8.0 *Energy*

8.1 *Introduction*

CEQA and NEPA require that an EIR/EIS evaluate the energy requirements and conservation potential of proposed projects and alternatives (CEQA Guidelines, Section 15126 and Appendix F, and CEQ NEPA Regulations, 40 CFR 1502.16). The CEQA Checklist (CEQA Guidelines, Appendix I) asks the following questions: 1) Will the proposed project result in use of substantial amounts of fuel or energy? 2) Will the proposed project result in a substantial increase in demand upon existing sources of energy, or require the development of new sources of energy?

This chapter describes existing conditions for the use of energy resources by the SWP and examines the potential impacts of the ISDP on these resources. The discussion focuses primarily on electricity use, as this is the major energy resource used by the SWP. SWP facilities and equipment use other energy resources such as gasoline, diesel fuel, gas and propane. However, if the ISDP results in any increase in the use of these other resources, it will be minimal and insignificant. This section also describes the energy conservation plan implemented by DWR.

8.2 *Environmental Setting/Affected Environment*

The SWP requires a dependable and economical source of electric power for its pumping plants to deliver water to its water contractors. The SWP delivers water to other water agencies under specific short-term and long-term agreements and contracts. To ensure an adequate power supply, DWR has operated the SWP as an independent utility since 1983. The SWP produces power from facilities it owns as well as buying and selling power on the open market.

The SWP regulates the time of day when water is pumped. This allows DWR to minimize the cost of power it purchases by maximizing pumping during off-peak periods when energy costs are lower - usually at night - and selling power to other utilities during the on-peak periods when energy costs are high - usually during the day.

8.2.1 SWP Current Energy Use

The SWP is the largest single user of electricity in California, representing between three percent and four percent of the State's electrical use at different times. Table 8-1 shows the amounts of energy used by the SWP from 1988 through 1992, along with energy sources.

Table 8-1

Amounts of Energy Used & Sources of Energy (1988-1992)*

(gWh)

ITEM	1988	1989	1990	1991	1992
Energy Used by Pumping & Powerplants					
Hyatt-Thermalito Pumpback and Station Service	320.99	221.25	238.43	163.39	134.25
North Bay Interim Pumping Plant	0.79	0.02	0.00	0.00	0.04
Cordelia Pumping Plant	6.65	10.98	12.13	9.21	7.73
Barker Slough Pumping Plant	3.48	4.96	5.95	6.02	5.77
South Bay Pumping Plant	132.23	149.81	165.99	148.64	84.76
Del Valle Pumping Plant	1.22	0.74	0.75	0.76	0.65
Harvey O. Banks Delta Pumping Plant	649.33	1017.32	663.76	496.60	435.64
Gianelli Pumping-Generating Plant (SWP Share)	209.25	319.45	210.09	284.79	258.96
Dos Amigos Pumping Plant (SWP Share)	309.12	376.00	363.51	131.40	173.34
Buena Vista Pumping plant	311.08	375.21	448.79	210.29	216.03
Wheeler Ridge Pumping Plant	316.66	388.35	473.76	231.11	224.88
Chrisman Wind Gap Pumping Plant	697.09	865.86	1065.79	521.97	499.19
A.D. Edmonston Pumping Plant	2441.62	3026.07	3747.64	1833.62	1726.05
Alamo Power Plant (Station Service)	0.20	0.13	0.14	0.43	0.40
Pearblossom Pumping Plant	351.21	452.13	510.83	202.66	229.31
Devil Canyon Power Plant (Station Service)	0.04	0.14	0.14	0.11	0.56
Oso Pumping Plant	141.04	169.10	227.34	136.94	106.89
William E. Warne Power Plant (Sta. Service)	0.36	0.41	0.18	0.66	0.66
Las Perillas Pumping Plant	9.78	9.52	9.75	5.74	6.92
Badger Hill Pumping Plant	26.17	25.26	26.10	15.55	18.04
SUBTOTAL	5928.31	7412.71	8171.07	4399.91	4130.06
Scheduled High Voltage Transmission Losses	123.09	163.46	216.70	153.92	142.86
TOTAL ENERGY REQUIRED	6051.40	7576.17	8387.77	4553.83	4272.92
SWP Energy Sources					
Hyatt-Thermalito Power Plant	1551.80	1914.18	1515.17	811.16	867.62
Gianelli Pumping-Generating Plant (SWP Share)	161.49	156.19	237.33	89.76	156.82
Alamo Power Plant	24.58	27.44	28.20	12.95	24.94
Devil Canyon Power Plant	590.83	763.94	853.48	327.74	395.17
William E. Warne Power Plant	297.95	351.65	467.71	288.26	228.19
Castaic Power Plant	472.68	555.17	766.70	456.15	359.46
Bottle Rock Power Plant	140.41	111.20	56.49	-1.48	-1.13
Reid Gardner Unit No.4	1631.68	1686.61	1447.16	1323.62	1069.03
Pine Flat Power Plant	127.46	108.08	76.94	145.47	92.23
TERA Power Corporation	4.31	2.73	3.57	4.01	3.49
MWDSC Hydroelectric Plants	192.27	184.48	219.13	152.79	174.17
Power Exchange Delivered to SCE	-1841.59	-2114.57	-2098.99	-1215.71	-1330.50
Power Exchange Received From SCE	4240.06	3938.13	3979.97	3205.74	3987.27
Power Exchange Delivered to PG&E	0.00	0.00	0.00	0.00	-45.46
Power Exchange Received From PG&E	0.00	0.00	0.00	0.00	29.81
Power Exchange Bonneville Power Administration	0.00	0.00	0.00	-87.50	-33.83
Power Exchange Northern California Power Agency	0.00	0.00	-0.02	0.00	2.60
Power Exchange Salt River Project	1.57	0.00	0.00	0.00	0.00
SCE-SBVMWD Exchange	-2.29	-1.93	-2.56	-1.52	0.00
USBR Schedule Excess	0.82	0.38	0.00	0.00	0.00
Power System Deviations Account Transactions	0.00	-3.63	0.67	-5.81	-5.17
PURCHASES					
Arizona Power Services	0.83	9.56	50.96	5.41	0.00
Bonneville Power Administration	6.20	107.57	575.89	483.62	13.09
British Colombia Hydro Power Authority	9.12	7.80	508.50	43.78	4.30
El Paso Electric	0.00	0.00	0.87	0.00	0.00
Eugene Water and Electric Board	0.00	0.80	1.61	1.60	2.92
Idaho Power Company	0.00	210.32	6.02	0.00	0.00
Power Services of New Mexico	0.00	0.00	0.00	0.05	0.00

-continued-

Table 8-1 continued

Amounts of Energy Used & Sources of Energy (1988-1992)*

(gWh)

ITEM	1988	1989	1990	1991	1992
Los Angeles Dept. of Water and Power	0.00	0.30	1.54	12.32	0.00
Montana Power Company	1.60	80.08	88.39	55.70	1.78
Nevada Power Company	0.00	0.00	0.00	0.05	0.00
Northern California Power Agency	0.00	0.24	2.55	0.00	0.00
Pacific Gas and Electric	2.47	146.72	86.81	0.73	0.00
Pacific Power and Light	0.80	51.60	83.19	433.94	623.50
Portland General Electric	13.71	102.58	61.09	19.63	20.77
Puget Sound Power and Light Company	0.00	52.70	35.87	11.93	11.35
Salt River Project	102.07	118.65	249.29	38.05	78.52
Seattle City Light	0.00	0.00	22.51	0.00	2.20
Southern California Edison	8.04	9.24	0.00	1.63	2.42
WAPA Lower Colorado	0.00	0.00	27.33	16.67	0.66
Washington Water and Power Company	2.07	97.13	424.73	13.97	3.95
San Diego Gas and Electric Company	1.33	0.00	0.00	0.00	0.00
SUBTOTAL	7742.27	8675.34	9778.10	6644.69	6740.16
LESS SALES	1690.87	1099.17	1390.33	2090.86	2467.24
TOTAL ENERGY PROVIDED TO SWP	6051.40	7576.17	8387.77	4553.83	4272.92

*** Taken from Bulletin 132 (Management of the California State Water Project)**

In 1990, the SWP used 8,388 gigawatt hours (gWh)[1] of electricity with a peak demand of 2,200 megawatts (MW)[2] for water deliveries of 2.58 million acre-feet. However, electricity use in 1992 dropped to 4,273 gWh due to drought conditions and the curtailment of water deliveries to only 1.4 million acre-feet. If DWR were to deliver the full contract entitlements of 4.23 million acre-feet to SWP contractors, the estimated energy requirements would be 12,500 gWh with a peak demand of 2,700 MW.

A different combination of generation resources is used by DWR to meet its on-peak and off-peak energy requirements. Because DWR has the flexibility to regulate the SWP pumping on an hourly basis, maximum SWP pumping is generally scheduled during the off-peak hours (10 p.m. to 8 a.m., Monday through Saturday and all day on Sunday and holidays). By scheduling as much off-peak pumping as possible, DWR is able to take advantage of inexpensive surplus generation capability. Conversely, DWR maximizes its power generation during the on-peak hours when it is the most expensive.

8.2.2 SWP Power-Generation Resources

The SWP generates a large portion of the energy it uses at the power plants that are owned or partially owned by DWR (Figure 8-1). In addition, the Department has a large number of contracts for long-term capacity and associated energy, and short-term energy purchases, exchanges, transfers and sales with other electric utilities in California and the western states[3]. Table 8-1 also shows the energy sources used by the SWP from 1988 to 1992.

- *DWR Ownership Of Power Plants And Long-Term Capacity And Associated Energy Contracts*

Table 8-2 summarizes information on facilities which DWR currently owns or jointly owns. This table also includes DWR's contracts for long-term firm capacity and associated energy.

The Hyatt-Thermalito hydroelectric powerplant complex at Lake Oroville provides the largest share of SWP power with 900 MW capacity and 2,148 gWh generation in a median water year. Other hydroelectric power plants include Alamo, Devil Canyon, William E. Warne, Thermalito Diversion Dam, and partial ownership of Gianelli (formerly called San Luis). The Mojave

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1 Energy consumption is expressed in gigawatt hours (gWh) or kilowatt hours (kWh) which measure electricity consumption over time. A million kWh is equal to one gWh.

2 The capacity of power plants to produce energy during a specific hour at one point in time is expressed as megawatts (MW).

3 Long-term capacity is power owned or under contract (generally for many years), which can be depended on to provide energy without interruption and whenever needed. Short-term energy purchases, on the other hand, may range over periods of a few hours to a few months. Exchange agreements usually involve one utility providing capacity and/or energy for a period of time to another utility, and this power is then returned at some later date (a few days or a few months). Transfers involve one utility, either temporarily or permanently, signing over their entitlements to capacity and/or energy to another utility. The same type of arrangements can also apply to transmission services.

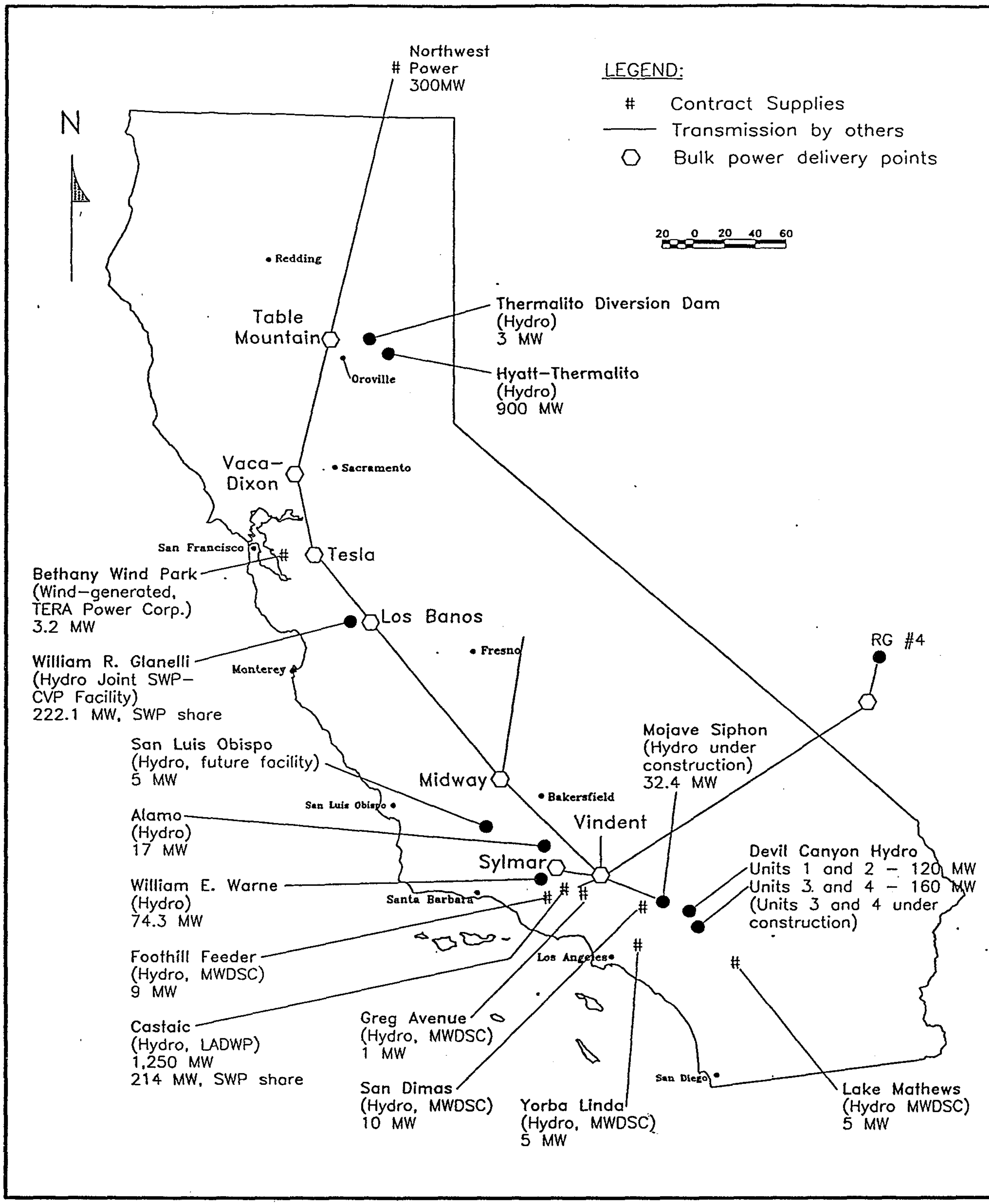

Figure 8-1. State Water Project Power Facilities.

Table 8-2
SWP Power Resources
Facilities Owned and Jointly Owned and Long-Term Capacity Contract to DWR

In Service Date	Energy Facility/Utility	Type of Facility	Total Capacity (MW)	SWP Share of Capacity (MW)	SWP Average Annual Energy (gWh)	Ownership
1968/69	Thermalito Hyatt	10 units Hydro	900	900	2148	DWR
1987	Thermalito Diversion Dam	Hydro-pumped storage	3	3	26	DWR
1968	Gianelli	8 units Hydro	424	222	170	DWR/USBR
1972/76	Devil Canyon	4 units Hydro	280	280	1,200	DWR
1982/83	Wm. Warne	2 units Hydro	78	78	720	DWR
1986	Alamo	1 unit Hydro	17	17	110	DWR
1994	Mojave Siphon	3 units Hydro	32.4	32.4	100	DWR
1983	Reid Gardner	Unit #4 Coal	250	169.5	1,400	DWR/NPC
1978	Castaic	Hydro	1,250	214	207	LADWP
1983	Pine Flat	3 units Hydro	165	165	387	KRCD
1983	MWD Hydro Phase I	5 units Hydro	30	30	184	MWDSC
--	Bethany Wind Park	60 units Wind	3.2	3.2	4	TERA PowerCorp.
1991	PacifiCorp	N/A	N/A	100	613	PacifiCorp
					7,269	

-- Data Not Available

Sources: CEC ER-92 and DWR Bulletin 132-93

Siphon hydroelectric plant has been under construction and will be completed in late 1995. Also scheduled for completion in 1995 is a second afterbay at Devil Canyon DWR is a joint owner of unit 4 of the Reid Gardner coal powerplant near Las Vegas, Nevada. The remainder of the plant is owned by Nevada Power Company (NPC). DWR currently receives up to 226 MW from unit 4 in exchange for NPC's limited right to interrupt DWR energy deliveries during peak periods. Beginning in 1998, NPC has an annual option to buy up to six percent of the DWR ownership share of unit 4. The joint ownership contract is effective through July 25, 2013.

DWR has two geothermal powerplants. Bottle Rock (55 MW) was completed in 1985 and operated until 1990 when insufficient steam made it uneconomical to continue. DWR began construction on the South Geysers plant, but before completion it was also determined that the level of steam was insufficient to continue.

DWR signed another long-term contract with the Kings River Conservation District (KRDC) to purchase all the capacity (165 MW) from three hydroelectric units at Pine Flat Dam in Fresno. The contract is effective through March 31, 2034.

DWR also signed a contract to purchase the capacity (30 MW) from five hydroelectric units owned and operated by the Metropolitan Water District of Southern California (MWDSC). This contract will be in effect until at least March 31, 2008.

DWR purchases 100 MW of firm capacity and associated energy from PacifiCorp of Portland, Oregon. This contract is in effect until December 31, 2004.

Finally, TERA Power Corporation owns the Bethany Wind Park which was designed for 168 wind machines with 9.45 MW capacity. DWR purchases the wind-generated energy from TERA at the South Bay Pumping Plant near Tracy. Due to mechanical failure and subsequent litigation only about 50 machines are operating with a capacity of 3.2 MW. The contract will expire in May 2002.

- *Contracts For Transfers, Exchanges And Purchases*

In addition to the long-term capacity and energy under contract to DWR described above, the Department also obtains energy for SWP operation through transfers, exchanges, and purchase agreements with other utilities throughout California, the Northwest, and the Southwest. Detailed information about DWR's 59 contracts can be found in DWR's Bulletin 132-93 (page 204).

The Los Angeles Department of Water and Power (LADWP) owns and operates the 1,250 MW pumped storage, hydroelectric Castaic Powerplant and Elderberry Pumping Forebay. This plant was developed under an agreement with DWR signed in 1966, and the facilities were completed in 1978. DWR receives up to 214 MW of transfer capacity and associated energy from LADWP until 2014.

DWR has both a power sales and an exchange agreement contract with Southern California Edison (SCE) involving capacity and energy from SWP hydroelectric facilities. Under the 1979 Power Contract, DWR provides SCE up to 485 MW of firm capacity and associated energy delivered mainly during on-peak hours. In exchange, SCE returns the energy with an additional amount of energy during off-peak hours. The 1981 exchange agreement provides SCE with 225 MW during on-peak hours and 412.5 gWh of energy. SCE then returns approximately 110 percent of this energy during the mid-peak and off-peak hours. These contracts expire in 2004.

DWR has contracts, which include short-term energy purchases and exchanges with PG&E, SCE, MWDSC, and Bonneville Power Administration, as well as agreements for purchasing interruptible economy energy to satisfy unexpected, short-term energy shortages.

- *Power Transmission Facilities And Arrangements*

DWR receives most of the intra-state transmission service it needs to operate the SWP pursuant to a contract with SCE dated October 11, 1979, and a contract with PG&E dated April 22, 1982. Both contracts will terminate on December 31, 2004. The Department has an option to extend the PG&E contract for an additional 10 years. Also, DWR has the Firm Transmission Service Agreement with SCE to provide up to 235 MW of transmission capability for delivering Reid Gardner unit 4 power to SWP.

DWR owns 32 circuit miles of 230-KV transmission lines connecting the Hyatt-Thermalito Powerplant to PG&E's Table Mountain Substation.

DWR also has rights to 300 MW of transmission line capacity on the Pacific Northwest Intertie through the year 2004. Under a memorandum of understanding signed with several California public and private electric utilities, DWR has a five-year option, beginning in January 2005, to purchase about 97 MW of a transmission capacity on the third 500-KV transmission line, the California Oregon Transmission Project (COTP). The COTP became operational in January 1993.

8.2.3 Power Sold

When generation from SWP power resources exceeds requirements, DWR sells the excess power. In 1992, DWR sold 2.55 million gWh of energy to 15 utilities, which resulted in revenues of $62.67 million. DWR also received $13.47 million in revenues for capacity payments and transmission sales from eight utilities.

8.2.4 Forecast Of Power Requirements

DWR forecasts the SWP's future demand for power using a simulation model to evaluate pumping demands for delivery of water to SWP contractors. The methodology and assumptions of the forecast are described in more detail below. This forecast is published each year in *Bulletin 132, Management of the California State Water Project.* In *Bulletin 132-93*, DWR's peak demand capacity and energy forecasts assume median hydrologic conditions and full SWP entitlement deliveries for 1994 and thereafter (see Table 8-3, 8-4 and 8-5).

DWR also submits twenty-year forecasts to the California Energy Commission (CEC) every two years using the Common Forecasting Methodology (CFM) for evaluation as part of the CEC's biennial *Electricity Report (ER)*. In the ER, the CEC adopts the official statewide energy demand and supply forecasts. The CEC forecast for DWR in the ER-94 proceeding is different from the DWR forecast (see Table 8-6). The CEC forecast and the reasons for the differences will also be discussed below.

- *DWR Forecast Methodology And Assumptions*

The DWR energy demand forecast begins with the SWP contractors' demand for water deliveries in each year. A computer simulation model then optimizes operations by projecting the quantities of water to be pumped at each plant that will result in the least use of on-peak energy. To determine the total load requirements, the pumping demand in acre feet (AF) at each pumping plant is converted to electric energy requirements based on the following formula:

Plant kWh = AF pumped * kWh/AF + Sta. Service Energy + Transmission Loss

The DWR capacity and energy forecasts shown in Tables 8-3, 8-4 and 8-6, are based upon the key assumption that the SWP contractors' water demand will be their maximum entitlements (as shown in Table 8-5). Where actual energy use in 1993 was 5,471 gWh, the forecast for 1994 jumps to 11,378 gWh based on DWR's assumption regarding water demand and deliveries. The forecast ignores the fact that current SWP facilities can not guarantee these water delivery entitlements on a firm basis and that additional water supply facilities would be needed to realize these delivery levels.

DWR forecasts peak demand based on a definition of peak demand as occurring between 8 am and 10 pm Monday through Saturday (historically Saturday has been the SWP peak pumping time). This definition differs considerably from the normal definition of peak demand used for electric utilities, which occurs on weekday afternoons in the summer.

The DWR water delivery and energy use forecasts are considered policy forecasts based on DWR's contractual obligations, rather than a reflection of current facility capabilities and operations. As a result, the DWR forecasts are not as useful for determining the electricity impacts of ISDP, which should be evaluated based on existing and expected future conditions.

Due to the differences in assumptions, the CEC forecasts for DWR's future capacity and energy requirements are more useful for the purpose of analyzing ISDP impacts.

Table 8-3
DWR Energy Forecast
Total Amounts of Energy Requirements for Years 1991, 1994, 1999, and 2004
(gWh)

Pumping Plants	1991*	1994	1999	2004
North Bay Aqueduct Plants				
Barker Slough	6	8.3	9.6	10.4
Cordelia	7	11.6	12.6	14.3
South Bay Aqueduct Plants				
Del Valle	1	0.0	1.6	1.6
South Bay	101	138.7	162.9	162.9
California Aqueduct Plants				
Harvey O. Banks	486	1,148.3	1,214.9	1223.6
Buena Vista	261	601.3	643.0	648.3
Ira J. Chrisman Wind Gap	682	1,494.9	1,562.1	1576.0
Dos Amigos	158	509.7	528.2	530.2
A.D. Edmonston	2,423	5,294.9	5,526.1	5,575.8
William R. Gianelli	172	277.7	294.6	296.8
Wheeler Ridge	316	701.3	734.9	741.4
East Branch Plants				
Pearblossom	381	715.9	797.9	793.0
West Branch Plants				
Oso	138	345.0	331.3	336.1
Coastal Branch Plants				
Badger Hill	1	19.6	40.9	39.4
Casmalia		0.0	0.0	0.0
Bluestone	0	0.0	50.4	50.4
Devil's Den	0	0.0	50.4	50.4
Las Perillas	1	7.9	16.0	15.5
Polonio Pass	0	0.0	50.4	50.4
Subtotal	5,135	11,275.1	12,027.8	12,116.5
Transmission Losses (a	305	593.5	622.1	626.5
Total SWP	5,440	11,868.6	12,649.9	12,743.0
Energy Obligations to Southern California Edison (b	1,290	2,386.2	2,179.7	2,192.6
Firm contracts Sales	570	266.8	0.0	0.0
Grand Total	7,300	14,521.6	14,829	14,935.6

a) Transmission losses are determined by contractual arrangements with utilities.
b) Energy obligations are based on existing power contract and capacity exchange agreement with Southern California Edison.

Source: *Bulletin* 132-93, Management of the California State Water Project
(*1991 data from Bulletin 132-91)

Table 8-4
Total Amounts of On-Peak and Off-Peak Electrical Capacity Requirements Projected for 1994 and 1999
(MW)

Pumping Plants	1994 On-Peak	1994 Off-Peak	1999 On-Peak	1999 Off-Peak
North Bay Aqueduct Plants				
Barker Slough	2	2	1	1
Cordelia	2	2	2	2
South Bay Aqueduct Plants				
Del Valle	0	0	(a	(a
South Bay	21	21	12	12
California Aqueduct Plants				
Harvey O. Banks	111	215	213	250
Buena Vista	64	89	63	94
Ira J. Chrisman Wind Gap	170	205	172	223
Dos Amigos	59	96	39	60
A.D. Edmonston	613	675	585	760
William R. Gianelli	1	1	51	203
Wheeler Ridge	79	97	78	105
East Branch, California Aqueduct, Plants				
Pearblossom	82	82	76	150
West Branch, California Aqueduct, Plants				
Oso	42	42	41	41
Coastal Branch, California Aqueduct, Plants				
Badger Hill	3	3	3	3
Bluestone	0	0	6	6
Casmalia	0	0	(b	(b
Devil's Den	0	0	6	6
Las Perillas	1	1	1	1
Polonio Pass	0	0	6	6
Total Capacity Needed to Pump Entitlement Water	**1,250**	**1,531**	**1,355**	**1,923**
Firm contract sales	75	40	0	0
Transmission losses	67	80	66	96
Reserve margin (10 percent of pumping, firm sales, and losses)	205	205	128	128
Capacity to Southern California Edison	700	475	710	485
Total Capacity Requirements	**2,297**	**2,331**	**2,259**	**2,632**

Source: Bulletin 132-93
a) Amount is smaller than one million kilowatts.
b) Future facility; data are not available

Table 8-5
Comparison of Actual and Forecasted SWP Deliveries
(Million Acre Feet)

Year	DWR Assumptions*	CEC Assumptions ER-94**
1980	1,530	1,530
1981	1,919	1,919
1982	1,750	1,750
1983	1,187	1,187
1984	1,588	1,588
1985	1,990	1,990
1986	1,999	1,999
1987	2,122	2,122
1988	2,377	2,377
1989	2,851	2,851
1990	2,582	2,582
1991	549	549
1992	1,437	1,437
1993	2,800	2,828
1994	4,058	2,856
1995	4,090	2,885
1996	4,175	2,914
1997	4,031	2,943
1998	4,041	2,972
1999	4,041	3,002
2000	4,066	3,032
2001	4,093	3,062
2002	4,093	3,093
2003	4,094	3,124
2004	4,095	3,155
2005	4,153	3,187
2006	4,154	3,219
2007	4,154	3,251
2008	4,155	3,283
2009	4,156	3,316
2010	4,196	3,349
2011	4,199	3,383
2012	4,199	3,417
2013	4,200	3,451

* Source: DWR 1993 CFM 10 submittal to CEC (1980-1992 are actual deliveries)
** Source: CEC Commission Order Adopting Electricity Demand Forecasts, March 16, 1994, Docket 93-ER-94
(1980-1992 are actual deliveries)

Table 8-6
Comparison of Energy Demand Forecasts for SWP
(gWh)

YEAR	DWR[1]	ER94[2]
1980	3,354	3246
1981	5,264	5249
1982	5,192	5017
1983	2,497	2155
1984	3,348	2945
1985	5,410	5202
1986	5,031	4690
1987	4,734	4459
1988	5,928	5397
1989	7,412	6871
1990	8,167	7722
1991	4,354	5043
1992	4,088	6530
1993	5,471	6412
1994	11,378	6709
1995	11,577	6845
1996	11,611	6899
1997	12,122	6986
1998	11,934	7221
1999	12,039	7214
2000	12,098	7425
2001	12,167	7458
2002	12,126	7531
2003	12,072	7648
2004	12,182	7836
2005	12,401	7968
2006	12,398	8125
2007	12,390	8222
2008	12,413	8371
2009	12,386	8524
2010	12,565	8669
2011	12,582	8835
2012	12,554	8966
2013	12,568	9083

1. DWR's *Demand Forecast Forms Using Common Forecasting Methodology (CFM10) for the 1994 Electricity Report (ER94) (Actual use through 1993)*
2. CEC Commission Order Adopting Electricity Demand Forecasts Docket N. 93-ER-94 March 16, 1994, Appendix A, Table 7

- *CEC Forecast Methodology And Assumptions*

Every two years, the CEC is required to adopt forecasts of the future demand for electricity in California for the upcoming 5-, 12-, and 20-year periods (Public Resources Code Sections 25305, 25309). The forecasts are one of the most important parts of the biennial *Electricity Report (ER)*.

The CEC staff recently completed the Electricity Report 1994 (ER-94), which is currently awaiting final action by the Commission. As part of the ER-94 proceeding, the CEC issued an Order on March 16, 1994, adopting new electricity demand forecasts. This order includes demand forecasts for DWR, as shown in Table 8-6.

The CEC uses a model similar to DWR's that estimates electricity demands at each pumping plant, based on water delivery demand. Table 8-6 presents a comparison of SWP energy demand forecasts from DWR and the CEC's ER-94 forecast. The differences in the DWR and CEC energy demand forecasts are due primarily to different assumptions about future water deliveries by the SWP.

The energy demand forecast adopted for the ER-94 proceeding differs substantially from the DWR forecast. This is based on the different water delivery forecasts used by DWR and CEC as shown in Table 8-5. The ER-94 forecast assumes 2.8 million acre feet for 1992 and a 1% increase in water deliveries every year thereafter. This forecast accounts for the new hydroelectric facilities scheduled for completion in 1995. The CEC forecast adjusts the water deliveries to reflect a statement in the DWR's Bulletin 132-91 (pg. 109), "the SWP does not have the storage facilities, delivery capabilities, or water supplies necessary to deliver the full amounts of entitlement water."

The CEC forecast for DWR's peak demand capacity requirements has two major differences in assumptions from the forecast prepared by DWR for ER-94 (see Table 8-7). As with the energy requirements forecast, the CEC peak demand forecast is based on lower water delivery forecasts. Also, as mentioned above, the CEC uses a different definition of peak demand consistent with California's overall electricity peak load. The CEC forecast is based on DWR's peak load data at 3:00 pm on a summer afternoon.

Because the CEC's ER-94 capacity and energy demand forecasts give the most accurate forecast of the SWP based on current and expected conditions, these will be used in analyzing ISDP impacts.

8.2.5 Forecast Of Energy Resources, Costs And Sales

Currently, the SWP is able to meet its power needs at a relatively economical cost through a combination of its own power resources and energy obtained through contracts. However, to ensure that the SWP needs will continue to be met at a relatively economical cost, DWR annually compiles a listing of the amount of energy forecasted to be generated by its own resources, the amount to be purchased, and the cost of producing or purchasing that energy.

Table 8-7
Estimated Amounts of Energy Resources for 1994, 1999 and 2004

Energy Sources and Costs	*1994*	*1999*	*2004*
Energy Resources (Millions of kilowatt-hours)			
SWP Resources			
Alamo Powerplant	47	114	112
Bottle Rock Powerplant	0	0	0
Castaic Powerplant	1,168	1,136	1,152
Devil Canyon Powerplant	1,074	1,206	1,220
William R. Gianelli Pumping-Generating Plant	199	222	227
Hyatt-Thermalito Powerplants	2,339	2,149	2,149
Mojave Siphon Powerplant	0	102	102
San Luis Obispo Powerplant	0	39	39
Thermalito Diversion Dam Powerplant	26	23	23
William E. Warne Powerplant	689	722	730
Energy Source from Short-Term Agreements			
Colorado River Aqueduct energy purchase	345	664	664
Energy purchase	1,229	373	394
Firm System purchases	1,600	1,600	2,400
Metropolitan Water District of Southern California hydroelectric plants	164	251	226
PacifiCorp	613	613	613
Pine Flat Powerplant	289	420	420
Reid Gardner Powerplant	1,500	1,321	901
Southern California Edison exchange (a	2,088	1,689	1,368
TERA Power Corporation	5	0	0
Total Resources	**13,375**	**12,650**	**12,740**
SWP Energy Requirements and Sales			
SWP energy requirements (b	12,011	12,650	12,740
Firm energy sales	1,240	0	0
Surplus economy energy sales	124	0	0

*Data taken from Bulletin 132-93 (Management of The California State Water Project)

When making the forecast, DWR assumes that future energy requirements in excess of available resources will be met through unspecified purchases of firm and non-firm energy.

The DWR estimates of resources available to meet future SWP energy demand are shown in Table 8-8. This shows an increase in energy available from hydroelectric power produced by DWR and other facilities with full entitlement water deliveries and the addition of several facilities. There is a gradual decrease in power from the Reid Gardner coal powerplant as NPC enforces its option to purchase a portion of the DWR ownership of unit 4.

As SWP deliveries increase, additional energy requirements will be met through new firm and non-firm energy purchases from utilities in California, the Pacific Northwest and the Southwest. The CEC's ER-94 projects that adequate economy energy supplies from the Pacific Northwest and the Southwest will be available to meet California's demands over the next 15 to 20 years. As a result, DWR will not need to build additional power facilities to meet energy demands for delivery of the full 4.2 maf of SWP entitlements and other wheeling commitments.

While DWR is currently able to meet the power needs for the SWP at a relatively economical cost through a combination of its own power resources and the energy obtained through contract, future costs are more uncertain. The increasing reliance on new firm and non-firm purchases could increase costs depending on the availability of power and the competition for sales.

DWR anticipates being both a purchaser and a seller of surplus energy in the future, due to annual uncertainties in State water needs, environmental needs, hydroelectric conditions, Colorado River water availability and agricultural programs.

8.2.6 Energy Conservation Plan

The "Energy Conservation Plan of the Department of Water Resources" by Elle Decker, October 1981, was established to provide practical, systematic energy reduction procedures at all DWR facilities throughout the State. These measures have reduced energy consumption at each of the DWR facilities from five percent to 35 percent to date.

All scheduled design and construction projects incorporate energy conservation measures. For example, the William E. Warne Powerplant was designed to incorporate a number of energy-saving features and systems.

DWR intends for all no/low/medium cost measures in the energy conservation plan to be implemented in order to achieve the minimum ten percent reduction goal at each facility. Since 1981, DWR has followed the listed energy conservation measures and succeeded in achieving substantial energy savings. Future facilities will also be designed with conservation measures included. The CEC ER-94 identifies the State building standards and State and federal appliance standards as the single largest sources of energy conservation for the future.

Table 8-8
Energy Used by SWP's Largest Contractors,*
Energy Cost, and Entitlement Deliveries

Year	Entitlement Deliveries (AF)	Energy Used (kWh)	Energy Cost ($)	% of Total
1989				
Kern Co. WA	807,380	406,915,548	15,048,858	10.82
MWDSC	1,408,050	6,103,482,129	78,036,628	56.13
SWP Total	2,692,642	7,524,727,976	139,031,996	N/A
1993				
Kern Co. WA	807,380	406,915,548	12,103,728	7.53
MWDSC	1,408,050	6,103,482,129	122,903,046	76.45
SWP Total	2,692,642	7,524,727,976	160,755,422	N/A
2000				
Kern Co. WA	1,153,400	619,735,425	23,153,733	7.03
MWDSC	2,011,500	8,681,671,800	237,223,554	72.05
SWP Total	4,064,328	11,498,935,667	329,252,389	N/A
2005				
Kern Co. WA	1,153,400	619,735,425	22,929,480	6.89
MWDSC	2,011,500	8,681,671,800	234,172,166	70.39
SWP Total	4,151,988	11,753,143,964	332,690,091	N/A

* Data taken from Bulletin 132-93
(1993 "Management of the California State Water Project" Bulletin)

8.2.7 Energy Use By SWP Contractors

The SWP has long-term water service contracts with twenty-nine agencies. In return for water service, the agencies contractually agree to repay all SWP capital and operating costs allocated to water supply. MWDSC and the Kern County water agency (with nearly 70 percent of the total SWP water deliveries) are among the largest SWP contractors. Entitlement deliveries, energy cost, and energy used by these two contractors are shown in Table 8-7. These data were unavailable for the other water agencies.

8.3 Environmental Impacts/Consequences

8.3.1 Significance Criteria

Objective criteria for determining the significance of energy impacts related to the proposed project and alternatives have been defined based on guidance from the CEQA Guidelines, Section 15126(c) and Appendices F and G: *"A project will normally have a significant effect on the environment if it will: (n) encourage activities which result in the use of large amounts of fuel, water or, energy; and (o) use fuel, water, or energy in a wasteful manner."*

The significance criteria used for the evaluation of energy impacts in this document is defined as follows:

> *"Increases in SWP energy use and peak demand, which substantially exceed DWR's identified supplies and result in the construction of new power facilities."*

8.3.2 Proposed Project

- *Energy Demand*

ISDP would result in changes to SWP energy use due to variations in the quantity and timing of water pumping for delivery to contractors and others. As detailed in Table 8-9, DWR modeling results show the changes in water levels exported from the H.O. Banks Pumping Plant with ISDP would range from a decrease of -228 thousand acre feet (TAF) in some years to a maximum increase of 262 TAF in other years, and on average would increase by 46 TAF per year (based on 1995 existing demand and facilities).

Changes in energy use associated with ISDP would be closely tied to changes in the levels of water pumping and delivery, decreasing in some years and increasing in other. Energy use and costs are also affected by both the amount of water storage capacity available within the SWP system and the time of pumping (both seasonal and time of day, which effect peak demand). Due to the modifications proposed for Clifton Court Forebay, other reservoirs within the SWP system would be able to increase the volume of water stored in given years. This will allow DWR additional flexibility in the timing and amount of pumping throughout the SWP system. This in turn would allow DWR to minimize energy costs for the SWP, by pumping water during

Table 8-9. H.O. Banks Pumping Plant, Total Pumping (Plus Wheeling) (TAF)

FUTURE DEMAND				EXISTING DEMAND		
YEAR	RUN 414 w/ISDP	RUN 411 w/o ISDP	INCREMENT 414-411	RUN 413 w/ISDP	RUN 420 w/o ISDP	INCREMENT 413-420
1922	3593	3710	-117	3141	3081	60
1923	3883	3843	40	3176	3231	-55
1924	1765	1715	50	2403	2269	134
1925	2650	2558	92	2895	2716	179
1926	3176	3116	60	3108	2846	262
1927	3837	3745	92	3274	3215	59
1928	3867	3737	130	3337	3335	2
1929	2321	2183	138	2455	2388	67
1930	2639	2494	145	2797	2624	173
1931	1592	1520	72	1605	1550	55
1932	1953	1845	108	2078	1880	198
1933	1851	1762	89	1748	1792	-44
1934	1847	1838	9	1835	1833	2
1935	3250	3260	-10	3041	3024	17
1936	3796	3626	170	3216	3203	13
1937	3625	3271	354	2880	2896	-16
1938	4156	4004	152	3382	3264	118
1939	3537	3395	142	2399	2522	-123
1940	3702	3492	210	3344	3320	24
1941	4056	3978	78	3358	3376	-18
1942	4172	4067	105	2906	2905	1
1943	3848	3737	111	2465	2465	0
1944	3573	3332	241	3095	3093	2
1945	3350	3218	132	3168	3170	-2
1946	3450	3329	121	3359	3345	14
1947	3218	3151	67	3252	3185	67
1948	3472	3389	83	3336	3375	-39
1949	2734	2741	-7	2950	2743	207

Table 8-9. H.O. Banks Pumping Plant, Total Pumping (Plus Wheeling) (TAF) (continued)

	FUTURE DEMAND			EXISTING DEMAND		
YEAR	RUN 414 w/ISDP	RUN 411 w/o ISDP	INCREMENT 414-411	RUN 413 w/ISDP	RUN 420 w/o ISDP	INCREMENT 413-420
1950	3267	3197	70	3431	3181	250
1951	4041	3866	175	3747	3709	38
1952	4476	4154	322	4127	3923	204
1953	3806	4068	-262	2261	2462	-201
1954	4125	3937	188	3363	3362	1
1955	3564	3189	375	3545	3427	118
1956	3973	3928	45	3810	3781	29
1957	3990	3769	221	3445	3459	-14
1958	4425	4340	85	4163	3971	192
1959	3649	3647	2	2325	2517	-192
1960	3176	3000	176	3239	3121	118
1961	3020	2947	73	3318	3137	181
1962	3299	3107	192	3316	3088	228
1963	3852	3762	90	3634	3561	73
1964	3620	3310	310	3351	3279	72
1965	3820	3735	85	3663	3635	28
1966	4159	3811	348	3594	3601	-7
1967	4522	3950	572	4055	3897	158
1968	3396	3610	-214	2058	2216	-158
1969	4209	3897	312	3621	3413	208
1970	3682	3707	-25	2194	2400	-206
1971	4261	4156	105	3714	3713	1
1972	4063	3766	297	3540	3540	0
1973	4012	3789	223	3633	3634	-1
1974	4278	4150	128	3898	3676	222
1975	3989	3950	39	3301	3482	-181
1976	3063	2878	185	2473	2496	-23
1977	1352	1348	4	1507	1459	48

Table 8-9. H.O. Banks Pumping Plant, Total Pumping (Plus Wheeling) (TAF) (concluded)

	FUTURE DEMAND			EXISTING DEMAND		
YEAR	RUN 414 w/ISDP	RUN 411 w/o ISDP	INCREMENT 414-411	RUN 413 w/ISDP	RUN 420 w/o ISDP	INCREMENT 413-420
1978	2778	2733	45	1725	1784	-59
1979	4187	4026	161	2795	2795	0
1980	4064	3995	69	2887	2886	1
1981	3961	3736	225	2727	2727	0
1982	4597	4238	359	4405	4176	229
1983	3847	3952	-105	2417	2645	-228
1984	3255	3291	-36	2125	2124	1
1985	3795	3608	187	3179	3180	-1
1986	4087	3993	94	3474	3465	9
1987	2935	2785	150	3183	3071	112
1988	1887	1817	70	2334	2191	143
1989	2616	2697	-81	2859	2636	223
1990	2032	1953	79	1841	1714	127
1991	1700	1539	161	1524	1446	78
1992	1809	1627	182	1987	1901	86
Minimum	1352	1348	-262	1507	1446	-228
Maximum	4597	4340	572	4405	4176	262
Average	3402	3282	120	2983	2937	46

off-peak and mid-peak hours to the greatest extent possible. DWR may also be able to increase hydroelectric power production during on-peak hours for sale or exchange with other utilities. This type of exchange provides benefits by lowering peak demand requirements for other utilities in the State as well.

The approximate changes in both average annual water pumping and maximum water pumping at the Banks Pumping Plant were developed by DWR staff using a model based on 71 years of hydrologic data for California (Table 8-9). The energy estimates were determined by first equating the DWR staff's ISDP water delivery levels to similar levels under the CEC water delivery forecast, as shown in Table 8-5. The CEC estimates of energy demand (shown in Table 8-6) for these same water delivery years were then used.

With ISDP, it is expected that the average annual increase in energy use will be approximately 250 gWh based on an average annual increase of 46 TAF of water pumped through the Banks Pumping Plant. The maximum increase in energy use due to ISDP in any one year would be about 1,400 gWh, when an additional 262 taf of water will be pumped over existing conditions.

According to the DWR model, ISDP would result in an increase of water pumped in 52 of the 71 years analyzed. The following shows the number of years in which various levels of water pumping changes occur between the maximum increase of 262 TAF and the largest decrease of -228 TAF.

Number of Years Where Changes in Water Delivery Levels Occur (Thousand Acre Feet)

-228 to -100	-100 to 0	0 - 100	100 to 200	200 to 262
7	12	30	13	9

While the annual net changes in pumping and energy use due to ISDP should be considered, it is also important to look at the level of total water pumped and energy demand for each year. These two parameters are very different from, and do not necessarily correspond with, one another. The total water levels pumped in any year depend on a number of factors, including water levels in previous years, water levels in the current year and the amount of water stored in reservoirs. Some of the larger net increases in pumping due to ISDP occur in relatively low water years in terms of the total water pumped. For example, 1989 data shows ISDP would result in an increase of 223 TAF pumped over existing conditions, in a year when the total water pumped would be 2,859 TAF or below the average deliveries of 2,983 TAF. In contrast, data for 1973 shows total water pumped with as 3,633 TAF, which is one acre foot than deliveries without ISDP.

Thus, the impact of ISDP on SWP energy demand depends both on: 1) the year to year increases due to ISDP; and, 2) the total amount of water being pumped through the system in any year. The highest annual energy demand for the SWP overall occurs in the maximum water year when 4,405 TAF of water would be pumped, of which 229 TAF are attributable to ISDP. The total energy use in this year would be approximately 13,000 gWh, of which 1,200 gWh would be due to ISDP (estimated based on Table 8-5 and 8-6). This is compared to the greatest annual increase in energy demand due to ISDP of 1,449 gWh.

The effects of ISDP on the SWP energy demand are not considered significant under CEQA and NEPA for the following reasons: 1) energy use will vary widely year to year due to ISDP, increasing in some years and decreasing in others, with the average annual increase about 250 gWh; 2) many of the largest increases in energy demand occur in years when overall SWP energy use will be relatively low, thus assuring ample, low cost energy is available to DWR for operations; 3) ISDP will not require any additional power facilities to be built, as existing DWR facilities, long-term contracts and short-term energy purchases will be sufficient to meet demands; 4) ISDP will allow DWR greater flexibility in operating the SWP and, as a result, will allow greater efficiency of energy use and production.

- *Energy Supplies*

As shown in Table 8-2, existing energy generation resources either owned by DWR or under long-term contract provide 7,269 gWh of energy. DWR's current and projected energy supply is adequate to meet the projected demand for both the with-and without-ISDP cases, when non-firm energy purchases are included (see Table 8-8). DWR energy supply plans are prepared based on full entitlement deliveries to SWP contractors of 4.2 maf plus additional wheeling commitments.

As discussed in the existing setting, as energy use increases, DWR's reliance on energy purchases increases. However, ample energy resources are expected to be available from other utilities both in- and out-of-state. As a result, ISDP would not result in the need to build any additional power facilities to supply the SWP. Accordingly, ISDP would have a less-than-significant adverse impact upon energy supplies.

8.4 Mitigation Measures

No mitigation is needed with ISDP. The SWP would continue to operate using existing resources and to utilize energy in the most efficient manner possible.

8.5 Comparative Evaluation Of The Alternatives

8.5.1 Enlargement Of Clifton Court Forebay, Construction Of Two Intake Structures, Increased Export Capability, And Construction Of Permanent Barriers

This alternative is the previously proposed South Delta Management Program, which would more than double the capacity of the Clifton Court Forebay, from the current 2,100 acres to 5,000 acres. This alternative would result in the same annual export of water from Banks Pumping Plant and deliveries to SWP contractors as the preferred ISDP. As a result, it can be expected that annual energy use would be very close to that of ISDP. However, the expanded Clifton Court Forebay would give DWR more flexibility in the amount of water stored and the timing of pumping through Banks. This could allow for some additional cost savings by pumping water during off- to mid-peak hours.

This alternative would not have a significant adverse energy impact as adequate power resources are available to the SWP. There might be some minor energy savings over the preferred ISDP.

8.5.2 Reduction Of CVP/SWP Exports And Management Or Reduction Of Demand For SWP Water

This alternative would substantially reduce pumping by the SWP during the April through September period each year, from a current average of 3,600 to 5,000 cfs down to 500 cfs. This would result in a corresponding decrease in SWP's energy demand during that period. As a result, DWR would be likely to have additional excess hydroelectric power to sell during the spring months, given the lower demand of the SWP.

During other periods of the year (October to March), energy demand might increase to the degree that DWR could to pump additional water to make up for the low pumping during April through September. However, adequate economy energy would be available from other utilities at low prices to meet the SWP's needs for additional pumping.

Because specific operational studies for this alternative were not run, it is not possible to estimate the annual energy demand associated with this alternative, but it is likely that it would result in reduced energy demand in comparison to ISDP.

In addition, many of the water conservation/demand side management practices proposed as part of this alternative would also result in additional energy savings. For example, more efficient agricultural irrigation systems would reduce pumping needs and energy use. However, other options such as desalination plants could incur high energy use. All of these options would need to be evaluated for their specific energy impacts.

8.5.3 Modification Of CVP/SWP Exports, Consolidation Of Agricultural Diversions, Extension Of Existing Agricultural Diversions, And Increased Pumping At Banks Pumping Plant Up To 10,300 cfs

As with the proposed project, changes in SWP energy use would be a less-than-significant adverse impact as ample existing energy sources are available to meet demand. This alternative reduces pumping levels substantially from April 15 through May 15, which would reduce energy use accordingly. However, this would likely offset by increased pumping and energy use in other months.

The ten consolidated agricultural diversions would use more energy than the existing individual diversions, because the water must first be pumped into the new regulated reservoirs and then pumped again through a pipe system to the individual irrigation distribution systems. Energy use and costs for the consolidated pumps were not calculated, but there could be significant increases over that of the existing diversions.

8.5.4 ISDP Project With An Additional Clifton Court Forebay Intake At Italian Slough

This alternative is expected to result in the same annual export of water through Banks Pumping Plant and delivery to SWP contractors as the preferred ISDP. However, there might be some variations in the timing and levels of pumping based on when the Italian Slough intake would be in operation, given the lower levels of pumping during this period. There would not be any significant adverse impacts associated with this alternative.

8.5.5 ISDP Without The Northern Intake, And With An Expanded Existing Intake

This alternative is the same as ISDP except that the existing Clifton Court Forebay Intake would be expanded instead of building a second intake at the north end of the forebay. This alternative would result in the same annual level of pumping at Banks Pumping Plant and delivery of water to SWP contractors as ISDP. There would not be any significant adverse energy impacts associated with this alternative.

8.5.6 No Action (Maintain Existing Conditions)

This alternative would leave operations of the SWP at their current level with the same amount of pumping and water delivery to SWP contractors. Energy use would also remain the same and would be lower than the preferred ISDP. There would not be any significant adverse energy impacts associated with this alternative.

8.5.7 No Action (Maintain Conditions As They Would Exist In The Future)

This alternative would leave operations of the SWP at their current level with the same amount of pumping and water delivery to SWP contractors. Energy use would also remain the same and would be lower than the preferred ISDP. There would not be any significant adverse energy impacts associated with this alternative.