

COVER SHEET

FEDERAL ENERGY REGULATORY COMMISSION

**DRAFT ENVIRONMENTAL IMPACT STATEMENT
FOR THE BIG CREEK ALP PROJECTS
Docket Nos. P-67, 2175, 2085, and 120**

**Section 4
Developmental Analysis
Pages 4-1 to 4-16
DEIS**

4.0 DEVELOPMENTAL ANALYSIS

In this section, we analyze the Big Creek ALP Projects’ use of the water resources of the San Joaquin River Basin to generate power, estimate the economic benefits of the SCE 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 PROJECTS

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 the project alternatives, we used the assumptions, values and sources shown in table 4-1.

Table 4-1. Staff assumptions for economic analysis of SCE’s Big Creek ALP Projects. (Source: Staff)

Assumption	Value	Source
Base year for costs and benefits	2008	Staff
Energy value (mills/kWh) ^a	\$52.40	SCE
Dependable capacity value (\$/kW-yr) ^b	\$73.93	SCE
Period of analysis ^c	30 years	Staff
Term of financing	20 years	Staff
Federal and state tax rate	35%	Staff
Local tax rate ^d	1.08%	SCE

Assumption	Value	Source
Insurance rate	0.25%	Staff
Discount rate ^e	10.0%	SCE

^a SCE provided an energy rate for 2009 in exhibit D, table D-3, of the license applications for Big Creek Projects Nos. 67, 120, and 2175. The application for Mammoth Pool was filed earlier and used older energy rate forecast information.

^b SCE provided dependable capacity rates for 2009 in exhibit D, table D-3, of the license applications for Big Creek Projects Nos. 67, 120, and 2175. The application for Mammoth Pool was filed earlier and used older capacity rate forecast information.

^c Although our period of financial analysis is 30 years, SCE provided costs for 46 years, reflecting a potential 50-year license. We have recognized the expenditures beyond year 30 by computing the present value of the expenditures over 46 years and then computing the annualized cost over 30 years.

^d We derived the local tax rate by dividing the local taxes paid by the net investment values as provided by SCE. The rate for each project was very similar, so we used a simple average of the rates for all four Big Creek ALP Projects.

^e We used cost of capital provided by SCE in table 7.0-1 of the amended PDEA.

4.1.2 Current Annual Costs and Future Capital Costs for the Big Creek ALP Projects under the No-action Alternative

Total annualized costs for the no-action alternative for the Big Creek Nos. 2A, 8, and Eastwood Project amount to \$37,317,930 (table 4-2).

Table 4-2. Summary of current annual costs and future costs for SCE's Big Creek Nos. 2A, 8, and Eastwood Project under the no-action alternative.
(Source: SCE, 2007a)

Cost	Capital and One-Time Costs	Annual Costs, Including O&M	Total Annualized Costs (12/31/2008)
Original net investment ^a	\$219,234,230 (12/31/06)		
Relicensing cost ^a	\$14,884,000 (12/31/06)		
Total net investment	\$234,118,230 (12/31/06)		\$24,721,510

Cost	Capital and One-Time Costs	Annual Costs, Including O&M	Total Annualized Costs (12/31/2008)
Plant operation and maintenance ^b		\$12,012,890 (12/31/06)	\$12,596,420
Total			\$37,317,930

^a The values shown above were presented by SCE in the license application. We have updated these values to current year dollars by depreciating using a 150 percent declining balance over 20 years, which is the federal tax method cited in table 7.0-1 of the amended PDEA.

^b The values shown above were presented by SCE in the license application. We have updated these values to current year dollars by escalating them at a rate of 2.4 percent per year.

Total annualized costs for the no-action alternative for the Big Creek Nos. 1 and 2 Project amount to \$12,973,290 (table 4-3).

Table 4-3. Summary of current annual costs and future costs for Big Creek Nos. 1 and 2 Project under the no-action alternative. (Source: SCE, 2007a)

Cost	Capital and One-Time Costs	Annual Costs, Including O&M	Total Annualized Costs (12/31/08)
Original net investment ^a	\$39,594,900 (12/31/05)		
Relicensing cost ^a	\$10,741,000 (12/31/06)		
Total net investment	\$47,366,280 (12/31/06)		\$5,001,600
Plant operation and maintenance ^b		\$7,602,400 (12/31/06)	\$7,971,690
Total			\$12,973,290

^a The values shown above were presented by SCE in the license application. We have updated these values to current year dollars by depreciating using a 150 percent declining balance over 20 years, which is the federal tax method cited in table 7.0-1 of the amended PDEA.

^b The values shown above were presented by SCE in the license application. We have updated these values to current year dollars by escalating them at a rate of 2.4 percent per year.

Total annualized costs for the no-action alternative for the Mammoth Pool Project amount to \$8,520,220 (table 4-4).

Table 4-4. Summary of current annual costs and future costs for the Mammoth Pool Project under the no-action alternative. (Source: SCE, 2007a)

Cost	Capital and One-Time Costs	Annual Costs, Including O&M	Total Annualized Costs (12/31/08)
Original net investment ^a	\$27,172,070 (12/31/04)		
Relicensing cost ^a	\$4,944,470 (12/31/06)		
Total net investment	\$28,193,570		\$2,977,070
Plant operation and maintenance ^b		\$5,286,360 (12/31/06)	\$5,543,150
Total			\$8,520,220

^a The values shown above were presented by SCE in the license application. We have updated these values to current year dollars by depreciating using a 150 percent declining balance over 20 years, which is the federal tax method cited in table 7.0-1 of the amended PDEA.

^b The values shown above were presented by SCE in the license application. We have updated these values to current year dollars by escalating them at a rate of 2.4 percent per year.

Total annualized costs for the no-action alternative for the Big Creek No. 3 Project amount to \$11,757,710 (table 4-5).

Table 4-5. Summary of current annual costs and future costs for SCE’s Big Creek No. 3 Project under the no-action alternative. (Source: SCE, 2007a)

Cost	Capital and One-Time Costs	Annual Costs, Including O&M	Total Annualized Costs (12/31/08)
Original net investment ^a	\$37,174,160 (12/31/05)		
Relicensing cost ^a	\$5,310,000 (12/31/06)		
Total net investment	\$39,696,100 (12/31/06)		\$4,191,670
Plant operation and maintenance ^b		\$7,215,534 (12/31/06)	\$7,566,040
Total			\$11,757,710

^a The values shown above were presented by SCE in the license application. We have updated these values to current year dollars by depreciating using a 150% declining balance over 20 years, which is the Federal tax method cited in table 7.0-1 of the amended PDEA.

^b The values shown above were presented by SCE in the license application. We have updated these values to current year dollars by escalating them at a rate of 2.4 percent per year.

4.2 COST OF ENVIRONMENTAL MEASURES

As proposed under the Settlement Agreement and as recommended by staff, the environmental measures for the Big Creek Nos. 2A, 8, and Eastwood Project would both reduce generation and increase annual O&M costs and capital costs. SCE does not anticipate the environmental measures would affect the dependable capacity of the project, which we find reasonable.

4.2.1 Cost of Environmental Measures for the Big Creek ALP Projects

SCE provided costs for environmental measures in 2006 dollars. Costs are taken from the amended PDEA (section 7.0) filed with the license applications. Although our period of financial analysis is 30 years, SCE provided costs for 46 years, reflecting a potential 50-year license. We have recognized the expenditures beyond year 30 by computing the present value of the expenditures over 46 years and then computing the annualized cost over 30 years.

Tables 4-6 through 4-9 summarize the costs by major resource area for both the proposed action and the proposed action with staff modifications for the Big Creek ALP

Projects. For details of the costs of specific measures included in each resource category in tables 4-6 through 4-9, see appendix B, *Capital and Annual Costs of Measures for the Big Creek ALP Projects and the Portal Project*.

Table 4-6. Summary of annualized costs for measures included in the proposed action and proposed action with staff modifications for the Big Creek Nos. 2A, 8, and Eastwood Project. (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
Aquatic resources	\$3,985,580	\$2,877,570	\$3,369,440	\$3,985,580	\$2,909,650	\$3,382,210
Terrestrial resources	\$20,420	\$72,090	\$74,610	\$20,420	\$72,090	\$74,610
Recreation, land use, and aesthetics	\$4,514,740	\$518,820	\$1,075,990	\$3,353,800	\$518,820	\$932,710
Cultural resources	\$183,780	\$19,670	\$52,350	\$183,780	\$19,670	\$52,350
Total	\$8,704,520	\$3,498,150	\$4,572,390	\$7,543,580	\$3,530,230	\$4,441,880

Table 4-7. Summary of annualized costs for measures included in the proposed action and proposed action with staff modifications for the Big Creek Nos.1 and 2 Project. (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
Aquatic resources	\$2,315,270	\$5,846,730	\$6,132,460	\$2,315,270	\$5,848,670	\$6,134,400
Terrestrial resources	\$20,420	\$60,090	\$62,610	\$20,420	\$60,090	\$62,610
Recreation, land use, and aesthetics	\$5,647,580	\$410,490	\$1,107,470	\$4,969,870	\$408,610	\$1,021,960
Cultural resources	\$31,010	\$5,180	\$9,000	\$31,010	\$5,180	\$9,000
Total	\$8,014,280	\$6,322,490	\$7,311,540	\$7,336,570	\$6,324,430	\$7,227,970

4-8

Table 4-8. Summary of annualized costs for measures included in the proposed action and proposed action with staff modifications for the Mammoth Pool Project. (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
Aquatic resources	\$11,172,520	\$871,850	\$2,250,670	\$11,172,520	\$874,050	\$2,252,870
Terrestrial resources	\$4,020	\$85,320	\$85,820	\$4,020	\$85,320	\$85,820
Recreation, land use, and aesthetics	\$825,930	\$395,820	\$497,750	\$496,800	\$395,820	\$454,900
Cultural resources	\$36,640	\$6,150	\$10,670	\$35,640	\$6,150	\$10,670
Total	\$12,039,110	\$1,359,140	\$2,844,910	\$11,708,980	\$1,364,560	\$2,804,260

4-9

Table 4-9. Summary of annualized costs for measures included in the proposed action and proposed action with staff modifications for the Big Creek No. 3 Project. (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
Aquatic resources	\$1,858,650	\$1,193,120	\$1,422,500	\$1,858,650	\$1,195,060	\$1,424,440
Terrestrial resources	\$18,910	\$43,780	\$46,110	\$18,910	\$43,780	\$46,110
4-10 Recreation, land use, and aesthetics	\$19,400	\$348,440	\$350,840	\$19,400	\$348,440	\$350,840
Cultural resources	\$31,010	\$5,180	\$9,000	\$31,010	\$5,180	\$9,000
Total	\$1,927,970	\$1,590,520	\$1,828,450	\$1,927,970	\$1,592,460	\$1,830,390

4.2.2 Effect of Proposed Operations on the Big Creek ALP Projects

Several measures affect energy generation. Energy estimates were provided by SCE for the proposed minimum flows and proposed channel riparian maintenance flows (see section 3.3.1.1, *Aquatic Resources*).

Staff notes that a reduction of 47,867 MWh would result from flows needed for environmental requirements at the Big Creek Nos. 2A, 8, and Eastwood Project as shown in table 4-10 and detailed in appendix B.

Table 4-10. Summary of the effect of environmental measures on energy and capacity for the no-action, proposed action, and proposed action with staff modifications for the Big Creek Nos. 2A, 8, and Eastwood Project. (Source: Staff)

Reduced Power Benefits	No Action	Proposed Action	Proposed Action with Staff Modifications
Dependable capacity (MW)	0	0	0
Energy (MWh)	0	47,867	47,867

Staff notes that a reduction of 108,411 MWh would result from flows needed for environmental requirements at the Big Creek Nos. 1 and 2 Project as shown in table 4-11 and detailed in appendix B.

Table 4-11. Summary of the effect of environmental measures on energy and capacity for the no-action, proposed action, and proposed action with staff modifications for the Big Creek Nos. 1 and 2 Project. (Source: Staff)

Reduced Power Benefits	No Action	Proposed Action	Proposed Action with Staff Modifications
Dependable capacity (MW)	0	0	0
Energy (MWh)	0	108,411	108,411

Staff notes that a reduction of 13,382 MWh would result from flows needed for environmental requirements at the Mammoth Pool Project as shown in table 4-12 and detailed in appendix B.

Table 4-12. Summary of the effect of environmental measures on energy and capacity for the no-action, proposed action, and proposed action with staff modifications for the Mammoth Pool Project. (Source: Staff)

Reduced Power Benefits	No Action	Proposed Action	Proposed Action with Staff Modifications
Dependable capacity (MW)	0	0	0
Energy (MWh)	0	13,382	13,382

Staff notes that a reduction of 19,841 MWh would result from flows needed for environmental requirements at the Big Creek No. 3 Project as shown in table 4-13 and detailed in appendix B.

Table 4-13. Summary of the effect of environmental measures on energy and capacity for the no-action, proposed action, and proposed action with staff modifications for the Big Creek No. 3 Project. (Source: Staff)

Reduced Power Benefits	No Action	Proposed Action	Proposed Action with Staff Modifications
Dependable capacity (MW)	0	0	0
Energy (MWh)	0	19,841	19,841

4.3 COMPARISON OF ALTERNATIVES

Table 4-14 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 Big Creek Nos. 2A, 8, and Eastwood. In section 5.2, *Comprehensive Development and Recommended Alternative*, we discuss our reasons for recommending the proposed action with staff modifications, and explain why we conclude the environmental benefits are worth these costs.

Table 4-14. Summary of annual net benefits for the no-action, proposed action, and proposed action with staff modifications for the Big Creek Nos. 2A, 8, and Eastwood Project. (Source: Staff)

	No Action	Proposed Action	Proposed Action with Staff Modifications
Dependable capacity (MW) ^a	370	370	370
Value of dependable capacity (\$)	\$27,354,100	\$27,354,100	\$27,354,100
Generation (MWh) ^b	1,173,296	1,125,429	1,125,429
Value of generation (\$)	\$61,480,710	\$58,972,480	\$58,972,480
Annual power value (\$)	\$88,834,810	\$86,326,580	\$86,326,580
Annual power value (\$/MWh)	75.71	76.71	76.71
Annualized cost of operations and current environmental measures (\$)	\$37,317,930	\$37,317,930	\$37,317,930
Annualized cost of new environmental measures (\$)	\$0	\$2,064,160	\$1,922,820
Annual cost (\$)	\$37,317,930	\$39,382,090	\$39,240,750
Annual cost (\$/MWh)	31.81	34.99	34.87
Annual net benefit (\$)	\$51,516,880	\$46,944,490	\$47,085,830
Annual net benefit (\$/MWh)	43.90	41.72	41.84

^a The dependable capacity for each project was provided in the license applications.

^b The average annual generation was provided by SCE in table 7.1-6 of the amended PDEA.

Table 4-15 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 Big Creek Nos. 1 and 2 Project. In section 5.2, *Comprehensive Development and Recommended Alternative*, we discuss our reasons for recommending the proposed action with staff modifications, and explain why we conclude the environmental benefits are worth these costs.

Table 4-15. Summary of annual net benefits for the no-action, proposed action, and proposed action with staff modifications for the Big Creek Nos. 1 and 2 Project. (Source: Staff)

	No Action	Proposed Action	Proposed Action with Staff Modifications
Dependable capacity (MW) ^a	150	150	150
Value of dependable capacity (\$)	\$11,089,500	\$11,089,500	\$11,089,500
Generation (MWh) ^b	765,483	657,072	657,072
Value of generation (\$)	\$40,111,310	\$34,430,570	\$34,430,570
Annual power value (\$)	\$51,200,810	\$45,520,070	\$45,520,070
Annual power value (\$/MWh)	66.89	69.28	69.28
Annualized cost of operations and current environmental measures (\$)	\$12,973,290	\$12,973,290	\$12,973,290
Annualized cost of new environmental measures (\$)	\$0	\$1,630,810	\$1,549,110
Annual cost (\$)	\$12,973,290	\$14,604,100	\$14,520,520
Annual cost (\$/MWh)	16.95	22.23	22.10
Annual net benefit (\$)	\$38,227,520	\$30,915,980	\$30,999,550
Annual net benefit (\$/MWh)	49.94	47.05	47.18

^a The dependable capacity for each project was provided in the license applications.

^b The average annual generation was provided by SCE in table 7.1-6 of the amended PDEA.

Table 4-16 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 Mammoth Pool Project. In section 5.2, *Comprehensive Development and Recommended Alternative*, we discuss our reasons for recommending the proposed action with staff modifications, and explain why we conclude the environmental benefits are worth these costs.

Table 4-16. Summary of annual net benefits for the no-action, proposed action, and proposed action with staff modifications for the Mammoth Pool Project. (Source: Staff)

	No Action	Proposed Action	Proposed Action with Staff Modifications
Dependable capacity (MW) ^a	187	187	187
Value of dependable capacity (\$)	\$13,824,910	\$13,824,910	\$13,824,910
Generation (MWh) ^b	603,734	590,352	590,352
Value of generation (\$)	\$31,635,660	\$30,934,440	\$30,934,440
Annual power value (\$)	\$45,460,570	\$44,759,350	\$44,759,350
Annual power value (\$/MWh)	75.30	75.82	75.82
Annualized cost of operations and current environmental measures (\$)	\$8,520,220	\$8,520,220	\$8,520,220
Annualized cost of new environmental measures (\$)	\$0	\$2,143,690	\$2,105,270
Annual cost (\$)	\$8,520,220	\$10,663,910	\$10,623,260
Annual cost (\$/MWh)	14.11	18.06	17.99
Annual net benefit (\$)	\$36,940,350	\$34,095,440	\$34,136,090
Annual net benefit (\$/MWh)	61.19	57.76	57.83

^a The dependable capacity for each project was provided in the license applications.

^b The average annual generation was provided by SCE in table 7.1-6 of the amended PDEA.

Table 4-17 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 Big Creek No. 3 Project. In section 5.2, *Comprehensive Development and Recommended Alternative*, we discuss our reasons for recommending the proposed action with staff modifications, and explain why we conclude the environmental benefits are worth these costs.

Table 4-17. Summary of annual net benefits for the no-action, proposed action, and proposed action with staff modifications for the Big Creek No. 3 Project. (Source: Staff)

	No Action	Proposed Action	Proposed Action with Staff Modifications
Dependable capacity (MW) ^a	181.9	181.9	181.9
Value of dependable capacity (\$)	\$13,447,870	\$13,447,870	\$13,447,870
Generation (MWh)	824,081	804,240	804,240
Value of generation (\$) ^b	\$43,181,840	\$42,142,180	\$42,142,180
Annual power value (\$)	\$56,629,710	\$55,590,050	\$55,590,050
Annual power value (\$/MWh)	68.72	69.12	69.12
Annualized cost of current operations and environmental measures (\$)	\$11,757,710	\$11,757,710	\$11,757,710
Annualized cost of new environmental measures (\$)	\$0	\$788,790	\$785,830
Annual cost (\$)	\$11,757,710	\$12,546,500	\$12,543,540
Annual cost (\$/MWh)	14.27	15.60	15.60
Annual net benefit (\$)	\$44,872,000	\$43,048,440	\$43,041,610
Annual net benefit (\$/MWh)	54.45	53.52	53.52

^a The dependable capacity for each project was provided in the license applications.

^b The average annual generation was provided by SCE in table 7.1-6 of the amended PDEA.

4.4 OTHER ECONOMIC CONSIDERATIONS

In addition to the costs evaluated in sections 4.2, 4.3, and 4.4, SCE would incur costs associated with measures that are not part of a potential Commission license. Because the measures are not part of our recommended action, we do not account for them here.