
4. Environmental Consequences and Mitigation Measures

4.9 ENERGY PRODUCTION

The production of electricity from falling water is a significant source of energy in the study areas. Major factors that influence hydrogeneration operations include upstream water regulation, downstream water needs, applicable license permit requirements, and electricity demands (which fluctuate according to the time of the year, weather conditions, and the economics of the energy market). Upstream releases from reservoirs are dependent on not only on upstream water sources (principally from snow melt), and the nature and extent of droughts, but also minimum downstream streamflow requirements, downstream flow fluctuation restrictions, and water quality requirements (USBR 1997d). In addition, downstream water needs are dependent on irrigation needs, water rights agreements, and other water supply contracts.

4.9.1 Key Impact Issues and Evaluation Criteria

This section of the EIS/EIR examines the issues associated with potential power production from reservoir releases to meet the project purpose. Power consumption from activities such as pumping are not addressed in this EIS/EIR because the proposed action does not call for any significant amount of pumping of water over what already occurs under existing conditions to deliver surface water and groundwater. There is the potential for indirect impacts to groundwater pumping to occur, but the energy consumption to accomplish this is not a significant issue. The key issue is to what extent the early release of water (to meet project objectives) would affect hydroelectric power production.

Hydroelectric generation projects typically start with an upstream water source, such as a storage reservoir. The electricity is generated in the powerhouse, which may be located at the reservoir or downstream. The amount of energy generated depends on the difference in elevation between the water in the reservoir and the powerhouse. Thus, the higher the elevation of the water in the storage reservoir, the greater the potential for power production.

In the competitive, deregulated energy market, electric utilities take all reasonable measures to maximize the value of their hydroelectric power production. Power produced during peak energy demand period is more valuable than that produced during lower demand periods. Because hydropower is a low cost energy source that can be turned on and off quickly, utilities generally employ it to meet peak loads. In California, these peak loads typically occur in the summer when maximum groundwater pumping, industrial, and air conditioning demands occur. When water is released in the spring to maintain river flows, less water is available in the summer to provide peak hydropower generation. Reductions in a hydroelectric plant's ability to meet peak load requirements accelerates the need for additional peaking resources and increases the utility costs (McCann 1994, cited in SWRCB 1998).

4.9.2 Environmental Consequences

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The proposed action and alternative require higher flows in the spring than occur at present. Model results show that achieving these flows often requires a shift in reservoir releases from the summer to the spring.

The projected reservoir storage capacity and flow figures were obtained from the Reclamation model results. The Water Right Priority System alternative is compared to the No Action alternative qualitatively for each reservoir, because this alternative was not modeled using Reclamation's modeling system. Rather the basis for analyses of this other alternative is the SWRCB's hydrologic modeling included in their recent Draft EIR (SWRCB 1997, 1998). Output from the two modeling systems are not directly comparable, and the base cases rely on different assumptions (see earlier discussion in Section 4.2, Surface Water). Of concern to the energy impact analyses is the fact that the Reclamation model alternatives include the New Melones Interim Plan of Operation (USBR 1997c) which has been in effect for over a year, while the SWRCB/DWR modeling of the base case does not.

4.9.2.1 Reservoirs

The changes in water storage based on the proposed action from the No Action alternative were averaged for both the April and May Reclamation model values. These differences in storage were then compared to the average storage capacity of each reservoir, and a percent change was calculated (Tables 4.9-1 through 4.9-3).

New Melones Reservoir

No Action. The storage capacity of New Melones Reservoir is 2,420,000 acre-feet. In the summer months, the storage levels average 1,455,000 acre-feet and range from 114,000 acre-feet to 2,420,000 acre-feet under existing conditions. Summer releases from New Melones Reservoir average 634 cfs and range from 255 cfs to 2,382 cfs.

The average annual generation for New Melones Reservoir and power plant is 385 Gigawatt Hours (GWH). The average annual generation from the Stanislaus River Basin is 1,946.15 GWH (FERC 1992), and for the entire state of California in 1995 a total of 51.66 thousand GWH were produced (CPUC 1998). Thus, while the New Melones plant produces roughly 20 percent of the power in the Stanislaus River Basin this represents less than one percent of the state's total power production.

Proposed Action. Based on an average of the April and May releases from the Reclamation's model, the proposed action affects total reservoir storage (Table 4.9-1). With the project action, the storage in the peak power producing months is increased, from 1.8 percent to 7.6 percent. Increasing the storage increases the potential for power production, and thus is a beneficial impact.

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Table 4.9-1: AVERAGE STORAGE DURING SUMMER MONTHS BY WATER YEAR FOR NEW MELONES RESERVOIR*

Year Type	No Action Average Storage (TAF)	With Project Changes in Average Storage During Summer Months					
		June		July		August	
		Average (TAF)	%	Average (TAF)	%	Average (TAF)	%
All	1,455.3	48.4	3.3	47.1	3.2	46.3	3.2
Critical	866.6	65.6	7.6	63.4	7.3	63.0	7.3
Dry	1,309.9	38.3	2.9	37.1	2.8	36.3	2.8
Below Normal	1,423.2	47.5	3.3	46.8	3.3	44.7	3.1
Above Normal	1,500.4	53.0	3.5	52.2	3.5	51.7	3.4
Wet	1,991.1	37.9	1.9	36.6	1.8	36.0	1.8

*April and May releases averaged.

Note: TAF = thousand acre feet

Alternative Action. The Water Right Priority System alternative is compared to the Reclamation's No Action alternative in a qualitative way in the absence of directly comparable data. The SWRCB's Alternative 2 is similar to the Reclamation base case and is used for the no action comparison. During peak power production, the Water Right Priority System alternative for net CVP energy generation reduces the amount of GWHs of power that can be produced in June and July but increases the potential generation capability slightly in August. The largest decrease is in July, but this only represents 0.3 percent of the power production in the Stanislaus River Basin. The overall adverse impact is less than significant.

New Don Pedro Reservoir

No Action. The storage capacity of New Don Pedro Reservoir is 2,030,000 acre-feet. In the summer months, the storage levels average 1,507,000 acre-feet and range from 578,000 acre-feet to 2,030,000 acre-feet under existing conditions. Summer releases from New Don Pedro Reservoir average 401 cfs and range from 50 cfs to 5,577 cfs.

The average annual generation for New Don Pedro Reservoir and power plant is 618.4 GWH. The average annual generation from the Tuolumne River Basin is 2,443.63 GWH (FERC 1992), and for the entire state of California in 1995 a total of 51.66 thousand GWH were produced (CPUC 1998). Thus, while the New Don Pedro plant produces roughly 25 percent of the power in the Tuolumne River Basin, this represents only 1.1 percent of the state's total power production.

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Proposed Action. Based on an average of the April and May releases from the Reclamation’s model, the proposed action affects total reservoir storage (Table 4.9-2). With the project action, the storage in the peak power producing months is decreased, from 0.0 percent to -1.6 percent. Decreasing the storage decreases the potential for power production at New Don Pedro but only slightly, and thus is a less-than-significant adverse impact.

Table 4.9-2: AVERAGE STORAGE DURING SUMMER MONTHS BY WATER YEAR FOR NEW DON PEDRO RESERVOIR*

Year Type	No Action Average Storage (TAF)	With Project Changes in Average Storage During Summer Months					
		June		July		August	
		Average (TAF)	%	Average (TAF)	%	Average (TAF)	%
All	1,507.4	-13.7	-0.9	-13.5	-0.9	-13.4	-0.9
Critical	1,006.3	-13.9	-1.4	-13.7	-1.4	-13.8	-1.4
Dry	1,391.6	-22.4	-1.6	-22.3	-1.6	-22.4	-1.6
Below Normal	1,459.3	-21.0	-1.4	-21.2	-1.5	-21.6	-1.5
Above Normal	1,647.5	-18.2	-1.1	-17.9	-1.1	-17.1	-1.0
Wet	1,897.1	-0.5	0.0	-0.2	0.0	-0.1	0.0

*April and May releases averaged.
 Note: TAF = thousand acre feet

Alternative Action. The Water Right Priority System alternative is compared to the Reclamation’s no project alternative in a qualitative way. The SWRCB’s Alternative 2 is similar to the Reclamation base case and is used for the comparison. During peak power production, the Water Right Priority System alternative for net CVP energy generation reduces the amount of GWHs of power that can be produced in June and July but increases the potential generation capability slightly in August. The largest decrease is in July, and it only represents 0.2 percent of the power production in the Tuolumne River Basin. Overall, the adverse impact is less than significant.

Lake McClure

No Action. The storage capacity of Lake McClure is 1,024,000 acre-feet. In the summer months, the storage levels average 701,000 acre-feet and range from 142,000 acre-feet to 1,024,000 acre-feet under existing conditions. Summer releases from Lake McClure average 355 cfs and range from zero to 3,573 cfs.

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The average annual generation for Lake McClure and power plant is 316.1 GWH. The average annual generation from the Merced River Basin is 406.75 GWH (FERC 1992), and for the entire state of California in 1995 a total of 51.66 thousand GWH were produced (CPUC 1998). Thus, while the Lake McClure plant produces roughly 78 percent of the power in the Merced River Basin, this represents less than one percent of the state's total power production.

Proposed Action. Using an average of the April and May releases from the Reclamation's model, the proposed action affects total reservoir storage (Table 4.9-3). With the project, the water storage in the peak power producing months is decreased, from -0.1 percent to -17.0 percent. Decreasing the storage significantly decreases the potential for power production. Decreases greater than 10 percent occur in critical, dry, and below normal years for June, July, and August; this is a potentially significant adverse impact.

Table 4.9-3: AVERAGE STORAGE DURING SUMMER MONTHS BY WATER YEAR FOR LAKE MCCLURE*

Year Type	No Action Average Storage (TAF)	With Project Changes in Average Storage During Summer Months					
		June		July		August	
		Average (TAF)	%	Average (TAF)	%	Average (TAF)	%
All	701.3	-55.6	-7.9	-54.5	-7.8	-53.4	-7.6
Critical	414.8	-70.5	-17.0	-66.3	-16.0	-62.2	-15.0
Dry	573.3	-89.0	-15.5	-88.5	-15.4	-87.8	-15.3
Below Normal	667.8	-86.0	-12.9	-85.6	-12.8	-85.1	-12.7
Above Normal	830.5	-61.6	-7.4	-61.1	-7.4	-60.8	-7.3
Wet	927.4	-0.9	-0.1	-0.8	-0.1	-0.9	-0.1

*April and May releases averaged.

Note: TAF = thousand acre feet

Alternative Action. The Water Right Priority System alternative is compared to the Reclamation's No Action alternative in a qualitative way. The SWRCB's Alternative 2 is similar to the Reclamation base case and is used for the comparison. During peak power production, the Water Right Priority System alternative for net CVP energy generation reduces the amount of GWHs of power that can be produced in June and July but increases the potential generation capability slightly in August.

The largest decrease is in July, and only represents 1.4 percent of the power production in the Merced River Basin. The overall adverse impact is less than significant.

4. Environmental Consequences and Mitigation Measures

4.9.2.2 Rivers

The changes in flows based on the proposed action from the No Action alternative were averaged for both the April and May Reclamation model values. These differences in flow were then compared to the average flows of each river, and a percent change was calculated.

Under certain circumstances of hydrology and operational objectives (not modeled) there could occur an operation whereby flows from the reservoir operators that would otherwise have been released at their discretion during the summer may, as the result of the proposed action, no longer be released.

The likelihood of these instances is considered rare, and its effect, if any, on Vernalis flow is complicated due to the potential reaction of New Melones Reservoir operations to flow and resultant water quality changes at Vernalis.

Stanislaus River

No Action. Summer releases on the Stanislaus River average 634 cfs and range from 255 cfs to 2,382 cfs.

Proposed Action. Based on averages of the April and May releases from the Reclamation's model (which simulates flows that are all at or above the established flows), the proposed action affects flow on the Stanislaus River (Table 4.9-4). With the project, the flow in the peak power producing months is changed, from -1.4 percent to 7.9 percent. Increasing the flow increases the potential for power production and thus is a beneficial impact. Consequently, decreasing the flow decreases the potential for power production and is an adverse impact on the potential to produce power. Since most of the flows are higher under the proposed action, the overall effect is beneficial but less than significant.

4. Environmental Consequences and Mitigation Measures

Table 4.9-4: AVERAGE FLOW DURING SUMMER MONTHS BY WATER YEAR FOR THE STANISLAUS RIVER*

Year Type	No Action Average Flow (cfs)	With Project Changes in Average Flows During Summer Months					
		June		July		August	
		Average (cfs)	%	Average (cfs)	%	Average (cfs)	%
All	634.3	27.4	4.3	11.0	1.7	4.1	0.6
Critical	417.4	22.1	5.3	27.8	6.7	0.0	0.0
Dry	710.6	-0.1	0.0	15.6	2.2	8.8	1.2
Below Normal	632.8	-9.0	-1.4	0.2	0.0	22.9	3.6
Above Normal	634.8	40.9	6.4	2.7	0.4	-3.3	-0.5
Wet	762.1	60.4	7.9	8.1	1.1	-1.8	-0.2

*April and May releases averaged.

Alternative Action. The Water Right Priority System alternative is compared to the Reclamation’s No Action alternative in a qualitative way in the absence of directly comparable data. The SWRCB’s Alternative 2 is similar to the Reclamation base case and is used for the No Action comparison. During peak power production, the alternative for net CVP energy generation reduces the amount of GWHs of power that can be produced in June and July, but increases the potential generation capability slightly in August. The largest decrease is in July and only represents 0.3 percent of the power production in the Stanislaus River Basin. The impact is less than significant.

Tuolumne River

No Action. Summer releases on the Tuolumne River average 401 cfs and range from 50 cfs to 5,577 cfs. The FERC required minimum flow is 50 cfs in critical water years in summer months, and increases to 300 cfs in wet years.

Proposed Action. Using Tuolumne River averages of April and May releases (based on Reclamation’s model, which simulates flows that are at or above the established flows), the proposed action affects flow (Table 4.9-5). With the project, the flow in the peak power producing months is changed, from -2.3 percent to 10.6 percent. Increasing the flow increases the potential for power production, and thus is a beneficial impact. Consequently, the overall impact is less than significant except in below normal years when the impact is significantly beneficial.

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Table 4.9-5: AVERAGE FLOW DURING SUMMER MONTHS BY WATER YEAR FOR THE TUOLUMNE RIVER*

Year Type	No Action Average Flow (cfs)	With Project Changes in Average Flows During Summer Months					
		June		July		August	
		Average (cfs)	%	Average (cfs)	%	Average (cfs)	%
All	401.1	2.7	0.7	-1.0	-0.2	-0.8	-0.2
Critical	50.0	0.0	0.0	-1.0	-2.0	-1.0	-2.0
Dry	66.1	5.1	7.7	3.5	5.3	3.5	5.3
Below Normal	75.3	8.0	10.6	6.0	8.0	6.0	8.0
Above Normal	258.2	1.9	0.7	-6.0	-2.3	-6.0	-2.3
Wet	1,183.2	0.7	0.1	-4.4	-0.4	-3.5	-0.3

*April and May releases averaged;

Alternative Action. The Water Right Priority System alternative is compared to the Reclamation’s No Action alternative in a qualitative way. The SWRCB’s Alternative 2 is similar to the Reclamation base case and is used for the comparison. During peak power production, the alternative for net CVP energy generation reduces the amount of GWHs of power that can be produced in June and July, but increases the potential generation capability slightly in August. The largest decrease is in July and only represents 0.2 percent of the power production in the Tuolumne River Basin. The impact is less than significant.

Merced River

No Action. Summer releases on the Merced River average 634 cfs and range from 255 cfs to 2,382 cfs.

Proposed Action. Using an average of the April and May Merced River releases (based on Reclamation’s model, which simulates flows that are at or above the established flows), the proposed action affects flows (Table 4.9-6). With the project, the flow in the peak power producing months is changed, from -46.4 percent to 2.2 percent. Increasing the flow increases the potential for power production, and thus is a beneficial impact. Consequently, decreasing the flow decreases the potential for power production and is an adverse impact. The large percentage decrease occurs only in above normal water years in June but is only a decrease of 117 cfs. This impact is potentially significant.

Table 4.9-6: AVERAGE FLOW DURING SUMMER MONTHS BY WATER YEAR

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FOR THE MERCED RIVER*

Year Type	No Action Average Flow (cfs)	With Project Changes in Average Flows During Summer Months					
		June		July		August	
		Average (cfs)	%	Average (cfs)	%	Average (cfs)	%
All	355.1	-39.9	-11.2	2.2	0.6	1.1	0.3
Critical	133.6	2.6	1.9	1.2	0.9	0.1	0.1
Dry	146.5	2.5	1.7	1.4	1.0	0.3	0.2
Below Normal	180.4	2.1	1.2	3.9	2.2	0.5	0.3
Above Normal	252.2	-116.9	-46.4	4.0	1.6	1.5	0.6
Wet	836.8	-67.8	-8.1	1.0	0.1	2.5	0.3

*April and May releases averaged.

Alternative Action. The Water Right Priority System alternative is compared to the Reclamation's No Action alternative in a qualitative way. The SWRCB's Alternative 2 is similar to the Reclamation base case and is used for the comparison. During peak power production, the alternative for net CVP energy generation reduces the amount of GWHs of power that can be produced in June and July, but increases the potential generation capability slightly in August. The largest decrease is in July and only represents 1.4 percent of the power production in the Merced River Basin. The impact is less than significant.

San Joaquin River

No hydropower is generated on the San Joaquin River that would be affected by either the proposed action or alternative action. No mitigation is necessary.

4.9.3 Impact Summary and Mitigation of Impacts

4.9.3.1 Reservoirs

Proposed Action

- Increases in storage capacity at New Melones have a beneficial effect on potential hydropower production. No mitigation is necessary.
- There are less-than-significant impacts to hydropower production at New Don Pedro Reservoir. No mitigation is necessary.

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- Decreases greater than 10 percent occur in critical, dry, and below normal years for June, July, and August for Lake McClure. This adverse impact to potential hydropower production is potentially significant and unavoidable, because the effects of changing the reservoir levels cannot be mitigated while still accomplishing project objectives.

Alternative Action

- There are less-than-significant impacts to potential hydropower production on either New Melones Reservoir, New Don Pedro Reservoir, or Lake McClure. No mitigation is necessary.

4.9.3.2 Rivers

Proposed Action

- Proposed releases on the Stanislaus River would have a less-than-significant effect on potential hydropower production. No mitigation is required.
- There are significant beneficial impacts to hydropower production at Tuolumne River powerplants during below normal years in June. No mitigation is necessary.
- Decreases greater than 10 percent occur in above normal years in June for the Merced River. This adverse impact to potential hydropower generation is potentially significant and unavoidable because the effects of changing the average flow cannot be mitigated while still accomplishing project objectives.

Alternative Action

- There are less-than-significant impacts to potential hydropower production on the Stanislaus, Tuolumne, or Merced rivers. No mitigation is required.

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