under DWRSIM Scenarios 3, 4, and 5 and the No Action Alternative (DWRSIM Study 472).

Table 11
Alternative 2
Average Water Year System-Wide Energy Generation Impacts

Month	Total Energy (000 MWh)				Change (in 000 MWh) From No Action to		
	No Action	Scenario 3	Scenario 4	Scenario 5	Scenario 3	Scenario 4	Scenario 5
October	788	788	788	783	0	0	(5)
November	598	598	613	616	0	15	18
December	572	572	571	572	0	(1)	0
January	440	469	504	483	29	64	43
February	522	551	571	614	29	49	92
March	780	767	763	766	(13)	(17)	(14)
April	846	842	851	862	(4)	5	16
May	1,789	1,759	1,767	1,774	(30)	(22)	(15)
June	1,384	1,372	1,361	1,363	(12)	(23)	(21)
July	1,402	1,329	1,457	1,251	(73)	55	(151)
August	1,089	1,016	1,106	1,045	(73)	17	(44)
September	699	700	696	714	1	(3)	15
TOTAL	10,909	10,763	11,047	10,843	(146)	138	(66)

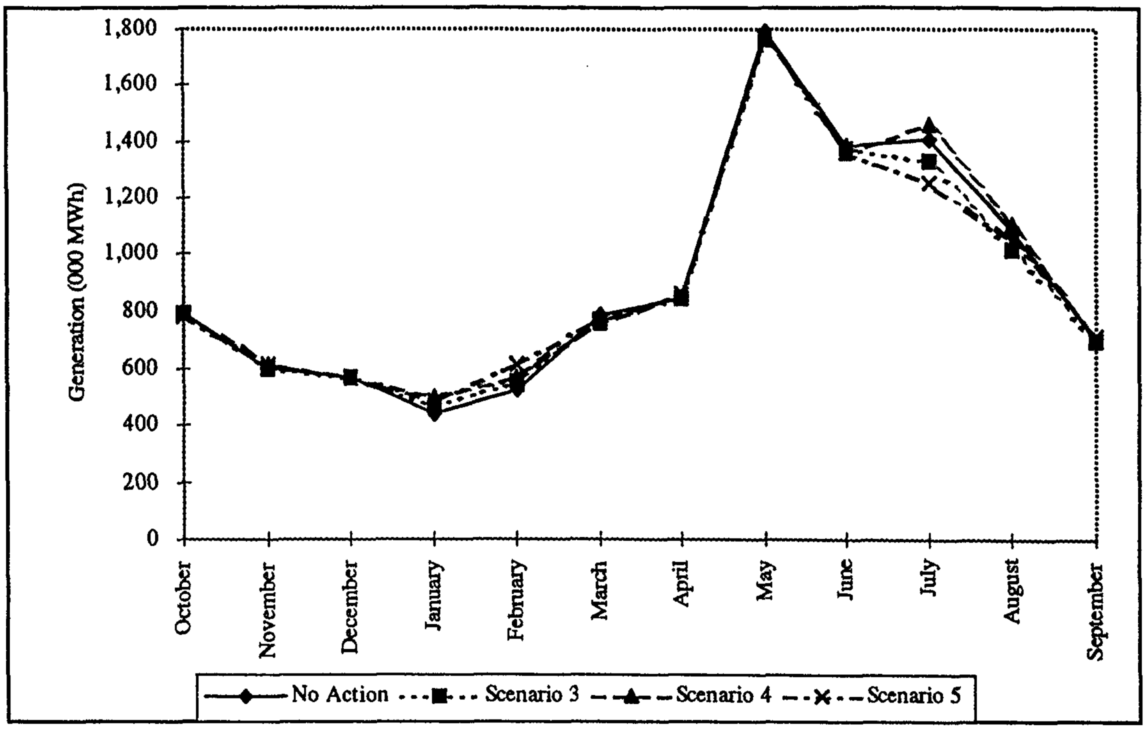

Figure 10 : Alternative 2, Average Water Year CVP and SWP System-Wide Energy Generation

As seen earlier in Figure 7, Scenario 3 results in a decrease in generation value of between $328,000 and $438,000. Scenario 4 impacts range from a gain of $311,000 to $415,000 and Scenario 5 results in a decrease in generation value of between $148,000 and $197,000. In addition to annual and monthly impacts, the timing of releases, diversions, and flows may impact the availability of energy within particular months. As an example, stream flow alterations within the Common Programs will include pulse flows designed to enhance anadromous fish habitat. These pulse flows are seasonal and will occur at various times of the year and for differing periods depending on the enhancement target and the environmental conditions (dry, normal, or wet year). These differences are reflected in charges in DWRSIM results for each operational scenario.

(This section to be completed later with comparisons of related conditions under Alternative 2 to No Action conditions.)

5.3.1.2.2 CVP and SWP Power Production and Replacement Costs

Operational changes identified for Alternative 2 in Section 5.2.1.2 provide the basis for determining impacts to Alternative 2 power production costs. Changes in O&M additions and replacements at existing facilities may occur, but would be reflected as variable O&M costs which are a minor cost component and are expected to be insignificant.

(This section to be completed later with comparisons of related conditions under Alternative 2 to No Action conditions.)

5.3.1.2.3 CVP and SWP Power Rates

(This section to be completed later with comparisons of related conditions under Alternative 2 to No Action conditions.)

5.3.1.2.4 CVP and SWP Project Energy Use Impacts

In addition to the pumping energy impacts to existing SWP and CVP facilities that occur as a result of the Common Programs, operational changes are identified in Alternative 2 as a result of a variety of storage and through-Delta conveyance modifications.

Impacts are estimated based on the results of specified DWRSIM scenario runs, as explained in Section 5.3.1.1.4. Three different DWRSIM scenarios are defined for the five different defined configurations of Alternative 2. Alternative configurations 2A and 2C are represented as DWRSIM Scenario 3. Operational impacts from DWRSIM Scenario 3 result from changes in operation due to implementation of the Common Programs and conveyance modifications. Alternative configurations 2B and 2E are represented as DWRSIM Scenario 4. Scenario 4 includes a substantial increase in additional storage (up to 6.5 MAF) through new surface and groundwater storage facilities. Alternative configuration 2D is represented as DWRSIM Scenario 5. Scenario 5 includes a lesser increase in additional storage (up to 2.0 MAF) through new surface storage facilities. Table 12 and Figure 11 compare monthly energy requirements and peak demand in an average water year for SWP and CVP surface water pumping facilities under DWRSIM Scenarios 3, 4, and 5 and the No Action Alternative (DWRSIM Study 472).

As seen earlier in Figure 9, Scenario 3 impacts range from a cost of almost $788,000 to over $1.0 million. Scenario 4 impacts range from a cost of over $2.1 million to almost $2.8 million and Scenario 5 impacts range from over $991,000 to almost $1.3 million.

Table 12
Alternative 2
Average Water Year System-Wide Energy Use Impacts

	Total Energy (000 MWh)				Change (in 000 MWh) From No Action to		
Month	No Action	Scenario 3	Scenario 4	Scenario 5	Scenario 3	Scenario 4	Scenario 5
October	1,144	1,144	1,153	1,128	0	9	(16)
November	1,137	1,137	1,154	1,153	0	17	16
December	1,193	1,267	1,282	1,272	74	89	79
January	1,022	1,204	1,346	1,256	182	324	234
February	1,069	1,132	1,331	1,230	63	262	161
March	1,489	1,397	1,494	1,509	(92)	5	20
April	1,354	1,341	1,340	1,367	(13)	(14)	13
May	1,264	1,289	1,330	1,271	25	65	6
June	1,156	1,289	1,179	1,200	133	23	44
July	1,167	1,139	1,207	1,091	(28)	40	(76)
August	1,190	1,158	1,199	1,133	(32)	10	(56)
September	1,397	1,389	1,379	1,354	(8)	(18)	(43)
TOTAL	14,582	14,885	15,395	14,963	303	813	381

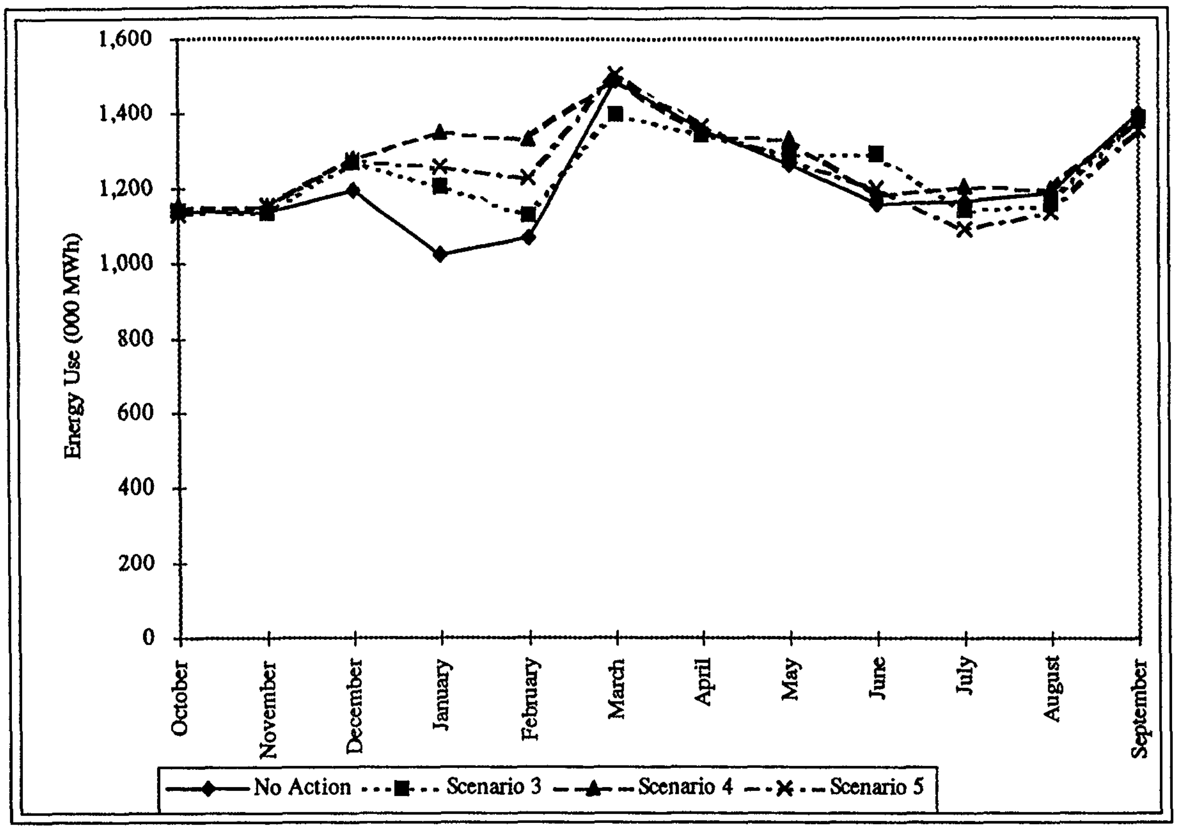

Figure 11 : Alternative 2, Average Water Year CVP and SWP System-Wide Energy Use

(This section to be completed later with comparisons of related conditions under Alternative 2 to No Action conditions.)

5.3.1.2.5 Other Types of Energy Use Impacts During Operations in the Overall Study Area

Energy Use at Groundwater Pumping Plants

(This section will briefly and qualitatively provide a regional overview of how energy use at state, federal and locally-owned groundwater pumping plants could be affected by this alternative. It will be noted that subsequent project-level studies are more appropriate to assess this type of impact in more detail.)

Energy Use at Treatment Plants

(This section will briefly and qualitatively provide a regional overview of how energy use at water treatment plants could be affected by this alternative. It will be noted that subsequent project-level studies are more appropriate to assess this type of impact in more detail.)

5.3.1.2.6 CVP and SWP Customer Power Costs

(This section to be completed later with comparisons of related conditions under Alternative 2 to both No Action and existing conditions.)

5.3.1.2.7 Energy Use Associated With Traffic & Navigation Impacts After Construction

The CALFED action alternatives are expected to cause major environmental improvements in the study area. This would increase recreation opportunities for many types of recreationists (boating enthusiasts at reservoirs, fishermen, hunters, bird watchers, etc.) As recreation use increases in the areas where environmental improvements occur, recreation-related traffic also would increase in the areas where the recreationists drive their vehicles. This would cause an indirect increase in the amount of fuel that is used in the study area and in the areas that recreationists travel from.

(If related data is developed by the Traffic & Navigation resource category, this section will conclude by providing a regional overview of traffic and navigation-related energy use impacts. It will be noted that subsequent project-level studies are more appropriate to assess this type of impact in more detail.)

5.3.1.3 Alternative 3: Dual Delta Conveyance

5.3.1.3.1 Hydroelectric Capacity and Energy Generation Impacts

In addition to the Hydroelectric Capacity and Energy Generation impacts to existing SWP and CVP facilities that occur as a result of the Common Programs (see Section 5.3.1.1.1 for a discussion), operational changes are identified in Alternative 3 as a result of a variety of storage and through-Delta conveyance modifications, and an isolated conveyance facility.

Impacts are estimated based on the results of specified DWRSIM scenario runs, as explained in Section 5.3.1.1.1. Three different DWRSIM scenarios are defined for the nine different defined configurations of Alternative 3. Alternative configurations 3A and 3C are represented as DWRSIM Scenario 6. Operational impacts from DWRSIM Scenario 6 result from changes in operation due to implementation of the Common Programs, through-Delta conveyance modifications, and a 5,000 cfs capacity isolated conveyance facility. Alternative configurations 3B, 3D, 3G, and 3H are represented as DWRSIM Scenario 7. Scenario 7 includes a substantial increase in additional storage (up to 6.7 MAF) through new surface and groundwater storage facilities. Alternative configurations 3E, 3F, and 3I are represented as DWRSIM Scenario 8. Scenario 8 includes an increase in additional storage through new surface storage facilities and a 15,000 cfs capacity isolated conveyance facility. Table 13 and Figure 12 compare monthly energy generation in an average water year for SWP and CVP facilities under DWRSIM Scenarios 6, 7, and 8 and the No Action Alternative (DWRSIM Study 472).

Table 13
Alternative 3
Average Water Year System-Wide Energy Generation Impacts

Month	Total Energy (000 MWh)				Change (in 000 MWh) From No Action to		
	No Action	Scenario 6	Scenario 7	Scenario 8	Scenario 6	Scenario 7	Scenario 8
October	788	792	791	791	4	3	3
November	598	598	611	611	0	13	13
December	572	571	571	571	(1)	(1)	(1)
January	440	487	496	496	47	56	56
February	522	529	561	561	7	39	39
March	780	767	764	764	(13)	(16)	(16)
April	846	811	811	811	(35)	(35)	(35)
May	1,789	1,763	1,779	1,779	(26)	(10)	(10)
June	1,384	1,374	1,361	1,361	(10)	(23)	(23)
July	1,402	1,306	1,444	1,444	(96)	42	42
August	1,089	1,016	1,051	1,051	(73)	(38)	(38)
September	699	723	716	716	24	17	17
TOTAL	10,909	10,737	10,957	10,957	(172)	48	48

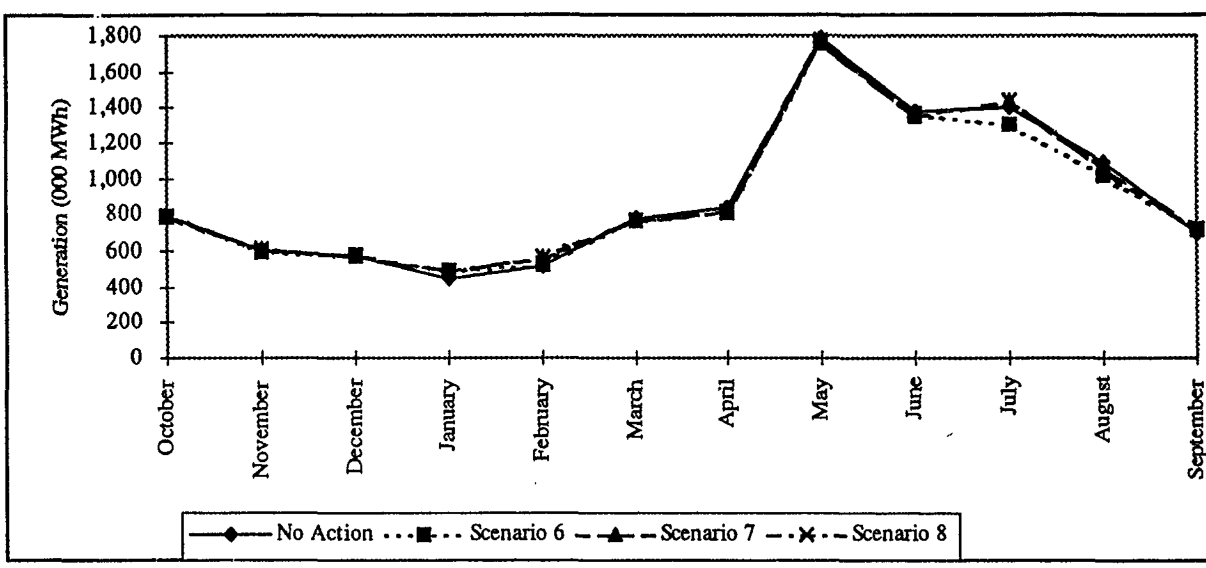

Figure 12 : Alternative 3, Average Water Year CVP and SWP System-Wide Energy Generation

As seen in Figure 7, Scenario 6 results in a decrease in generation value of between $387,000 and $516,000. Both Scenario 7 and Scenario 8 impacts range from a gain of $107,000 to $144,000.

In addition to annual and monthly impacts, the timing of releases, diversions, and flows may impact the availability of energy within particular months. As an example, stream flow alterations within the Common Programs will include pulse flows designed to enhance anadromous fish habitat. These pulse flows are seasonal and will occur at various times of the year and for differing periods depending on the enhancement target and the environmental conditions (dry, normal, or wet year).

(This section to be completed later with comparisons of related conditions under Alternative 3 to No Action conditions.)

5.3.1.3.2 CVP and SWP Power Production and Replacement Costs

Operational changes identified for Alternative 3 in Section 5.2.1.3 provide the basis for determining impacts to Alternative 3 power production costs. Changes in O&M additions and replacements at existing facilities may occur, but would be reflected as variable O&M costs which are a minor cost component and are expected to be insignificant.

(This section to be completed later with comparisons of related conditions under Alternative 3 to No Action conditions.)

5.3.1.3.3 CVP and SWP Power Rates

(This section to be completed later with comparisons of related conditions under Alternative 3 to No Action conditions.)

5.3.1.3.4 CVP and SWP Project Energy Use Impacts

In addition to the pumping energy impacts to existing SWP and CVP facilities that occur as a result of the Common Programs, operational changes are identified in Alternative 3 as a result of a variety of storage and through-Delta conveyance modifications, and an isolated conveyance facility.

Impacts are estimated based on the results of specified DWRSIM scenario runs, as explained in Section 5.3.1.1.4. Three different DWRSIM scenarios are defined for the nine different defined configurations of Alternative 3. Alternative configurations 3A and 3C are represented as DWRSIM Scenario 6. Operational impacts from DWRSIM Scenario 6 result from changes in operation due to implementation of the Common Programs, through-Delta conveyance modifications, and a 5,000 cfs capacity isolated conveyance facility. Alternative configurations 3B, 3D, 3G, and 3H are represented as DWRSIM Scenario 7. Scenario 7 includes a substantial increase in additional storage (up to 6.7 MAF) through new surface and groundwater storage facilities. Alternative configurations 3E, 3F, and 3I are represented as DWRSIM Scenario 8. Scenario 8 includes a the increase in additional storage through new surface storage facilities and a 15,000 cfs capacity isolated conveyance facility. Table 14 and Figure 13 compare monthly energy requirements in an average water year for SWP and CVP surface water pumping facilities under DWRSIM Scenarios 6, 7, and 8 and the No Action Alternative (DWRSIM Study 472).

As seen earlier in Figure 9, Scenario 6 impacts range from a cost of over $1.2 million to over $1.6 million. Both Scenario 7 and Scenario 8 impacts range from a cost of almost $3.6 million to almost $4.7 million.

Table 14
Alternative 3
Average Water Year System-Wide Energy Use Impacts

Month	Total Energy (000 MWh)				Change (in 000 MWh) From No Action to		
	No Action	Scenario 6	Scenario 7	Scenario 8	Scenario 6	Scenario 7	Scenario 8
October	1,144	1,149	1,185	1,185	5	41	41
November	1,137	1,139	1,160	1,160	2	23	23
December	1,193	1,294	1,295	1,295	101	102	102
January	1,022	1,332	1,332	1,332	310	310	310
February	1,069	1,008	1,388	1,388	(61)	318	318
March	1,489	1,397	1,579	1,579	(92)	90	90
April	1,354	1,407	1,511	1,511	53	157	157
May	1,264	1,377	1,448	1,448	113	183	183
June	1,156	1,221	1,175	1,175	65	19	19
July	1,167	1,136	1,217	1,217	(31)	50	50
August	1,190	1,160	1,220	1,220	(30)	30	30
September	1,397	1,433	1,450	1,450	36	53	53
TOTAL	14,582	15,053	15,959	15,959	471	1,377	1,377

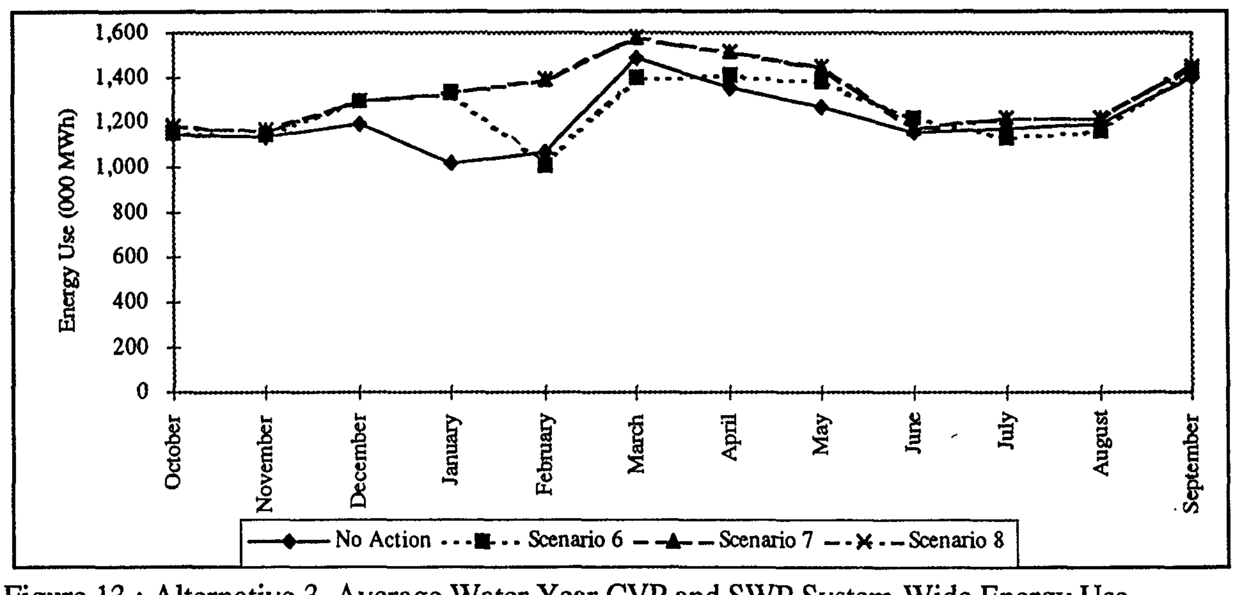

Figure 13 : Alternative 3, Average Water Year CVP and SWP System-Wide Energy Use

(This section to be completed later with comparisons of related conditions under Alternative 3 to No Action conditions.)

5.3.1.3.5 Other Types of Energy Use Impacts During Operations in the Overall Study Area

Energy Use at Groundwater Pumping Plants

(This section will briefly and qualitatively provide a regional overview of how energy use at state, federal and locally-owned groundwater pumping plants could be affected by this alternative. It will be noted that subsequent project-level studies are more appropriate to assess this type of impact in more detail.)

Energy Use at Treatment Plants

(This section will briefly and qualitatively provide a regional overview of how energy use at water treatment plants could be affected by this alternative. It will be noted that subsequent project-level studies are more appropriate to assess this type of impact in more detail.)

5.3.1.3.6 CVP and SWP Customer Power Costs

(This section to be completed later with comparisons of related conditions under Alternative 3 to No Action conditions.)

5.3.1.3.7 Energy Use Associated With Traffic & Navigation Impacts After Construction

The CALFED action alternatives are expected to cause major environmental improvements in the study area. This would increase recreation opportunities for many types of recreationists (boating enthusiasts at reservoirs, fishermen, hunters, bird watchers, etc.) As recreation use increases in the areas where environmental improvements occur, recreation-related traffic also would increase in the areas where the recreationists drive their vehicles. This would cause an indirect increase in the amount of fuel that is used in the study area and in the areas that recreationists travel from.

(If related data is developed by the Traffic & Navigation resource category, this section will conclude by providing a regional overview of traffic and navigation-related energy use impacts. It will be noted that subsequent project-level studies are more appropriate to assess this type of impact in more detail.)

5.3.2 DELTA REGION

This section summarizes the results of the power production and energy impact analysis that was conducted for the Delta Region. Table 15 summarizes the major conditions that were compared for each of the assessment variables analyzed in this region. These conditions and other information presented in the sub-sections below were used to reach the impact conclusions for the Delta Region.

<u>5.3.2.1 Alternative 1: Existing System Conveyance</u>

5.3.2.1.1 CVP and SWP Surface Water Pumping

<u>(To be completed)</u>

Table 15
Comparison of Power Production and Energy Conditions in the Delta Region

Assessment Variables	Existing Conditions	No Action Alternative Conditions	Alternative 1 Conditions	Alternative 2 Conditions	Alternative 3 Conditions
Available Capacity and Energy Generation	As described in Affected Environment	Similar to Existing Conditions			
Project Energy Use	As described in Affected Environment	Similar to Existing Conditions			
Power Rates	As described in Affected Environment	Similar to Existing Conditions			

5.3.2.1.2 Water Storage Facility Actions

Direct water storage-related impacts would not occur in this region under Alternative 1.

5.3.2.1.3 Water Conveyance Actions

Direct and Construction-Related Impacts

Two configurations of Alternative 1 (1B and 1C) could include the same two conveyance projects in the Delta Region (the South Delta Modifications and the CVP-SWP Improvements projects). Both of these representative and example projects would require energy to power a wide variety of construction procedures, including trenching, grading and workers commuting to construction sites. Table 16 summarizes the amount of energy that would be used to construct each of these example projects as well as the other conveyance projects that could be included in the other CALFED action alternatives. A total of _____ to ______ gallons of fuel would be used to construct these two projects in the Delta Region.

(Note: the energy use during construction analysis will be completed once the Traffic and Navigation analysis provides related estimates of construction vehicles and CALFED staff prepares estimates of construction workers and equipment. ***Indirect and Operational-Related***

A minor amount of energy would be needed to maintain the conveyance facilities after construction. A substantially greater amount of energy would be required at related pumping facilities, as discussed in Section 5.3.2.1.1.

5.3.2.1.4 CVP and SWP Customer Power Costs

(To be completed)

5.3.2.1.5 Impacts of the Common Programs

The impacts of Common Programs on power production and energy are generally described for all alternatives and regions in the related sub-section of Section 5.3.1.1.

Table 16 Summary of Energy Use During Construction of Example Conveyance Projects			
Name of Example Conveyance Project	**Alternative Configurations the Project is Included In**	**Region**	**Energy Use During Construction**
South Delta Modifications	1B, 1C, 2A, 2B, 2C, 3A, 3B, 3C, 3D, 3E, 3F, 3G, 3I	Delta	(to be determined)
CVP-SWP Improvements	1B, 1C, 2A, 2B, 2C, 2D, 2E, 3A, 3B, 3C, 3D, 3E, 3F, 3G, 3H, 3I	Delta	(to be determined)
10,000 cfs Screened Intake at Hood	2A, 2B, 2D	Delta	(to be determined)
North Delta Channel Modifications	2A, 2B, 3A, 3B, 3C, 3D, 3E, 3F, 3G	Delta	(to be determined)
Western 15,000 cfs Isolated South Delta Intake Project	2C, 3I	Delta	(to be determined)
Northern 15,000 cfs Isolated South Delta Intake Project	2C, 3I	Delta	(to be determined)
Eastern 15,000 cfs Isolated South Delta Intake Project	2C	Delta	(to be determined)
Mokelumne River Floodway & East Delta Wetlands	2D, 2E, 3H	Delta	(to be determined)
South Delta Habitat Modifications	2D, 2E, 3H	Delta	(to be determined)
Tyler Island Aquatic Habitat	2E, 3H	Delta	(to be determined)
5,000 cfs Isolated Facility (Features Vary in Some Configurations)	3A, 3B, 3C, 3D, 3G, 3H	Delta	(to be determined)
15,000 cfs Isolated Facility	3E	Delta	(to be determined)
10,000 cfs Intake at the Delta Cross Channel With Isolated Island Conveyance Facilities	3F	Delta	(to be determined)
Northern 15,000 cfs Isolated Sacramento River Intake Project	3I	Delta	(to be determined)
Eastern 5,000 cfs Isolated South Delta Intake Project	3I	Delta	(to be determined)
Tehama-Colusa Canal Extension	(to be determined)	Sacramento River	(to be determined)
Mid-Valley Canal Project (including Enlargement of the Delta-Mendota Canal)	(to be determined)	Delta and San Joaquin River	(to be determined)

5.3.2.2 Alternative 2: Modified Through Delta Conveyance

5.3.2.2.1 CVP and SWP Surface Water Pumping

(To be completed)

5.3.2.2.2 Water Storage Facility Actions

Direct and Construction-Related Impacts

Alternative 2 includes five different alternative configurations. Only one of these, configuration 2C, includes new storage that would be constructed in the Delta Region. This project would be the In-Delta Storage-Southern Delta project would use ___ to ___ gallons of fuel during its construction phase.

Indirect and Operational-Related Impacts

A minor amount of energy would be used to maintain the new In-Delta Storage project. The pumping-related impacts of new storage projects are addressed in Section 5.3.1.2.4.

5.3.2.2.3 Water Conveyance Actions

Direct and Construction-Related Impacts

Alternative 2 includes five different alternative configurations. All of them include multiple conveyance projects that would be constructed in the Delta Region. Table 16 shows the amount of energy that would be used by each of the projects on an individual basis. Collectively, the amount of energy that would be used by each configuration of Alternative 2 is summarized below.

- Configuration 2A: a total range of ___ to ___ gallons of fuel would be used
- Configuration 2B: a total range of ___ to ___ gallons of fuel would be used
- Configuration 2C: a total range of ___ to ___ gallons of fuel would be used
- Configuration 2D: a total range of ___ to ___ gallons of fuel would be used
- Configuration 2E: a total range of ___ to ___ gallons of fuel would be used

Indirect and Operational-Related Impacts

A minor amount of energy would be needed to maintain the new conveyance projects. A much greater amount of energy would be required for related pumping and is addressed in Section 5.3.2.2.1.

5.3.2.2.4 CVP and SWP Customer Power Costs

(To be completed)

5.3.2.2.5 Impacts of the Common Programs

The impacts of Common Programs on power production and energy are generally described for all alternatives and regions in the related sub-section of Section 5.3.1.1.

5.3.2.3 Alternative 3: Dual Delta Conveyance

5.3.2.3.1 CVP and SWP Surface Water Pumping

(To be completed)

5.3.2.3.2 Water Storage Facility Actions

Direct and Construction-Related Impacts

Alternative configurations 3B, 3D, 3E, 3G, and 3I each include the In-Delta Storage-Southern Delta Project while 3F includes the Chain-of-Lakes Project. Alternative configurations 3A, 3C and 3H do not include new storage projects in the Delta Region. The amount of energy used during construction under alternative configurations 3B, 3D, 3G, and 3I would range from ___ to ___ gallons of fuel. The amount of energy used during construction of configuration 3F would range from ___ to ___ gallons of fuel.

Indirect and Operational-Related Impacts

A minor amount of energy would be needed to maintain the Delta Region storage projects. Pumping-related energy impacts are described in Section 5.3.2.3.1.

5.3.2.3.3 Water Conveyance Actions

Direct and Construction-Related Impacts

Each of the nine configurations of Alternative 3 include new conveyance projects in the Delta Region (see Table 16 to see which conveyance projects are included in Alternative 3 and the amount of energy that would be used by each of the projects on an individual basis). Collectively, the amount of energy that would be used by each configuration of Alternative 3 is summarized below.

- Configuration 3A: a total range of ___ to ___ gallons of fuel would be used
- Configuration 3B: a total range of ___ to ___ gallons of fuel would be used
- Configuration 3C: a total range of ___ to ___ gallons of fuel would be used
- Configuration 3D: a total range of ___ to ___ gallons of fuel would be used
- Configuration 3E: a total range of ___ to ___ gallons of fuel would be used
- Configuration 3F: a total range of ___ to ___ gallons of fuel would be used
- Configuration 3G: a total range of ___ to ___ gallons of fuel would be used
- Configuration 3H: a total range of ___ to ___ gallons of fuel would be used
- Configuration 3I: a total range of ___ to ___ gallons of fuel would be used

Indirect and Operational-Related Impacts

A minor amount of energy would be needed to maintain the new conveyance projects. A much greater amount of energy would be required for related pumping and is addressed in Section 5.3.2.3.1.

5.3.2.3.4 CVP and SWP Customer Power Costs

(To be completed)

5.3.2.3.5 Impacts of the Common Programs

The impacts of Common Programs on power production and energy are generally described for all alternatives and regions in the related sub-section of Section 5.3.1.1.

5.3.3 BAY REGION

Significant power production and energy impacts are not expected in the Bay Region under any of the CALFED alternatives.

5.3.4 SACRAMENTO RIVER REGION

This section summarizes the results of the power production and energy impact analysis that was conducted for the Sacramento River Region. Table 17 summarizes the major conditions that were compared for each of the assessment variables analyzed in this region. These conditions and other information presented in the sub-sections below were used to reach the impact conclusions for the Sacramento River Region.

Table 17
Comparison of Power Production and Energy Conditions in the Sacramento River Region

Assessment Variables	Existing Conditions	No Action Alternative Conditions	Alternative 1 Conditions	Alternative 2 Conditions	Alternative 3 Conditions
Available Capacity and Energy Generation	As Described in Affected Environment	Similar to Existing Conditions			
Project Energy Use	As Described in Affected Environment	Similar to Existing Conditions			
Power Rates	As Described in Affected Environment	Similar to Existing Conditions			

<u>5.3.4.1 Alternative 1: Existing System Conveyance</u>

5.3.4.1.1 Water Storage Facility Actions

Direct and Construction-Related Impacts

Alternative 1 may include new water storage facilities if configuration 1C is chosen. Configurations 1A and 1B do not include new storage facilities. If configuration 1C is implemented, the representative types of power and energy impacts described below would occur in the Sacramento River Region.

<u>Construction of New Power Plants and Modifications to Existing Power Plants</u>

It is not known at this time what reservoir site will finally be selected. Some potential sites include: Cottonwood Creek, Lake Berryessa, Shasta Lake, Sites/Colusa and Thomes-Newville. For purposes of this analysis, the sites/Colusa Reservoir Project is used as the representative project for this region. This on-stream storage project would increase the capacity of the hydroelectric power system in this region by ___ MW. This would be a positive impact on power and energy resources.

Energy Use During Construction

Construction of the Sites/Colusa Reservoir Project is expected to require the use of ___ to ___ gallons of fuel. Development of groundwater storage is also a component of configuration 1C and is expected to require the use of ___ to ___ gallons of fuel.

(Note: the energy use during construction analysis will be completed once the Traffic and Navigation analysis provides related estimates of construction vehicles and CALFED staff prepares estimates of construction workers and equipment.)

Indirect and Operational-Related Impacts

Minor increases in the use of energy would be required to operate and maintain both the surface water and groundwater storage projects included in configuration 1C as operation and maintenance (O&M) workers drive to the sites and electricity is used to test equipment, etc. This type of impact would not occur if configurations 1A or 1B are implemented.

Additional indirect and operational-related impacts of the surface water and groundwater storage projects that may be included in configuration 1C are described in Section 5.3.4.1.5.

5.3.4.1.2 Available Capacity and Energy Generation Impacts at CVP and SWP Hydroelectric Facilities

(To be completed)

5.3.4.1.3 Other Potentially Affected Hydroelectric Projects

(To be completed)

5.3.4.1.4 CVP and SWP Surface Water Pumping

(To be completed)

5.3.4.1.5 Water Conveyance Actions

Direct and Construction -Related Impacts

Configuration 1C would require a water conveyance facility from the Sacramento River to a reservoir. While a specific site and project has not been chosen as of yet, the Tehama-Colusa Canal Extension Project is an example of such a conveyance project. This project is in the Sacramento River Region and would require the use of ___ to ___ gallons of fuel during its construction phase.

(Note: it is not known at this time which CALFED alternative or alternatives include the Tehama-Colusa Canal Extension Project. This section will be edited as appropriate once this is determined.)

Indirect and Operational-Related Impacts

A minor amount of energy would be needed to maintain the conveyance facilities after construction. A substantially greater amount of energy would be required at related pumping facilities, as discussed in Section 5.3.4.1.4.

5.3.4.1.6 CVP and SWP Customer Power Costs

(To be completed)

5.3.4.1.7 Impacts of the Common Programs

The impacts of Common Programs on power production and energy are generally described for all alternatives and regions in the related sub-section of Section 5.3.1.1.

5.3.4.2 Alternative 2: Modified Through Delta Conveyance

5.3.4.2.1 Water Storage Facility Actions

Direct and Construction-Related Impacts

Construction of New Power Plants and Modifications to Existing Power Plants

Alternative configurations 2B and 2E include new surface water projects that would be located in the Sacramento River Region. As with configuration 1C, the Sites/Colusa Reservoir Project is used as the representative project for the region. Impacts are the same as identified for configuration 1C in Section 5.3.4.1.1. Configuration 2A, 2C, and 2D do not include a new storage component in the Sacramento River Region.

Energy Use During Construction

Construction of the Sites/Colusa Reservoir Project is expected to require the use of ___ to ___ gallons of fuel. Groundwater storage projects in configuration 2B and 2E would use from ___ to ___ gallons of fuel during their construction phase. Therefore, the total amount of energy used during construction would range from ___ to ___ gallons of fuel.

Indirect and Operational-Related Impacts

A minor amount of energy would be used to maintain the example storage projects included in this region. The pumping-related impacts of the example storage projects are addressed in Section 5.3.4.1.4

5.3.4.2.2 Available Capacity and Energy Generation Impacts at CVP and SWP Hydroelectric Facilities

(To be completed)

5.3.4.2.3 Other Potentially Affected Hydroelectric Projects

(To be completed)

5.3.4.2.4 CVP and SWP Surface Water Pumping

(To be completed)

5.3.4.2.5 Water Conveyance Actions

Direct and Construction -Related Impacts

Configuration 2B and 2E would include a conveyance project such as the example Tehama-Colusa Canal Extension Project. This example project is in the Sacramento River Region and would require the use of ___ to ___ gallons of fuel during its construction phase.

(Note: it is not known at this time which CALFED alternative or alternatives include the Tehama-Colusa Canal Extension Project. This section will be edited as appropriate once this is determined.)

Indirect and Operational-Related Impacts

A minor amount of energy would be needed to maintain the conveyance facilities after construction. A substantially greater amount of energy would be required at related pumping facilities, as discussed in Section 5.3.4.2.4.

5.3.4.2.6 CVP and SWP Customer Power Costs

(To be completed)

5.3.4.2.7 Impacts of the Common Programs

The impacts of Common Programs on power production and energy are generally described for all alternatives and regions in the related sub-section of Section 5.3.1.1.

<u>5.3.4.3 Alternative 3: Dual Delta Conveyance</u>

5.3.4.3.1 Water Storage Facility Actions

Direct and Construction-Related Impacts

<u>Construction of New Power Plants and Modifications to Existing Power Plants</u>

Alternative configurations 3B, 3D, 3E, 3F, 3G, 3H and 3I all include new surface water projects that would be located in the Sacramento River Region. The representative example project (Sites/Colusa) is discussed in Section 53.4.1.1. Configurations 3A and 3C do not include a new storage project component in the Sacramento River Region.

<u>Energy Use During Construction</u>

Energy use during construction for configurations 3B, 3D, 3E, 3F, 3G, 3H, and 3I is the same as that described for configuration 1C in Section 5.3.4.1.1.

Indirect and Operational-Related Impacts

A minor amount of energy would be used to maintain the new storage projects included in this region. The pumping-related impacts of new storage projects are addressed in Section 5.3.4.1.4.

5.3.4.3.2 Available Capacity and Energy Generation Impacts at CVP and SWP Hydroelectric Facilities

(To be completed)

5.3.4.3.3 Other Potentially Affected Hydroelectric Projects

(To be completed)

5.3.4.3.4 CVP and SWP Surface Water Pumping

(To be completed)

5.3.4.3.5 Water Conveyance Actions

Direct and Construction -Related Impacts

Configurations configurations 3B, 3D, 3E, 3F, 3G, 3H and 3I would include a new conveyance project such as the example Tehama-Colusa Canal Extension Project. This example project is in the Sacramento River Region and would require the use of ___ to ___ gallons of fuel during its construction phase.

Indirect and Operational-Related Impacts

A minor amount of energy would be needed to maintain the conveyance facilities after construction. A substantially greater amount of energy would be required at related pumping facilities, as discussed in Section 5.3.4.3.4.

5.3.4.3.6 CVP and SWP Customer Power Costs

(To be completed)

5.3.4.3.7 Impacts of the Common Programs

The impacts of Common Programs on power production and energy are generally described for all alternatives and regions in the related sub-section of Section 5.3.1.1.

5.3.5 SAN JOAQUIN RIVER REGION

This section summarizes the results of the power production and energy impact analysis that was conducted for the San Joaquin River Region. Table 18 summarizes the major conditions that were compared for each of the assessment variables analyzed in this region. These conditions and other information presented in the sub-sections below were used to reach the impact conclusions for the San Joaquin River Region.

Table 18
Comparison of Power Production and Energy Conditions in the San Joaquin River Region

Assessment Variables	Existing Conditions	No Action Alternative Conditions	Alternative 1 Conditions	Alternative 2 Conditions	Alternative 3 Conditions
Available Capacity and Energy Generation	As described in Affected Environment	Similar to Exiting Conditions			
Project Energy Use	As described in Affected Environment	Similar to Exiting Conditions			
Power Rates	As described in Affected Environment	Similar to Exiting Conditions			

<u>5.3.5.1 Alternative 1: Existing System Conveyance</u>

5.3.5.1.1 Water Storage Facility Actions

Direct and Construction-Related Impacts

Alternative 1 does not include new San Joaquin River Region storage, with one exception. Configuration 1C would include 500 thousand acre-feet (TAF) of groundwater storage and one million AF of surface water storage somewhere in the San Joaquin Valley. For purposes of this analysis, the Los Banos Grandes Project is used as the representative project for this region. The construction of the representative example storage projects would use energy during the construction phase as workers commute to construction sites and construction equipment is used to build recharge areas, wells and other facilities. These example projects would use ___ to ___ gallons of fuel during their construction phase.

Indirect and Operational-Related Impacts

A minor amount of energy would be required to maintain the groundwater storage facilities. A much greater amount of energy would be used for pumping.

Pumping-related energy impacts are addressed in Section 5.3.5.1.4.

5.3.5.1.2 Available Capacity and Energy Generation Impacts at CVP and SWP Hydroelectric Facilities

(To be completed)

5.3.5.1.3 Other Potentially Affected Hydroelectric Projects

(To be completed)

5.3.5.1.4 CVP and SWP Surface Water Pumping

(To be completed)

5.3.5.1.5 Water Conveyance Actions

Direct and Construction -Related Impacts

Alternative 1 will require a new conveyance project but the specific project and its location is not known at this time. An example of such a project is the Mid-Valley Canal Project, which includes the enlargement of the Delta-Mendota Canal. Most of this example project is in the San Joaquin River Region and would require the use of ___ to ___ gallons of fuel during its construction phase.

Indirect and Operational-Related Impacts

A minor amount of energy would be needed to maintain the conveyance facilities after construction. A substantially greater amount of energy would be required at related pumping facilities, as discussed in Section 5.3.5.1.4.

5.3.5.1.6 CVP and SWP Customer Power Costs

(To be completed)

5.3.5.1.7 Impacts of the Common Programs

The impacts of Common Programs on power production and energy are generally described for all alternatives and regions at the related sub-section of Section 5.3.1.1.

5.3.5.2 Alternative 2: Modified Through Delta Conveyance

5.3.5.2.1 Water Storage Facility Actions

Direct and Construction-Related Impacts

Alternative configurations 2B and 2E include new surface water and groundwater storage projects that would be located in the San Joaquin river Region. Impacts to these configurations are the same as those for configuration 1C, and are discussed in Section 5.3.5.1.1. Configuration 2D includes the Los Banos Grandes Project, but no groundwater storage. The total amount of energy used during construction for configuration 2D would range from ___ to ___ gallons of fuel.

Indirect and Operational-Related Impacts

A minor amount of energy would be used to maintain the new storage projects included in this region. The pumping-related impacts of new storage projects are addressed in Section 5.3.5.2.4.

5.3.5.2.2 Available Capacity and Energy Generation Impacts at CVP and SWP Hydroelectric Facilities

(To be completed)

5.3.5.2.3 Other Potentially Affected Hydroelectric Projects

(To be completed)

5.3.5.2.4 CVP and SWP Surface Water Pumping

(To be completed)

5.3.5.2.5 Water Conveyance Actions

Direct and Construction -Related Impacts

Alternative 2 would include a conveyance project such as the Mid-Valley Canal Project. Most of this example project is in the San Joaquin River Region and would require the use of ___ to ___ gallons of fuel during its construction phase.

Indirect and Operational-Related Impacts

A minor amount of energy would be needed to maintain the conveyance facilities after construction. A substantially greater amount of energy would be required at related pumping facilities, as discussed in Section 5.3.5.2.4.

5.3.5.2.6 CVP and SWP Customer Power Costs

(To be completed)

5.3.5.2.7 Impacts of the Common Programs

The impacts of Common Programs on power production and energy are generally described for all alternatives and regions in the related sub-section of Section 5.3.1.1.

<u>5.3.5.3 Alternative 3: Dual Delta Conveyance</u>

5.3.5.3.1 Water Storage Facility Actions

Direct and Construction-Related Impacts

Alternative configurations 3B, 3D, 3E, 3F, 3G, 3H and 3I all include new surface water and groundwater storage projects that would be located in the San Joaquin River Region. Impacts to these configurations are the same as those for configuration 1C, and are discussed in Section 5.3.5.1.1. Configurations 3A and 3C do not include storage projects.

Indirect and Operational-Related Impacts

A minor amount of energy would be needed to maintain the new storage projects included in this region. The pumping-related impacts of new storage projects are addressed in Section 5.3.5.3.4.

5.3.5.3.2 Available Capacity and Energy Generation Impacts at CVP and SWP Hydroelectric Facilities

(To be completed)

5.3.5.3.3 Other Potentially Affected Hydroelectric Projects

(To be completed)

5.3.5.3.4 CVP and SWP Surface Water Pumping

(To be completed)

5.3.5.3.5 Water Conveyance Actions

Direct and Construction -Related Impacts

Alternative 3 would include a conveyance project such the Mid-Valley Canal Project. Most of this project is in the San Joaquin River Region and would require the use of ___ to ___ gallons of fuel during its construction phase.

Indirect and Operational-Related Impacts

A minor amount of energy would be needed to maintain the conveyance facilities after construction. A substantially greater amount of energy would be required at related pumping facilities, as discussed in Section 5.3.5.3.4.

5.3.5.3.6 CVP and SWP Customer Power Costs

(To be completed)

5.3.5.3.7 Impacts of the Common Programs

The impacts of Common Programs on power production and energy are generally described for all alternatives and regions in the related sub-section of Section 5.3.1.1.

5.3.6 SWP SERVICE AREAS OUTSIDE CENTRAL VALLEY

Significant power production and energy impacts are not expected in SWP service areas outside the Central Valley.

ENDNOTES

[1] Statewide surplus/deficit declines from 591 MW, to -2,520 MW between 2000 and 2003 (Page A-16). ER-96 presents data for 2000, 2003 and 2015.

[2] In fact, additional capacity may be economic beyond that which the CEC identifies. The CEC estimate is based solely on reserve margin criteria.

[3] Assuming a baseloaded facility with a $550/kW capital cost, and private financing. Energy costs based on a 6,900 heat rate and 2.42 burner tip gas price per the August 1997 CEC Revised Fuels Report.

[4] Pacific Gas and Electric Company, Tariff and Prepared Direct Testimony, Volume 1, Appendix IV, March 31, 1997.

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