

**COVER SHEET**

**FEDERAL ENERGY REGULATORY COMMISSION  
FINAL ENVIRONMENTAL IMPACT STATEMENT  
FOR THE OROVILLE FACILITIES PROJECT  
Docket No. P-2100-052**

**Section 4  
Developmental Analysis  
Pages 351 to 358  
FEIS**

## 4.0 DEVELOPMENTAL ANALYSIS

In this section, we analyze the project's use of the water resources of the Feather River Basin to generate power, estimate the economic benefits of the Oroville Facilities, and estimate the cost of various environmental measures and the effects of these measures on project operations.

### 4.1 POWER AND ECONOMIC BENEFITS OF THE PROJECT

#### 4.1.1 Economic Assumptions

Under its approach to evaluating the economics of hydropower projects, as articulated in Mead Corporation, Publishing Paper Division (72 FERC ¶61,027, July 13, 1995), the Commission employs an analysis that uses current costs to compare the costs of the project and likely alternative power with no consideration for potential future inflation, escalation, or deflation beyond the license issuance date. The Commission's economic analysis provides a general estimate of the potential power benefits and costs of a project and reasonable alternatives to project-generated power. The estimate helps to support an informed decision concerning what is in the public interest with respect to a proposed license.

For our economic analysis of alternatives, we used the assumptions, values, and sources shown in table 70. DWR provided information updating the assumptions and/or costs in responses to additional information requests in August 2005 (DWR, 2005i).

Table 70. Staff assumptions for economic analysis of the Oroville Facilities.

Assumption	Value	Source
Base year for costs and benefits	2006	Staff
On-peak power value (mills/kWh) <sup>a</sup>	\$35.35	DWR
Off-peak power value (mills/kWh) <sup>a</sup>	\$27.76	DWR
Pump-back power cost (mills/kWh)	\$24.14	DWR
Dependable capacity value (\$/MW)	\$51,600	CEC, 2003 and adjusted by staff
Ancillary benefits value (\$/MW)	\$10,436	Computed from DWR
Period of analysis	30 years	Staff
Term of financing	20 years	Staff
Federal and state tax rate	0 percent	DWR
Local tax rate	0 percent	DWR
Insurance rate <sup>b</sup>	Included in O&M costs	Staff
Discount rate	6.0 percent	DWR
Long-term bond interest rate	6.0 percent	DWR

<sup>a</sup> We computed peak and off peak energy values in a manner consistent with DWR clarification no. 3 to our additional information request (DWR, 2005i).

<sup>b</sup> DWR did not separate insurance costs from other operations and maintenance costs.

#### 4.1.2 Current Annual Costs and Future Capital Costs for the Oroville Facilities under the No-action Alternative

Total annualized current costs for the No-action Alternative amount to \$71,955,100, as table 71 shows.

Table 71. Summary of current annual costs and future capital costs for DWR's Oroville Facilities under the No-action Alternative. (Source: DWR, 2005i)

Cost	Capital and One-Time Costs	Annual Costs, Including O&M	Total Annualized Costs
Temperature criteria/targets	\$12,130,000	\$80,000	\$961,200
Natural salmonid spawning and rearing habitat	\$0	\$556,000	\$556,000
Salmonid genetics	\$0	\$0	\$0
Feather River Fish Hatchery	\$0	\$1,625,000	\$1,625,000
Lower Feather river fishery	\$0	\$985,000	\$985,000
Fishery management	\$0	\$234,000	\$234,000
Thermalito afterbay terrestrial habitat	\$8,000	\$73,000	\$73,600
OWA terrestrial	\$0	\$10,000	\$10,000
Vegetation and wildlife management	\$12,000	\$27,000	\$27,900
Water quality	\$0	\$50,000	\$50,000
Recreation—General including trails, restrooms, wildfire evacuation plan, law enforcement, final Recreation Management Plan, and monitoring <sup>a</sup>	\$244,000	\$210,000	\$227,700
Bidwell Canyon boat ramp/campground/day-use area/marina	\$0	\$550,000	\$550,000
Loafer Creek boat ramp /day-use area/campground/group campground/equestrian campground <sup>a</sup>	\$10,000	\$675,000	\$675,700
Lime Saddle boat ramp/day-use area/campground/marina	\$0	\$425,000	\$425,000
Spillway boat ramp/day-use area <sup>a</sup>	\$164,000	\$575,000	\$586,900
Enterprise boat ramp	\$0	\$125,000	\$125,000
Vinton Gulch car-top boat ramp	\$0	\$30,000	\$30,000
Dark Canyon car-top boat ramp	\$0	\$40,000	\$40,000
Foreman Creek car-top boat ramp	\$0	\$170,000	\$170,000
Stringtown car-top boat ramp	\$0	\$50,000	\$50,000
Lake Oroville Visitor Center	\$0	\$340,000	\$340,000
Saddle dam equestrian facilities and trailhead access <sup>a</sup>	\$38,000	\$25,000	\$27,800
Bloomer area boat-in campground	\$0	\$40,000	\$40,000

<b>Cost</b>	<b>Capital and One-Time Costs</b>	<b>Annual Costs, Including O&amp;M</b>	<b>Total Annualized Costs</b>
Goat Ranch boat-in campground	\$0	\$40,000	\$40,000
Foreman Creek boat-in campground	\$0	\$40,000	\$40,000
Craig Saddle boat-in campground	\$0	\$40,000	\$40,000
Oroville Dam Overlook day-use area <sup>a</sup>	\$0	\$25,000	\$25,000
Floating Campsites and Floating Restrooms	\$0	\$385,000	\$385,000
Diversion pool day-use area (Northwest side)	\$0	\$25,000	\$25,000
Lakeland Boulevard <sup>a</sup>	\$71,000	\$10,000	\$15,200
Recreation—low flow channel/Feather River Fish Hatchery landscape improvements <sup>a</sup>	\$30,000	\$25,000	\$27,200
North Thermalito forebay	\$0	\$475,000	\$475,000
South Thermalito forebay	\$0	\$80,000	\$80,000
Thermalito afterbay—Wilbur Road boat ramp <sup>a</sup>	\$7,000	\$25,000	\$25,500
Thermalito afterbay—Larkin Road car-top boat ramp	\$0	\$25,000	\$25,000
Thermalito afterbay—Monument Hill boat ramp/day-use area	\$0	\$100,000	\$100,000
Model aircraft flying area <sup>a</sup>	\$27,000	\$25,000	\$27,000
OWA—Thermalito afterbay outlet boat ramp/day-use area campground	\$0	\$25,000	\$25,000
OWA dispersed river and pond access sites	\$0	\$10,000	\$10,000
Land use, management, and aesthetics	\$0	\$40,000	\$40,000
Annual estimate of future recreation capital improvements and replacements	\$0	\$800,000	\$800,000
Subtotal current environmental and recreational costs	\$12,741,000	\$9,090,000	\$10,015,700
O&M cost		\$26,431,000	\$26,431,000
FERC fees		Included in O&M costs	
Total original net investment	\$231,871,326		\$16,845,200
Relicensing process costs	\$65,000,000		\$4,722,200
Future plant costs and replacements	\$62,313,391		\$4,527,000
Subtotal			\$62,541,100
Cost of pump-back energy		\$9,414,000	\$9,414,000
Total annualized costs			\$71,955,100

<sup>a</sup> Interim recreational projects implemented prior to receiving a potential new license. Note items listed in section 3.1.2 of DWR (2005a) did not correlate well with the measures listed for the No-action Alternative in section 6.6.2 of DWR (2005a).

## **4.2 COST OF ENVIRONMENTAL MEASURES**

As proposed under the Settlement Agreement and as recommended by staff, the Oroville Facilities would experience reduced generation and incur higher annual O&M costs and capital costs associated with the implementation of environmental measures. No effect on dependable capacity is anticipated.

### **4.2.1 Cost of Environmental Measures for Oroville Facilities**

DWR provided costs for environmental measures in current dollars. Costs are taken from DWR's additional information request response, the Settlement Agreement Recreation Plan filed in March 2006, and a cost update to the additional information request response reflecting the Settlement Agreement submitted on June 28, 2006 (DWR, 2006d). Where cost information was either missing or incomplete, staff estimated costs. Table 72 summarizes the costs by major resource area for both the Proposed Action and Proposed Action with staff modifications. Our detailed costs are provided in appendix B.

### **4.2.2 Effect of Proposed Operations on Oroville Facilities**

The minimum instream flows in the low flow channel under Proposed Article 108, *Flow/Temperature to Support Anadromous Fish*, are higher than currently required. These higher flows would reduce the amount of flow available for generation at the Thermalito powerhouse. Additional effects on generation, which have been preliminarily quantified by DWR, could occur if additional flows (up to 1,500 cfs) are ultimately needed to meet temperature objectives. The minimum instream flow schedule is as follows:

- September 9–March 31: 800 cfs
- April 1–September 8: 700 cfs

DWR indicates that additional energy loss would occur owing to change in bypass flow and estimate the effect on gross energy generation would be 8,500MWh. An additional reduction of 35,000 MWh would result from flows needed for flow and temperature requirements identified in Proposed Articles A108.3 and A108.4. This results in a drop in gross energy generation from 2,708,000 MWh under the No-action Alternative to 2,664,500 MWh under the Proposed Action.

DWR also computed the effect on pump back energy, resulting in an estimated reduction in pump-back energy required under the Proposed Action compared to the No-action Alternative reduction of 1,450 MWh. The energy required for pump back operation would be reduced from 389,900 MWh under the No-action Alternative to 388,450 MWh under the Proposed Action. Staff does not recommend measures beyond the Proposed Action that would affect energy generation.

Table 72. Summary of annualized costs for measures included in the Proposed Action and Proposed Action with Staff Modifications for the Oroville Facilities. (Source: Staff)

Resource Area	Proposed Action			Proposed Action with Staff Modifications		
	Capital Cost	Annualized O&M Cost	Total Annualized Cost	Capital Cost	Annualized O&M Cost	Total Annualized Cost
Geology and soils	\$15,000	\$321,600	\$322,700	\$15,000	\$251,600	\$252,700
Water quality	\$26,000	\$247,700	\$249,600	\$26,000	\$247,700	\$249,600
Aquatic resources	\$86,360,000	\$1,001,200	\$5,404,000	\$86,185,000	\$983,700	\$5,379,200
Terrestrial resources	\$1,832,000	\$984,200	\$1,117,500	\$1,832,000	\$984,200	\$1,117,500
Recreation	\$77,890,000	\$1,535,900	\$4,404,600	\$77,920,000	\$1,330,900	\$4,201,800
Land use and aesthetics	\$750,000	\$35,000	\$89,500	\$761,000	\$35,700	\$91,000
Cultural	\$19,600,000	\$360,000	\$1,783,900	\$19,600,000	\$360,000	\$1,783,900
Socioeconomics	--	--	--	--	--	--
Total	\$186,473,000	\$4,485,600	\$13,371,800	\$186,339,000	\$4,193,800	\$13,075,700

<sup>a</sup> Note that in its June 28, 2006, cost update, DWR combined several individual elements of various environmental measures. This required staff to estimate costs of individual measures and elements within certain individual measures both with respect to cash flow and implementation schedule.

### 4.3 COMPARISON OF ALTERNATIVES

Table 73 compares the power value, annual costs, and net benefits of the No-action Alternative, Proposed Action, and the Proposed Action with Staff Modifications for the Oroville Facilities. In section 5, *Comprehensive Development and Recommended Alternative*, we discuss our reasons for recommending the Proposed Action, as well as any staff modifications, and explain why we conclude the environmental benefits are worth these costs. The decrease in net benefits from 14.95 to 9.74 mills/kWh for the Proposed Action with Staff Modifications represents a decrease of 35.87 percent relative to the No-action Alternative. However, the Proposed Action with Staff Modifications has minimal effects on net benefits when compared to the Proposed Action because staff modifications result in only modest increases in project costs associated with new environmental measures.

Table 73. Summary of annual net benefits for the No-action, Proposed Action, and Proposed Action with Staff Modifications for the Oroville Facilities.  
(Source: Staff)

	No Action	Proposed Action	Proposed Action With Staff Modifications
Dependable capacity (MW)	300.0	300.0	300.0
Value dependable capacity (\$)	15,480,000	15,480,000	15,480,000
Value ancillary benefits (\$)	5,218,000	5,218,000	5,218,000
Lost on-peak gross energy generation (MWh) <sup>a</sup>	--	35,873	35,873
Lost off peak gross energy generation (MWh) <sup>a</sup>	--	7,627	7,627
Total gross energy generation (MWh)	2,708,000	2,664,500	2,664,500
Annual energy value (\$)	91,734,000	90,254,000	90,254,000
Annual power value (\$)	112,432,000	110,952,000	110,952,000
Annual power value (mills/kWh)	41.52	41.64	41.64
Pump back energy requirements (MWh)	389,900	388,450	388,450
Annual cost pump back energy (\$)	9,414,000	9,379,000	9,379,000
Annualized cost of plant and current environmental measures(\$)	62,541,100	62,541,100	62,541,100
Annualized cost of new environmental measures(\$)	0	13,371,800	13,075,700
Annualized cost (\$)	71,955,100	85,291,900	84,995,800
Annual cost (mills/kWh)	\$26.57	\$32.01	\$31.90
Annual net benefit (\$)	40,476,900	25,660,100	25,956,200
Annual net benefit (mills/kWh)	14.95	9.63	9.74

<sup>a</sup> DWR did not update the distribution of peak and off peak energy in its June 28, 2006, filing; however, we were able to solve for those values using the peak and off-peak energy values from table 70.

#### 4.4 OTHER ECONOMIC CONSIDERATIONS

In addition to the cost evaluated in sections 4.2 and 4.3, DWR would incur costs associated with measures listed in appendix B of the Settlement Agreement that are not part of a potential Commission license. Costs associated with these measures are external to our developmental analysis.

#### 4.5 EFFECT OF ALERNATIVES ON GREENHOUSE GASES

By producing hydroelectricity, the Oroville Facilities displaces the need for other power plants, primarily fossil-fueled facilities, to operate, thereby avoiding some power plant emissions and creating an environmental benefit. We summarize the effect of the project, off-peak pumping energy, and the overall net effect on carbon emission reduction in table 74.

Table 74. Summary of the effect of greenhouse gases on the No-action, Proposed Action, and Proposed Action with Staff Modifications for the Oroville Facilities  
(Source: Staff)

	No Action	Proposed Action	Proposed Action with Staff Modifications
Oroville Facilities avoided Carbon emissions (metric tons/year) <sup>a</sup>	418,531	411,808	411,808
Generation source for off-peak pumping energy (metric tons/year) <sup>b</sup>	60,260	60,036	60,036
Net effect on avoided carbon emissions (metric tons/year) <sup>c</sup>	358,270	351,771	351,771

<sup>a</sup> This row only accounts for avoided emissions due to hydro turbine generation. Avoided carbon emission estimates are based on a carbon intensity factor of 155 kilograms per MWh, which is consistent with Department of Energy values for the WECC region of the U.S. Estimates are obtained by multiplying the gross energy generation values in table 73 by the carbon intensity factor and converting from kilograms to metric tons.

<sup>b</sup> This row accounts for emissions that would occur due to the generation source that would provide off-peak pumping energy. We assume that off-peak generation would have a carbon intensity factor of 155 kilograms per MWh. Estimates are obtained by multiplying the pump-back energy requirements in table 73 by the carbon intensity factor and converting kilograms to metric tons.

<sup>c</sup> This row computes net avoided emissions and is equal to row 1 minus row 2.



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