

## **Appendix 31B**

### **CVP-SWP Power Modeling**

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Line items and numbers identified or noted as “No Action Alternative” represent the “Existing Conditions/No Project/No Action Condition” (described in Chapter 2 Alternatives Analysis). Table numbering may not be consecutive for all appendixes.

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# **APPENDIX 31B**

## **CVP-SWP Power Modeling**

### **31B.1 Introduction**

In order to examine the range of potential effects of Sites Reservoir Project (Project) operations on the electric power system in the Western U.S., computer modeling of Central Valley Project (CVP), State Water Project (SWP), and Project power and energy use was conducted over a wide range of hydrological conditions, including multiple dry years as well as very wet years. This modeling allows and informs a preliminary analysis of the direct and indirect effects of future Project operations on power and energy use in the Extended, Secondary, and Primary study areas.

The power analysis uses spreadsheet post-processors that evaluate the power impacts of flow scenarios from CALSIM II operations studies on a monthly time step. The following post-processor tools are used in the analysis:

- LTGen: analyzes CVP facilities
- SWP\_Power: analyzes SWP facilities
- NODOS\_Power: analyzes existing and Project facilities

Table 31B-1 shows pumping and power generation facilities that are included in each power analysis tool. The tools estimate average annual energy generation and use at SWP and CVP facilities and at Project generation and pumping facilities, including existing facilities that would be operated differently if the Project is built. For generation facilities, the tools estimate average annual energy generation as well as average annual peaking power capacity. For pumping facilities, the tools estimate average annual energy requirements. The tools also check to determine whether off-peak energy use targets are being met. Transmission losses are estimated for both pumping and generation facilities.

Flow and storage levels used in the power analysis tool are taken from CALSIM II studies, using the results of the entire simulation period of October 1921 to September 2003.

### **31B.2 Summary of Results**

Table 31B-2 provides a summary of predicted changes in power and energy production and use for CVP, SWP, and Project facilities for the No Action Alternative, and Alternatives A, B and C as compared to Existing Conditions. Table 31B-2 also provides a summary of predicted changes in power and energy production and use for Alternatives A, B, and C as compared to the No Action Alternative.

Tables 31B-3 through 31B-5 provide detailed summaries of predicted changes power and energy production and use for each CVP, SWP, and Project facility for Existing Conditions and for the No Action Alternative and Alternatives A, B, and C.

### **31B.3 Approach and Assumptions**

#### **31B.3.1 Computational Approach**

This section documents the approach that would be used to estimate energy use, generation, peaking power capacity, and transmission losses.

### 31B.3.1.1 Energy Use at Pumping Facilities

Energy use at CVP and SWP pumping facilities are determined using empirical energy factors provided by the Western Area Power Authority (WAPA) for CVP facilities and by the California Department of Water Resources Operations Control Office (OCO) for SWP facilities. For these facilities, energy use is estimated using the following equation:

Energy Use (MWh) =

$$\text{Energy\_Factor} * Q \frac{\text{ft}^3}{\text{s}}$$

The approach used to estimate energy use at Project pumping facilities assumes that pumping plant energy use is a function of flow and total head. For these facilities, energy use is estimated using the following equation:

Energy Use (MWh) =

$$0.7457 \frac{\text{kW}}{\text{hp}} * 62.4 \frac{\text{lbs}}{\text{ft}^3} * \frac{1\text{MW}}{1000\text{kW}} * \frac{1\text{hp}}{550 \frac{\text{lb} * \text{ft}}{\text{s}}} * t \frac{\text{hrs}}{\text{month}} * \frac{1}{\eta} * \text{head}(\text{ft}) * Q \frac{\text{ft}^3}{\text{s}}$$

The tools also estimate whether user-defined off-peak energy use targets can be met. For example, if it is desired that 90 percent of required pumping energy use during a particular month occur during off-peak hours, the tools determine whether this is feasible given power and flow capacity limits.

### 31B.3.1.2 Energy Generation

Energy generation at CVP and SWP power facilities are determined using empirical energy factors provided by WAPA for CVP facilities and by the OCO for SWP facilities. For these facilities, energy use is estimated using the following equation:

Energy Generation (MWh) =

$$\text{Energy\_Factor} * Q \frac{\text{ft}^3}{\text{s}}$$

The approach used to estimate energy generation at Project power facilities assumes that power plant generation is a function of flow and total head. Energy generation is estimated using the following equation:

Energy Generation (MWh) =

$$0.7457 \frac{\text{kW}}{\text{hp}} * 62.4 \frac{\text{lbs}}{\text{ft}^3} * \frac{1\text{MW}}{1000\text{kW}} * \frac{1\text{hp}}{550 \frac{\text{lb} * \text{ft}}{\text{s}}} * t \frac{\text{hrs}}{\text{month}} * \eta * \text{head}(\text{ft}) * Q \frac{\text{ft}^3}{\text{s}}$$

### 31B.3.1.3 Average Monthly Power Capacity

Energy generation is limited on a monthly basis by an average power capacity at each facility. At any one time, power capacity can be higher or lower, depending upon reservoir levels and scheduled water releases. Power production in general will be high during summer months when reservoir levels are higher and water is being released to meet delivery requirements, and power operations are optimized to provide the greatest benefit to taxpayers.

Average monthly power capacity for CVP facilities is estimated using empirical equations provided by WAPA. The approach used to estimate average monthly power capacity for SWP and Project facilities assumes that peak capacity is a function of total head and average power plant flow. The average monthly power capacity is estimated using the following equation:

Power Capacity (MW) =

$$0.7457 \frac{kW}{hp} * 62.4 \frac{lbs}{ft^3} * \frac{1MW}{1000kW} * \frac{1hp}{550 \frac{lb * ft}{s}} * \frac{1}{\eta} * head(ft) *$$

Avg. power plant flow rate( $\frac{ft^3}{s}$ )

#### **31B.3.1.4 Transmission Losses**

Transmission losses are estimated to estimate energy use and generation at load center, as a percentage of energy use or generation.

#### **31B.3.2 Assumptions**

Tables 31B-6 through 31B-8 show assumptions that are used to estimate energy use and transmission losses at CVP, SWP, and Project pumping facilities.

Tables 31B-9 through 31B-11 show assumptions that are used to estimate energy generation, power capacity, and transmission losses at CVP, SWP, and Project generation facilities.

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**Appendix 31B**  
**CVP-SWP Power Modeling**  
Power and Pumping Facilities Included in the Analysis  
Power and Pumping Reporting Metrics  
Project Pumping/Powerplant Characteristics

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Line items and numbers identified or noted as “No Action Alternative” represent the “Existing Conditions/No Project/No Action Condition” (described in Chapter 2 Alternatives Analysis).  
Table numbering may not be consecutive for all appendixes.

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**Table 31B-1  
Power and Pumping Facilities Included in the Analysis  
Sites DEIRS and FS Alternatives**

	Central Valley Project		State Water Project		Project Facilities	
	Pumping Facilities	Hydropower Facilities	Pumping Facilities	Hydropower Facilities	Pumping Facilities	Hydropower Facilities
<b>North of Delta</b>	Red Bluff Corning Tehama Other Folsom Contra Costa	Trinity Lewiston Carr Spring Creek Shasta Keswick Folsom Nimbus New Melones	none	Oroville Thermalito	Funks Sacramento River G-C Canal TRR T-C Canal Diversion G-C Canal Diversion	Funks Reservoir Sacramento River G-C Canal TRR
<b>South of Delta</b>	Jones CVP Banks O'Neill CVP San Luis San Felipe CVP Dos Amigos DMC Intertie San Luis Other DMC Other Misc	CVP San Luis O'Neill	SWP Banks SWP San Luis SWP Dos Amigos Buena Vista Teerink Chrisman Edmonston Pearblossom Oso South Bay Del Valle Las Perillas Badger Hill	SWP San Luis Alamo Mojave Devil's Canyon Warner Castaic	none	none

**Table 31B-2  
Power and Pumping Reporting Metrics - Summary of All CVP, SWP,  
and Project Facilities  
Sites Reservoir Project DEIRS and FS Alternatives**

				Project Alternatives and Comparisons to Existing Conditions/No Project/No Action Condition										
				Existing Conditions/No Project/No Action Condition	Alternative A	Difference Between Alternative A and Existing Conditions/No Project/No Action Condition	Alternative B	Difference Between Alternative B and Existing Conditions/No Project/No Action Condition	Alternative C	Difference Between Alternative C and Existing Conditions/No Project/No Action Condition	Alternative C1	Difference Between Alternative C1 and Existing Conditions/No Project/No Action Condition	Alternative D	Difference Between Alternative D and Existing Conditions/No Project/No Action Condition
<b>Central Valley Project (CVP) Facilities</b>														
<b>CVP Generation Facilities</b>														
Capacity	Total of all Facilities at load center	(MW)	Long-Term Dry and Critical	1,647	1,659	12	1,660	13	1,661	14	1,661	14	1,661	14
				1,505	1,523	18	1,525	20	1,526	21	1,526	21	1,525	21
Energy Generation	Total of all Facilities at load center	(GWh)	Long-Term Dry and Critical	4,701	4,711	11	4,718	18	4,715	14	4,715	14	4,718	18
				3,513	3,500	-13	3,506	-6	3,479	-34	3,479	-34	3,485	-28
<b>CVP Pumping Facilities</b>														
Energy Use	Total of all Facilities at load center	(GWh)	Long-Term Dry and Critical	1,116	1,152	36	1,147	32	1,155	40	1,155	40	1,145	29
				878	902	24	902	25	901	24	901	24	895	17
<b>All CVP Facilities</b>														
Net Generation	Total of all Facilities	(GWh)	Long-Term Dry and Critical	3,585	3,560	-25	3,571	-14	3,559	-26	3,559	-26	3,574	-11
				2,635	2,598	-37	2,604	-31	2,578	-58	2,578	-58	2,590	-45
<b>State Water Project (SWP) Facilities</b>														
<b>SWP Generation Facilities</b>														
Capacity	Total of all Facilities at load center	(MW)	Long-Term Dry and Critical	618	632	15	633	16	632	15	632	15	632	15
				439	462	24	462	24	462	23	462	23	460	21
Energy Generation	Total of all Facilities at load center	(GWh)	Long-Term Dry and Critical	4,386	4,491	105	4,493	107	4,496	110	4,496	110	4,486	100
				2,909	3,143	234	3,128	220	3,168	259	3,168	259	3,108	199
<b>SWP Pumping Facilities</b>														
Energy Use	Total of all Facilities at load center	(GWh)	Long-Term Dry and Critical	8,088	8,442	354	8,464	376	8,473	385	8,473	385	8,424	336
				6,013	6,768	755	6,727	714	6,848	834	6,848	834	6,659	645
<b>All SWP Facilities</b>														
Net Generation	Total of all Facilities	(GWh)	Long-Term Dry and Critical	-3,702	-3,951	-249	-3,971	-269	-3,977	-275	-3,977	-275	-3,937	-236
				-3,104	-3,625	-521	-3,599	-494	-3,679	-575	-3,679	-575	-3,551	-446
<b>Sites Reservoir Project Facilities</b>														
<b>Sites Generation Facilities</b>														
Capacity	At load center	(MW)	Long-Term Dry and Critical	0	14	14	12	12	18	18	0	0	17	17
				0	15	15	11	11	20	20	0	0	18	18
Energy Generation	Total of all Facilities at load center	(GWh)	Long-Term Dry and Critical	0	126	126	104	104	157	157	0	0	149	149
				0	129	129	100	100	173	173	0	0	163	163
<b>Sites Pumping Facilities</b>														
Energy Use	Total of all Facilities at load center	(GWh)	Long-Term Dry and Critical	13	229	216	195	182	278	265	278	265	258	245
				12	184	172	106	95	199	188	199	188	172	160
<b>All Sites Facilities</b>														
Net Generation	Total of all Facilities	(GWh)	Long-Term Dry and Critical	-13	-103	-90	-91	-78	-121	-108	-278	-265	-108	-95
				-12	-54	-43	-6	6	-26	-15	-199	-188	-9	2
<b>All Facilities (CVP, SWP and Project)</b>														
<b>Generation Facilities</b>														
Capacity	At load center	(MW)	Long-Term Dry and Critical	2,265	2,306	41	2,305	41	2,311	46	2,293	29	2,310	46
				1,943	1,999	56	1,999	55	2,008	64	1,988	45	2,003	60
Energy Generation	Total of all Facilities at load center	(GWh)	Long-Term Dry and Critical	9,087	9,329	242	9,316	229	9,368	281	9,211	124	9,354	267
				6,422	6,771	350	6,735	313	6,821	399	6,647	225	6,756	334
<b>Pumping Facilities</b>														
Energy Use	Total of all Facilities at load center	(GWh)	Long-Term Dry and Critical	9,214	9,818	604	9,801	587	9,901	687	9,901	687	9,820	606
				6,901	7,850	948	7,732	830	7,945	1,043	7,945	1,043	7,721	820
<b>All Facilities</b>														
Net Generation	Total of all Facilities	(GWh)	Long-Term Dry and Critical	-132	-499	-367	-498	-366	-543	-412	-700	-569	-477	-346
				-482	-1,085	-603	-1,004	-522	-1,131	-649	-1,304	-823	-873	-491

**Notes:**

1. Results are estimated using LTGEN, SWP\_Power and Sites\_Power utilizing data from the CALSIM II model.
2. Due to rounding of the energy values to whole numbers, some differences may appear to be off by +/- one.
3. Long-Term is the average quantity for the calendar years 1922-2002.
4. Dry and Critical is the average quantity for dry and critical years according to the Sacramento River 40-30-30 index.
5. Net Generation for all facilities does not equal sum of Net Generation for CVP, SWP and proposed Sites facilities because energy use at Red Bluff pumping plant is included in both CVP and proposed Sites facilities. Results for Red Bluff pumping from LTGEN are subtracted from Net Generation for all facilities to avoid double-counting.

Table 31B-3  
Power and Pumping Reporting Metrics - CVP Facilities Detail  
Sites Reservoir Project DEIRS and FS Alternatives

			Project Alternatives and Comparisons to Existing Conditions/No Project/No Action Condition									
			Existing Conditions/No Project/No Action Condition	Difference Between Alternative A and Existing Conditions/No Project/No Action Condition	Difference Between Alternative B and Existing Conditions/No Project/No Action Condition	Difference Between Alternative C and Existing Conditions/No Project/No Action Condition	Difference Between Alternative C1 and Existing Conditions/No Project/No Action Condition	Difference Between Alternative C and Existing Conditions/No Project/No Action Condition	Difference Between Alternative C1 and Existing Conditions/No Project/No Action Condition	Difference Between Alternative D and Existing Conditions/No Project/No Action Condition	Difference Between Alternative D and Existing Conditions/No Project/No Action Condition	
			Alternative A	Alternative B	Alternative C	Alternative C1	Alternative C1	Alternative D	Alternative D	Alternative D	Alternative D	
<b>Central Valley Project (CVP) Facilities</b>												
<b>CVP Generation Facilities</b>												
<b>North of the Delta CVP Generation Facilities</b>												
<b>Trinity Reservoir Power Facility</b>												
Capacity	At load center	(MW)	Long-Term	114	116	2	116	2	116	2	115	1
			Dry and Critical	103	106	3	106	3	107	4	104	1
Energy Generation	Total of all Facilities at load center	(GWh)	Long-Term	396	400	4	400	5	401	5	398	3
			Dry and Critical	293	296	3	297	4	295	2	290	-3
<b>Lewiston Power Facility</b>												
Capacity	At load center	(MW)	Long-Term	0	0	0	0	0	0	0	0	0
			Dry and Critical	0	0	0	0	0	0	0	0	0
Energy Generation	Total of all Facilities at load center	(GWh)	Long-Term	0	0	0	0	0	0	0	0	0
			Dry and Critical	0	0	0	0	0	0	0	0	0
<b>Carr Power Facility</b>												
Capacity	At load center	(MW)	Long-Term	145	145	0	145	0	145	0	145	0
			Dry and Critical	145	145	0	145	0	145	0	145	0
Energy Generation	Total of all Facilities at load center	(GWh)	Long-Term	285	285	0	287	2	285	0	287	2
			Dry and Critical	286	278	-8	280	-6	272	-13	274	-12
<b>Spring Creek Power Facility</b>												
Capacity	At load center	(MW)	Long-Term	179	178	0	178	0	178	0	178	0
			Dry and Critical	179	178	0	178	0	178	0	179	0
Energy Generation	Total of all Facilities at load center	(GWh)	Long-Term	339	336	-2	339	0	336	-3	340	1
			Dry and Critical	286	278	-10	279	-7	271	-15	274	-12
<b>Shasta Power Facility</b>												
Capacity	At load center	(MW)	Long-Term	571	578	7	579	8	580	9	580	9
			Dry and Critical	508	522	14	526	17	528	20	527	19
Energy Generation	Total of all Facilities at load center	(GWh)	Long-Term	2,050	2,056	5	2,057	7	2,060	9	2,059	8
			Dry and Critical	1,517	1,518	1	1,520	2	1,516	-2	1,519	1
<b>Keswick Power Facility</b>												
Capacity	At load center	(MW)	Long-Term	48	48	0	48	0	48	0	48	0
			Dry and Critical	40	39	0	39	-1	39	-1	39	0
Energy Generation	Total of all Facilities at load center	(GWh)	Long-Term	419	419	0	420	1	420	0	420	1
			Dry and Critical	344	342	-3	341	-3	339	-5	340	-4
<b>Folsom Power Facility</b>												
Capacity	At load center	(MW)	Long-Term	169	171	2	171	2	171	2	171	2
			Dry and Critical	155	158	3	158	3	159	3	158	3
Energy Generation	Total of all Facilities at load center	(GWh)	Long-Term	563	564	1	564	1	564	1	564	1
			Dry and Critical	394	395	2	396	2	396	2	395	2
<b>Nimbus Power Facility</b>												
Capacity	At load center	(MW)	Long-Term	7	7	0	7	0	7	0	7	0
			Dry and Critical	5	5	0	5	0	5	0	5	0
Energy Generation	Total of all Facilities at load center	(GWh)	Long-Term	65	65	0	65	0	65	0	65	0
			Dry and Critical	40	40	0	40	0	40	0	40	0
<b>New Melones Power Facility</b>												
Capacity	At load center	(MW)	Long-Term	312	312	0	312	0	312	0	312	0
			Dry and Critical	277	277	0	277	0	277	0	277	0
Energy Generation	Total of all Facilities at load center	(GWh)	Long-Term	473	473	0	473	0	473	0	473	0
			Dry and Critical	342	342	0	342	0	342	0	342	0
<b>Total of North of the Delta CVP Generation Facilities</b>												
Capacity	At load center	(MW)	Long-Term	1,546	1,556	10	1,556	10	1,558	13	1,557	12
			Dry and Critical	1,410	1,430	20	1,432	22	1,437	26	1,433	22
Energy Generation	Total of all Facilities at load center	(GWh)	Long-Term	4,580	4,598	8	4,605	15	4,603	13	4,606	15
			Dry and Critical	3,412	3,398	-14	3,405	-7	3,381	-31	3,384	-28
<b>South of the Delta CVP Generation Facilities</b>												
<b>CVP San Luis Power Facility</b>												
Capacity	At load center	(MW)	Long-Term	100	102	2	103	3	102	1	103	2
			Dry and Critical	83	81	-2	82	-1	88	-5	81	-2
Energy Generation	Total of all Facilities at load center	(GWh)	Long-Term	104	106	2	106	2	105	1	106	2
			Dry and Critical	91	92	1	91	0	88	-3	91	0
<b>O'Neill Power Facility</b>												
Capacity	At load center	(MW)	Long-Term	1	1	0	1	0	1	0	1	0
			Dry and Critical	1	1	0	1	0	1	0	1	0
Energy Generation	Total of all Facilities at load center	(GWh)	Long-Term	7	7	0	7	0	7	0	7	0
			Dry and Critical	10	10	0	10	0	10	0	10	0
<b>Total of South of the Delta CVP Generation Facilities</b>												
Capacity	At load center	(MW)	Long-Term	101	103	2	104	3	102	1	104	3
			Dry and Critical	94	92	-2	93	-1	89	-5	92	-2
Energy Generation	Total of all Facilities at load center	(GWh)	Long-Term	111	113	3	113	3	112	1	113	2
			Dry and Critical	101	102	1	102	1	98	-3	101	0
<b>Total of CVP Generation Facilities</b>												
Capacity	At load center	(MW)	Long-Term	1,647	1,659	12	1,660	13	1,661	14	1,661	14
			Dry and Critical	1,505	1,523	18	1,525	20	1,526	21	1,525	21
Energy Generation	Total of all Facilities at load center	(GWh)	Long-Term	4,701	4,711	11	4,715	18	4,715	14	4,718	18
			Dry and Critical	3,513	3,500	-13	3,506	-6	3,479	-34	3,485	-28

Table 31B-3  
Power and Pumping Reporting Metrics - CVP Facilities Detail  
Sites Reservoir Project DEIRS and FS Alternatives

			Project Alternatives and Comparisons to Existing Conditions/No Project/No Action Condition										
			Existing Conditions/No Project/No Action Condition	Alternative A	Difference Between Alternative A and Existing Conditions/No Project/No Action Condition	Alternative B	Difference Between Alternative B and Existing Conditions/No Project/No Action Condition	Alternative C	Difference Between Alternative C and Existing Conditions/No Project/No Action Condition	Alternative C1	Difference Between Alternative C1 and Existing Conditions/No Project/No Action Condition	Alternative D	Difference Between Alternative D and Existing Conditions/No Project/No Action Condition
<b>Central Valley Project (CVP) Facilities</b>													
<b>CVP Pumping Facilities</b>													
<b>North of the Delta CVP Pumping Facilities</b>													
<b>Red Bluff Pumping Facility</b>													
Energy Use	Total of all Facilities at load center	(GWh) Long-Term Dry and Critical	2	5	2	6	4	5	3	5	3	5	3
			1	4	2	4	3	3	2	3	2	4	3
<b>Corning Pumping Facility</b>													
Energy Use	Total of all Facilities at load center	(GWh) Long-Term Dry and Critical	4	4	0	4	0	4	0	4	0	4	0
			2	2	0	2	0	2	0	2	0	2	0
<b>Tehama Other Facility</b>													
Energy Use	Total of all Facilities at load center	(GWh) Long-Term Dry and Critical	7	16	9	22	15	17	10	17	10	19	12
			4	12	8	13	9	12	8	12	8	13	9
<b>Folsom Pumping Facility</b>													
Energy Use	Total of all Facilities at load center	(GWh) Long-Term Dry and Critical	14	14	0	14	0	14	0	14	0	14	0
			17	17	-1	17	-1	17	0	17	0	17	-1
<b>Contra Costa Pumping Facility</b>													
Energy Use	Total of all Facilities at load center	(GWh) Long-Term Dry and Critical	28	28	0	28	0	28	0	28	0	28	0
			24	24	0	24	0	24	0	24	0	24	0
<b>Total of North of the Delta CVP Pumping Facilities</b>													
Energy Use	Total of all Facilities at load center	(GWh) Long-Term Dry and Critical	55	67	11	74	18	68	13	68	13	70	15
			49	59	10	60	11	59	10	59	10	60	12
<b>South of the Delta CVP Pumping Facilities</b>													
<b>Jones Pumping Facility</b>													
Energy Use	Total of all Facilities at load center	(GWh) Long-Term Dry and Critical	522	536	14	536	14	540	18	540	18	535	12
			431	440	9	442	11	444	13	444	13	441	10
<b>CVP Banks Pumping Facility</b>													
Energy Use	Total of all Facilities at load center	(GWh) Long-Term Dry and Critical	18	18	1	19	1	19	1	19	1	19	1
			9	9	1	9	0	9	0	9	0	9	0
<b>O'Neill Pumping Facility</b>													
Energy Use	Total of all Facilities at load center	(GWh) Long-Term Dry and Critical	63	65	2	64	1	64	1	64	1	64	1
			49	50	1	50	2	50	1	50	1	50	1
<b>CVP San Luis Pumping Facility</b>													
Energy Use	Total of all Facilities at load center	(GWh) Long-Term Dry and Critical	191	200	8	199	7	198	6	198	6	198	7
			159	157	-2	162	3	153	-6	153	-6	159	0
<b>San Felipe Pumping Facility</b>													
Energy Use	Total of all Facilities at load center	(GWh) Long-Term Dry and Critical	37	37	0	36	-1	37	0	37	0	36	0
			30	31	1	30	1	32	2	32	2	30	1
<b>CVP Dos Amigos Pumping Facility</b>													
Energy Use	Total of all Facilities at load center	(GWh) Long-Term Dry and Critical	103	105	2	103	0	104	1	104	1	104	1
			57	61	4	58	1	60	3	60	3	59	2
<b>DMC Interlie Pumping Facility</b>													
Energy Use	Total of all Facilities at load center	(GWh) Long-Term Dry and Critical	2	2	0	2	0	2	0	2	0	2	0
			1	1	0	1	0	1	0	1	0	1	0
<b>San Luis Other Pumping Facility</b>													
Energy Use	Total of all Facilities at load center	(GWh) Long-Term Dry and Critical	72	74	1	72	0	73	0	73	0	73	0
			40	43	2	41	1	42	2	42	2	42	1
<b>DMC Other Pumping Facility</b>													
Energy Use	Total of all Facilities at load center	(GWh) Long-Term Dry and Critical	1	1	0	1	0	1	0	1	0	1	0
			1	1	0	1	0	1	0	1	0	1	0
<b>Misc Pumping Facility</b>													
Energy Use	Total of all Facilities at load center	(GWh) Long-Term Dry and Critical	51	48	-3	43	-8	50	-1	50	-1	43	-8
			53	51	-2	48	-5	52	-1	52	-1	42	-11
<b>Total of South of the Delta CVP Pumping Facilities</b>													
Energy Use	Total of all Facilities at load center	(GWh) Long-Term Dry and Critical	1,060	1,085	25	1,074	13	1,087	27	1,087	27	1,074	14
			829	843	14	842	13	843	14	843	14	834	5
<b>Total of CVP Pumping Facilities</b>													
Energy Use	Total of all Facilities at load center	(GWh) Long-Term Dry and Critical	1,116	1,152	36	1,147	32	1,155	40	1,155	40	1,145	29
			878	902	24	902	25	901	24	901	24	895	17
<b>Total of CVP Facilities</b>													
<b>CVP Generation Facilities</b>													
Capacity	At load center	(MW) Long-Term Dry and Critical	1,647	1,659	12	1,660	13	1,661	14	1,661	14	1,661	14
			1,505	1,523	18	1,525	20	1,526	21	1,526	21	1,526	21
Energy Generation	Total of all Facilities at load center	(GWh) Long-Term Dry and Critical	4,701	4,711	11	4,718	18	4,715	14	4,715	14	4,718	18
			3,513	3,500	-13	3,506	-6	3,479	-34	3,479	-34	3,485	-28
<b>CVP Pumping Facilities</b>													
Energy Use	Total of all Facilities at load center	(GWh) Long-Term Dry and Critical	1,116	1,152	36	1,147	32	1,155	40	1,155	40	1,145	29
			878	902	24	902	25	901	24	901	24	895	17
<b>All CVP Facilities</b>													
Net Generation	Total of all Facilities	(GWh) Long-Term Dry and Critical	3,585	3,560	-25	3,571	-14	3,559	-26	3,559	-26	3,574	-11
			2,635	2,698	-37	2,604	-31	2,578	-58	2,578	-58	2,590	-45

Notes:  
1. Results are estimated using LTGEN utilizing data from the CALSIM II model  
2. Due to rounding of the energy values to whole numbers, some differences may appear to be off by +/- one.  
3. Long-Term is the average quantity for the calendar years 1992-2002.  
4. Dry and Critical is the average quantity for dry and critical years according to the Sacramento River 40-30-30 index

**Table 31B-4  
Power and Pumping Reporting Metrics - SWP Facilities Detail  
Sites Reservoir Project DEIRS and FS Alternatives**

			Project Alternatives and Comparisons to Existing Conditions/No Project/No Action Condition											
			Existing Conditions/No Project/No Action Condition	Alternative A	Difference Between Alternative A and Existing Conditions/No Project/No Action Condition	Alternative B	Difference Between Alternative B and Existing Conditions/No Project/No Action Condition	Alternative C	Difference Between Alternative C and Existing Conditions/No Project/No Action Condition	Alternative C1	Difference Between Alternative C1 and Existing Conditions/No Project/No Action Condition	Alternative D	Difference Between Alternative D and Existing Conditions/No Project/No Action Condition	
<b>State Water Project (SWP) Facilities</b>														
<b>SWP Generation Facilities</b>														
<b>North of the Delta SWP Generation Facilities</b>														
<b>Oroville Reservoir Power Facility</b>														
Capacity	At load center	(MW)	Long-Term	225	226	1	226	1	226	1	226	1	226	1
			Dry and Critical	132	133	1	133	2	133	2	133	2	133	2
Energy Generation	Total of all Facilities at load center	(GWh)	Long-Term	1,944	1,952	8	1,951	7	1,951	7	1,951	7	1,954	9
			Dry and Critical	1,131	1,138	7	1,143	12	1,143	12	1,143	12	1,141	10
<b>Thermalito Power Facility</b>														
Capacity	At load center	(MW)	Long-Term	30	30	0	30	0	30	0	30	0	30	0
			Dry and Critical	18	17	0	18	0	18	0	18	0	17	0
Energy Generation	Total of all Facilities at load center	(GWh)	Long-Term	248	246	0	245	0	246	0	246	0	246	0
			Dry and Critical	144	143	-1	144	-1	144	0	144	0	142	-2
<b>Total of North of the Delta SWP Generation Facilities</b>														
Capacity	At load center	(MW)	Long-Term	255	256	1	255	1	256	1	256	1	256	1
			Dry and Critical	149	150	1	151	2	151	2	151	2	151	1
Energy Generation	Total of all Facilities at load center	(GWh)	Long-Term	2,190	2,198	8	2,197	6	2,197	7	2,197	7	2,199	9
			Dry and Critical	1,275	1,281	6	1,287	11	1,288	12	1,288	12	1,283	8
<b>South of the Delta SWP Generation Facilities</b>														
<b>SWP San Luis Power Facility</b>														
Capacity	At load center	(MW)	Long-Term	113	115	2	116	3	114	1	114	1	115	3
			Dry and Critical	105	102	-2	103	-1	99	-6	99	-6	102	-2
Energy Generation	Total of all Facilities at load center	(GWh)	Long-Term	126	128	2	128	2	125	-1	125	-1	128	2
			Dry and Critical	107	117	10	115	9	115	9	115	9	115	8
<b>Alamo Power Facility</b>														
Capacity	At load center	(MW)	Long-Term	13	13	1	13	1	13	1	13	1	13	1
			Dry and Critical	9	11	1	11	1	11	1	11	1	10	1
Energy Generation	Total of all Facilities at load center	(GWh)	Long-Term	101	105	4	106	5	106	4	106	4	105	4
			Dry and Critical	79	87	8	88	9	88	10	88	10	87	8
<b>Mojava Power Facility</b>														
Capacity	At load center	(MW)	Long-Term	11	11	0	12	1	11	0	11	0	11	0
			Dry and Critical	8	9	1	9	1	9	1	9	1	9	1
Energy Generation	Total of all Facilities at load center	(GWh)	Long-Term	78	82	3	83	4	82	3	82	3	82	3
			Dry and Critical	58	65	6	65	7	66	7	66	7	64	6
<b>Devil's Canyon Power Facility</b>														
Capacity	At load center	(MW)	Long-Term	117	122	5	123	5	123	5	123	5	122	5
			Dry and Critical	87	96	9	97	10	97	10	97	10	95	8
Energy Generation	Total of all Facilities at load center	(GWh)	Long-Term	952	990	38	996	44	994	42	994	42	990	38
			Dry and Critical	704	781	77	785	81	790	86	790	86	773	69
<b>Warner Power Facility</b>														
Capacity	At load center	(MW)	Long-Term	42	45	2	44	2	45	2	45	2	44	2
			Dry and Critical	31	37	5	36	5	37	6	37	6	36	4
Energy Generation	Total of all Facilities at load center	(GWh)	Long-Term	352	371	19	370	17	372	20	372	20	369	17
			Dry and Critical	259	305	47	297	39	309	50	309	50	296	37
<b>Castaic Power Facility</b>														
Capacity	At load center	(MW)	Long-Term	67	70	4	70	3	71	4	71	4	70	3
			Dry and Critical	49	58	9	56	7	58	9	58	9	56	7
Energy Generation	Total of all Facilities at load center	(GWh)	Long-Term	585	617	32	615	29	619	34	619	34	613	28
			Dry and Critical	427	506	79	492	65	512	85	512	85	490	63
<b>Total of South of the Delta SWP Generation Facilities</b>														
Capacity	At load center	(MW)	Long-Term	363	377	14	378	15	377	14	377	14	376	14
			Dry and Critical	289	312	23	311	22	311	22	311	22	309	19
Energy Generation	Total of all Facilities at load center	(GWh)	Long-Term	2,196	2,293	97	2,297	101	2,299	103	2,299	103	2,287	91
			Dry and Critical	1,633	1,852	228	1,842	208	1,881	247	1,881	247	1,834	191
<b>Total of SWP Generation Facilities</b>														
Capacity	At load center	(MW)	Long-Term	618	632	15	633	16	632	15	632	15	632	15
			Dry and Critical	439	462	24	462	24	462	23	462	23	460	21
Energy Generation	Total of all Facilities at load center	(GWh)	Long-Term	4,386	4,491	105	4,493	107	4,496	110	4,496	110	4,486	100
			Dry and Critical	2,909	3,143	234	3,128	220	3,168	259	3,168	259	3,108	199

**Table 31B-4  
Power and Pumping Reporting Metrics - SWP Facilities Detail  
Sites Reservoir Project DEIRS and FS Alternatives**

				Project Alternatives and Comparisons to Existing Conditions/No Project/No Action Condition										
				Existing Conditions/No Project/No Action Condition	Alternative A	Difference Between Alternative A and Existing Conditions/No Project/No Action Condition	Alternative B	Difference Between Alternative B and Existing Conditions/No Project/No Action Condition	Alternative C	Difference Between Alternative C and Existing Conditions/No Project/No Action Condition	Alternative C1	Difference Between Alternative C1 and Existing Conditions/No Project/No Action Condition	Alternative D	Difference Between Alternative D and Existing Conditions/No Project/No Action Condition
<b>State Water Project (SWP) Facilities</b>														
<b>SWP Pumping Facilities</b>														
<b>South of the Delta SWP Pumping Facilities</b>														
<b>SWP Banks Pumping Facility</b>														
Energy Use	Total of all Facilities at load center	(GWh)	Long-Term Dry and Critical	784	820	35	822	38	824	39	824	39	818	33
				580	627	47	630	49	637	57	637	57	624	43
<b>SWP San Luis Pumping Facility</b>														
Energy Use	Total of all Facilities at load center	(GWh)	Long-Term Dry and Critical	169	166	-3	166	-3	161	-7	161	-7	167	-2
				149	132	-17	139	-10	132	-17	132	-17	137	-12
<b>SWP Dos Amigos Pumping Facility</b>														
Energy Use	Total of all Facilities at load center	(GWh)	Long-Term Dry and Critical	352	369	17	371	19	372	20	372	20	368	16
				258	293	35	291	33	297	39	297	39	288	29
<b>Buena Vista Pumping Facility</b>														
Energy Use	Total of all Facilities at load center	(GWh)	Long-Term Dry and Critical	422	441	19	442	20	443	21	443	21	440	18
				315	359	44	355	40	363	48	363	48	352	37
<b>Teerink Pumping Facility</b>														
Energy Use	Total of all Facilities at load center	(GWh)	Long-Term Dry and Critical	513	537	23	538	24	539	25	539	25	535	22
				383	436	53	432	49	441	58	441	58	428	45
<b>Chrisman Pumping Facility</b>														
Energy Use	Total of all Facilities at load center	(GWh)	Long-Term Dry and Critical	1,080	1,128	48	1,131	52	1,133	53	1,133	53	1,126	46
				799	910	111	902	103	920	122	920	122	893	94
<b>Edmonston Pumping Facility</b>														
Energy Use	Total of all Facilities at load center	(GWh)	Long-Term Dry and Critical	3,783	3,954	171	3,963	181	3,970	187	3,970	187	3,944	162
				2,799	3,198	399	3,199	390	3,225	426	3,225	426	3,177	328
<b>Pearblossom Pumping Facility</b>														
Energy Use	Total of all Facilities at load center	(GWh)	Long-Term Dry and Critical	856	883	26	887	31	886	29	886	29	883	26
				489	544	55	546	56	550	61	550	61	538	49
<b>Oso Pumping Facility</b>														
Energy Use	Total of all Facilities at load center	(GWh)	Long-Term Dry and Critical	179	189	9	188	9	189	10	189	10	187	8
				132	155	24	151	20	157	26	157	26	151	19
<b>South Bay Pumping Facility</b>														
Energy Use	Total of all Facilities at load center	(GWh)	Long-Term Dry and Critical	119	124	5	125	6	125	6	125	6	124	5
				86	97	11	97	10	99	12	99	12	96	9
<b>Del Valle Pumping Facility</b>														
Energy Use	Total of all Facilities at load center	(GWh)	Long-Term Dry and Critical	1	1	0	1	0	1	0	1	0	1	0
				1	1	0	1	0	1	0	1	0	1	0
<b>Las Perillas Pumping Facility</b>														
Energy Use	Total of all Facilities at load center	(GWh)	Long-Term Dry and Critical	6	6	0	6	0	6	0	6	0	6	0
				6	7	1	7	1	7	1	7	1	7	1
<b>Badger Hill Pumping Facility</b>														
Energy Use	Total of all Facilities at load center	(GWh)	Long-Term Dry and Critical	21	22	1	22	1	22	1	22	1	22	1
				16	18	2	18	2	18	3	18	3	18	2
<b>Total of South of the Delta SWP Pumping Facilities</b>														
Energy Use	Total of all Facilities at load center	(GWh)	Long-Term Dry and Critical	8,088	8,442	354	8,464	376	8,473	385	8,473	385	8,424	336
				6,013	6,768	755	6,727	714	6,848	834	6,848	834	6,659	645
<b>Total of SWP Pumping Facilities</b>														
Energy Use	Total of all Facilities at load center	(GWh)	Long-Term Dry and Critical	8,088	8,442	354	8,464	376	8,473	385	8,473	385	8,424	336
				6,013	6,768	755	6,727	714	6,848	834	6,848	834	6,659	645
<b>Total of SWP Facilities</b>														
<b>SWP Generation Facilities</b>														
Capacity	At load center	(MW)	Long-Term Dry and Critical	618	632	15	633	16	632	15	632	15	632	15
				439	462	24	462	24	462	23	462	23	460	21
Energy Generation	Total of all Facilities at load center	(GWh)	Long-Term Dry and Critical	4,386	4,491	105	4,493	107	4,496	110	4,496	110	4,486	100
				2,909	3,143	234	3,128	220	3,168	259	3,168	259	3,108	199
<b>SWP Pumping Facilities</b>														
Energy Use	Total of all Facilities at load center	(GWh)	Long-Term Dry and Critical	8,088	8,442	354	8,464	376	8,473	385	8,473	385	8,424	336
				6,013	6,768	755	6,727	714	6,848	834	6,848	834	6,659	645
<b>All SWP Facilities</b>														
Net Generation	Total of all Facilities	(GWh)	Long-Term Dry and Critical	-3,702	-3,951	-249	-3,971	-269	-3,977	-275	-3,977	-275	-3,937	-236
				-3,104	-3,625	-521	-3,599	-494	-3,679	-575	-3,679	-575	-3,551	-446

Notes:  
1. Results are estimated using SWP Power utilizing data from the CALSIM II model  
2. Due to rounding of the energy values to whole numbers, some differences may appear to be off by +/- one.  
3. Long-Term is the average quantity for the calendar years 1922-2002.  
4. Dry and Critical is the average quantity for dry and critical years according to the Sacramento River 40-30-30 Index

**Table 31B-5  
Power and Pumping Reporting Metrics - Project Facilities Detail  
Sites Reservoir Project DEIRS and FS Alternatives**

			Project Alternatives and Comparisons to Existing Conditions/No Project/No Action Condition											
Existing Conditions/No Project/No Action Condition			Alternative A	Difference Between Alternative A and Existing Conditions/No Project/No Action Condition	Alternative B	Difference Between Alternative B and Existing Conditions/No Project/No Action Condition	Alternative C	Difference Between Alternative C and Existing Conditions/No Project/No Action Condition	Alternative C1	Difference Between Alternative C1 and Existing Conditions/No Project/No Action Condition	Alternative D	Difference Between Alternative D and Existing Conditions/No Project/No Action Condition		
<b>Sites Reservoir Project Facilities</b>														
<b>Sites Generation Facilities</b>														
<b>Funks Reservoir Power Facility</b>														
Capacity	At load center	(MW)	Long-Term	0	10	10	11	11	13	13	0	0	13	13
			Dry and Critical	0	10	10	11	11	14	14	0	0	14	14
Energy Generation	Total of all Facilities at load center	(GWh)	Long-Term	0	89	89	99	99	115	115	0	0	116	116
			Dry and Critical	0	84	84	96	96	121	121	0	0	125	125
<b>Sacramento River Pipeline Power Facility</b>														
Capacity	At load center	(MW)	Long-Term	0	3	3	0	0	3	3	0	0	3	3
			Dry and Critical	0	4	4	0	0	4	4	0	0	3	3
Energy Generation	Total of all Facilities at load center	(GWh)	Long-Term	0	27	27	0	0	30	30	0	0	27	27
			Dry and Critical	0	33	33	0	0	39	39	0	0	30	30
<b>G-C Canal TRR Power Facility</b>														
Capacity	At load center	(MW)	Long-Term	0	1	1	1	1	1	1	0	0	1	1
			Dry and Critical	0	1	0	0	2	2	0	0	1	1	
Energy Generation	Total of all Facilities at load center	(GWh)	Long-Term	0	10	10	5	5	11	11	0	0	7	7
			Dry and Critical	0	12	12	4	4	13	13	0	0	8	8
<b>Total of Sites Generation Facilities</b>														
Capacity	At load center	(MW)	Long-Term	0	14	14	12	12	18	18	0	0	17	17
			Dry and Critical	0	15	15	11	11	20	20	0	0	18	18
Energy Generation	Total of all Facilities at load center	(GWh)	Long-Term	0	126	126	104	104	157	157	0	0	149	149
			Dry and Critical	0	129	129	100	100	173	173	0	0	163	163
<b>Sites Pumping Facilities</b>														
<b>Funks Pumping Facility</b>														
Energy Use	Total of all Facilities at load center	(GWh)	Long-Term	0	149	149	161	161	191	191	191	191	190	190
			Dry and Critical	0	110	110	84	84	127	127	127	127	123	123
<b>Sacramento River Pipeline Pumping Facility</b>														
Energy Use	Total of all Facilities at load center	(GWh)	Long-Term	0	53	53	0	0	58	58	58	58	37	37
			Dry and Critical	0	52	52	0	0	50	50	50	50	26	26
<b>G-C Canal TRR Pumping Facility</b>														
Energy Use	Total of all Facilities at load center	(GWh)	Long-Term	0	12	12	15	15	13	13	13	13	13	13
			Dry and Critical	0	9	9	8	8	9	9	9	9	9	9
<b>T-C Canal Diversion Pumping Facility</b>														
Energy Use	Total of all Facilities at load center	(GWh)	Long-Term	2	5	3	7	5	6	3	6	3	6	4
			Dry and Critical	1	4	3	4	3	4	3	4	3	4	3
<b>G-C Canal Diversion Pumping Facility</b>														
Energy Use	Total of all Facilities at load center	(GWh)	Long-Term	11	10	-1	11	1	10	-1	10	-1	11	0
			Dry and Critical	10	9	-1	10	0	9	-2	9	-2	10	-1
<b>Total of Sites Pumping Facilities</b>														
Energy Use	Total of all Facilities at load center	(GWh)	Long-Term	13	229	216	195	182	278	265	278	265	258	245
			Dry and Critical	12	184	172	106	95	199	188	199	188	172	160
<b>Total of Sites Facilities</b>														
<b>Sites Generation Facilities</b>														
Capacity	At load center	(MW)	Long-Term	0	14	14	12	12	18	18	0	0	17	17
			Dry and Critical	0	15	15	11	11	20	20	0	0	18	18
Energy Generation	Total of all Facilities at load center	(GWh)	Long-Term	0	126	126	104	104	157	157	0	0	149	149
			Dry and Critical	0	129	129	100	100	173	173	0	0	163	163
<b>Sites Pumping Facilities</b>														
Energy Use	Total of all Facilities at load center	(GWh)	Long-Term	13	229	216	195	182	278	265	278	265	258	245
			Dry and Critical	12	184	172	106	95	199	188	199	188	172	160
<b>All Sites Facilities</b>														
Net Generation	Total of all Facilities	(GWh)	Long-Term	-13	-103	-90	-91	-78	-121	-108	-278	-265	-108	-95
			Dry and Critical	-12	-54	-43	-6	6	-26	-15	-199	-188	-9	2

Notes:  
1. Results are estimated using Sites\_Power utilizing data from the CALSIM II model  
2. Due to rounding of the energy values to whole numbers, some differences may appear to be off by +/- one.  
3. Long-Term is the average quantity for the calendar years 1922-2002.  
4. Dry and Critical is the average quantity for dry and critical years according to the Sacramento River 40-30-30 index

























