

**SACRAMENTO MUNICIPAL UTILITY DISTRICT'S
UPPER AMERICAN RIVER PROJECT
(FERC NO. 2101)**

APPLICATION FOR NEW LICENSE

**EXHIBIT D
PROJECT ECONOMICS AND FINANCING**

Sacramento Municipal Utility District
Sacramento, California

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EXHIBIT D PROJECT ECONOMICS AND FINANCING

1.0 REGULATIONS DEFINING THE CONTENT OF EXHIBIT D

The Sacramento Municipal Utility District (SMUD) prepared Exhibit D as part of its application for a new license from the Federal Energy Regulatory Commission (FERC) for the Upper American River Project (UARP or project), FERC Project No. 2101. This exhibit is prepared in conformance with Title 18 of the Code of Federal Regulations (CFR), Subchapter B (Regulations Under the Federal Power Act), Part 4 (Licenses, Permits, Exemptions, and Determination of Project Costs), Subpart E (Application for License for Major Unconstructed Project and Major Modified Project). In particular, Exhibit D conforms to the regulations in 18 CFR §4.41(e), and provides information regarding cost and financing, as well as other information that SMUD believes would be useful when FERC evaluates project economics. As a reference, 18 CFR §4.41(e) states:

Exhibit D is a statement of project costs and financing. The exhibit must contain:

- (1) A statement of estimated costs of any new construction, modification, or repair, including:
 - (i) The cost of any land or water rights necessary to the development;
 - (ii) The total cost of all major project works;
 - (iii) Indirect construction costs such as costs of construction equipment, camps and commissaries;
 - (iv) Interest during construction; and
 - (v) Overhead, construction, legal expenses, and contingencies;
- (2) If any portion of the proposed project consists of previously constructed, unlicensed water power structures or facilities, a statement of the original cost of those structures or facilities specifying for each, to the extent possible, the actual or approximate total costs (approximate costs must be identified as such) of:
 - (i) Any land or water rights necessary to the existing project works;
 - (ii) All major project works; and
 - (iii) Any additions or modifications other than routine maintenance;
- (3) If the applicant is a licensee applying for a new license, and is not a municipality or a state, an estimate of the amount which would be payable if the project were to be taken over pursuant to Section 14 of the Federal Power Act, 16 U.S.C. 807, upon expiration of the license in effect including:
 - (i) Fair value;
 - (ii) Net investment; and
 - (iii) Severance damages;
- (4) A statement of the estimated average annual cost of the total project as proposed, specifying any projected changes in the costs (life-cycle costs) over the estimated financing or licensing period if the applicant takes such changes into account, including:
 - (i) Cost of capital (equity and debt);
 - (ii) Local, state, and Federal taxes;
 - (iii) Depreciation or amortization;
 - (iv) Operation and maintenance expenses, including interim replacements, insurance, administrative and general expenses, and contingencies;
 - (v) The estimated capital cost and estimated annual operation and maintenance expense of each proposed environmental measure.
- (5) A statement of the estimated annual value of project power, based on a showing of the contract price for sale of power or the estimated average annual cost of obtaining an equivalent amount of power (capacity and energy) from the lowest cost alternative source of power, specifying any projected changes in the cost (life-cycle costs) of power from that source over the estimated financing or licensing period if the applicant takes such changes into account.

- (6) A statement describing other electric energy alternatives, such as gas, oil, coal and nuclear-fueled power plants and other conventional and pumped-storage hydroelectric plants;
 - (7) A statement and evaluation of the consequences of denial of the license application and a brief perspective of what future use would be made of the proposed site if the proposed project were not constructed; and
 - (8) A statement specifying the sources and extent of financing and annual revenues available to the applicant to meet the costs identified in paragraphs (e) (1) and (4) of this specification.
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2.0 OVERVIEW

To provide the information required of 18 CFR §4.41(e), Exhibit D is structured as follows: Section 1 provides the regulations defining the content of Exhibit D; Section 2 provides an overview of the three alternatives considered in the exhibit and a rationale for the selection by SMUD of the Proposed Action; Section 3 provides a description of project costs, including costs of different elements of the alternatives (e.g., proposed construction, license application preparation, proposed environmental measures); Section 4 provides estimates of project power and value for each of the three alternatives considered; Section 5 describes other electrical energy alternatives; Section 6 discusses the cost related to takeover of the project; Section 7 describes the consequences of denial of a new license for the UARP; and Section 8 presents the sources of financing.

In developing the License Application for the UARP, three alternative actions were considered by SMUD for the next license term. Each of the three actions considered would affect project economics and environmental resources differently. A review of the three alternatives is provided below:

- No Action Alternative – Under this alternative, the UARP, as currently configured with no additional development, will continue to operate under the terms and conditions of the existing license. Continued operation of the UARP in this manner will not alter project economics or affect environmental resources with respect to their current conditions. The No Action Alternative represents project baseline conditions.
- UARP-only Alternative – Under this alternative, the UARP, as currently configured with no additional development, will operate under a new set of license terms and conditions, including a set of environmental measures designed to enhance and protect the existing environmental resources. Some of the new terms and conditions will alter project operations, while others will have only an economic effect on the project.
- Proposed Action – Under this preferred alternative, the current UARP configuration will be augmented with the addition of the Iowa Hill Development, which will commence operation in approximately 2015. The Proposed Action will include the environmental measures contained in the UARP-only Alternative, and will include additional environmental measures to ensure project expansion does not result in significant long-term environmental effects.

The Proposed Action significantly expands UARP capabilities to meet the needs of the SMUD service area. From a power generation value perspective, the No Action and UARP-only alternatives provide continued and essential power-related benefits to SMUD, but neither addresses many of the upcoming energy challenges SMUD and the Northern California region will face throughout the 50-year period of the next license term. In contrast, the Proposed Action expands power generation capability for the UARP. This expanded capability will play a pivotal role in meeting continued system reliability for the Sacramento regional electric market.

The Proposed Action will not only provide SMUD with 400 MW of additional local peaking capacity, which represents about six to seven years of SMUD's anticipated load growth, but it will also play a significant role in assisting SMUD to achieve its overall long-term strategic, reliability, and portfolio planning objectives by:

- (a) Meeting State public policy objectives and energy challenges in the Northern California region;
- (b) More comprehensively developing the waterway by expanding project capabilities without a significant impact on the environment;
- (c) Producing significant local generation in the Sacramento region to maintain system reliability as well as alleviate anticipated voltage and transmission constraints during peak-demand periods;
- (d) Aiding management of greatly increased minute-by-minute load balancing and control area challenges presented by wind and other non-dispatchable generation technologies that are needed to meet SMUD's renewable portfolio standards;
- (e) Shifting energy from low-demand to significantly more valuable peak-demand periods when appropriate;
- (f) Reducing emission burdens by displacing the need for additional thermal peaking power plants in the Sacramento region, which is a non-attainment area; and
- (g) Providing generation diversity within SMUD's resource portfolio.

SMUD anticipates the peak demand of its customer-owners will continue to grow at an annual rate of about two percent, which is around 60 MW. This means SMUD must plan for periodic and sizeable generating and/or transmission resource additions to ensure there will be adequate energy to meet needs, including reserves to meet continued system reliability. Because the Sacramento regional area has an existing transmission configuration that limits physical power importation to 2,100 MW, the balance of the increasing load must be provided from local generating resources. This physical need exists regardless of potential changes to SMUD's status as a control area over the next license term. The Proposed Action will play an important role in helping to meet these needs.

The Iowa Hill Development will also provide an indirect benefit related to SMUD's strategic objective of providing 20 percent of its energy from renewable generating resources by 2011. To achieve this goal, SMUD is actively pursuing renewable generating resources from various technologies such as wind, geothermal, solar, and biomass to supplement its long-term renewable resource portfolio. While these resources have many positive attributes, they can frequently present system reliability planning and operational challenges. For example, wind

turbines generate power only when the wind blows, which frequently happens during non-peak seasons and non-peak hours within the day. During these periods, SMUD, like other California utilities, could likely experience what is referred to as a “minimum load condition”, where power produced by must-run generating facilities exceeds the actual power demand, i.e., supply exceeds demand. Thus, the potential addition of wind and other non-dispatchable renewable power to the grid can exacerbate existing challenges facing California utilities during minimum load conditions. The Iowa Hill Development will help overcome these challenges by enabling SMUD system operators to pump water during these minimum load conditions, thereby helping absorb a significant amount of the surplus power generated by must-run facilities and/or wind turbines. Because power prices are typically lower than normal during minimum load conditions, the Iowa Hill Development is expected to provide SMUD with an economic opportunity to off-set its annual costs by utilizing the low-priced power during minimum load conditions, then generate power during higher price super-peak periods. Such an economic opportunity, however, does not exist for a gas-fired peaking plant.

Because the Sacramento Metropolitan Air Quality Management District is an air quality non-attainment area for both ozone and PM₁₀, the development of thermal power facilities is severely restricted. SMUD cannot easily construct new thermal peaking plants beyond existing locally-permitted projects due to the limited availability of emissions offset credits. In addition, constructing new transmission lines to bring in more power to the Sacramento region is beset with siting and environmental constraints. With the Proposed Action, the Iowa Hill Development will provide needed local generation to support system reliability while reducing air emission burdens by displacing the need for additional thermal peaking power plants in the Sacramento region.

The Proposed Action dovetails with many of California’s mandated long-term energy policy objectives. For example, several state entities, including the California Energy Commission, the California Public Utilities Commission, and the California Independent System Operator have determined that additional generating capacity is needed to meet California’s growing summer peak energy demand. Moreover, these same entities and the California Legislature have declared it is in the public interest of the state to ensure, to the maximum extent possible, additional generating capacity incorporates renewable, non-fossil fuel based projects. The Proposed Action, with Iowa Hill Development’s ability to convert intermittent wind energy into future hydroelectric energy, alleviates this operational challenge and supports both of these publicly adopted objectives. The development would therefore enable more wind and other non-dispatchable renewable resources to be developed, thereby contributing to more diverse, less fossil fuel-reliant resources in the Sacramento region as well as Northern California in the long-term.

Not only does the Proposed Action help SMUD and Northern California achieve multiple long-term strategic, reliability and portfolio planning objectives, it also provides positive average annual net economic benefits to SMUD, when compared to the UARP-only and No Action alternatives. Throughout this exhibit, SMUD utilizes the FERC’s current cost valuation approach by applying 2004 historic market pricing information whenever possible. Using this approach, the Proposed Action, when compared to the No Action Alternative (baseline), will

result in an increase of \$8.2 million in long-term average annual net benefits Table D2.0-1. This increase in annual benefits, however, will not accrue until approximately 2015, when the \$474 million Iowa Hill Development is expected to commence operations. From license issuance (assumed to be 2007) and 2015, the UARP will operate under the UARP-only alternative, which compared to baseline will result in a decrease of \$3.0 million in annual net benefits or a 3.5 percent decrease in project value. This reduction is due to both flow and non-flow-related environmental measures of the UARP-only alternative (primarily the proposed reservoir minimum release schedule), which are also include in the Proposed Action. The change in 2015 from the UARP-only Alternative to the Proposed Action will result in an increase in annual net value of \$11.2 million.

Table D2.0-1. Comparison of long-term average annual net benefits of SMUD’s Proposed Action to the UARP-only and No Action Alternatives (2004 Dollars).

	Proposed Action	UARP-only Alternative	No Action Alternative
Total Gross Benefits (see Table D4.2-1)	\$162,600,000	\$121,100,000	\$123,100,000
Costs (see Table D3.5-1)	\$68,200,000	\$37,900,000	\$36,900,000
Long-term Average Annual Net Benefit (Table D4.2-1)	\$94,400,000	\$83,200,000	\$86,200,000

3.0 PROJECT COSTS

As provided for in 18 CFR §4.41(g)(2), the description of the Iowa Hill Development facilities and features, and the construction schedule are conceptual in nature. The cost of this development is based on this conceptual understanding and may be modified in the future.

All costs in this Exhibit D are provided in 2004 U.S. dollars unless otherwise specified. All analyses in this exhibit are predicated on a new license with a 50-year term.

3.1 Cost of Original UARP

The UARP was originally licensed in 1957. Because this is not an application for original license, detailed statements of the actual or approximate original cost of the original project are not provided.

3.2 Cost of Previously Constructed, Unlicensed Facilities

The project does not include any previously constructed, unlicensed water power structures, or facilities.

3.3 Cost of New Construction, Modifications and Repairs for Proposed Action

SMUD's Proposed Action, as described in Exhibit A of the License Application, includes construction costs related to the proposed Iowa Hill Development as shown below (Table D3.3.1-1) and costs related to implementation of environmental measures (Table D3.3.2-1).

3.3.1 Costs Related to Construction of Iowa Hill Development

In developing the conceptual design of the Iowa Hill Development, SMUD planners utilized, to the greatest extent possible, existing UARP infrastructure to minimize costs and reduce local environmental effects. For example, the proposed development utilizes the existing UARP Slab Creek Reservoir as a lower reservoir and the existing UARP transmission lines to supply energy, capacity and related ancillary services, and voltage support from the facility to the Sacramento region. SMUD estimates the Iowa Hill Development construction cost including contingencies would total about \$474 million (2004 dollars) (Table D3.3.1-1).

Mobilization and water handling	\$2,000
Permanent Access Roads	\$1,650
Upper Reservoir	\$68,000
Waterways and Intakes	\$57,000
Powerhouse and Access Tunnels	\$65,500
Equipment (installed)	\$121,300
Transmission Line	\$11,000
Subtotal	\$326,450
Civil contingency (25% of lines 1-5 & 7)	\$51,300
Equipment Contingency (10% of line 6)	\$12,130
Licensing, SMUD project management and Geotechnical Exploration	\$55,250
Interest During Construction (4.1% annually for 4 years)	\$18,700
Sales Tax on Equipment (El Dorado County rate: 7.25%)	\$9,700
Total Construction Cost with Contingencies	\$473,530

The Iowa Hill Development will expand the UARP FERC Project Boundary by about 283 acres. Of this, 185 acres are lands of the United States managed by the Eldorado National Forest (ENF), 78 acres are owned by SMUD, and 20 acres are owned by Sierra Pacific Industries (SPI). SMUD will obtain an easement or purchase the SPI lands because of the relatively small amount of land involved, the cost of these actions are considered minimal for the purposes of this analysis. A special use permit will also be secured from the ENF.

At present, SMUD does not expect the addition of the Iowa Hill Development to result in substantial costs associated with modifying SMUD's UARP water rights. The development will require a modification of water rights to include a new places of diversion and use and storage, if necessary. Costs for these modifications are anticipated to be no more than the application fee charged by the SWRCB, currently capped at \$120,000 for hydro related water rights. This fee is included within the proposed construction budget.

Indirect costs associated with construction (construction equipment, etc.), engineering and design, overhead, and legal services are included in the total construction cost, with contingencies. SMUD assumes interest during construction will accrue at a 4.1 percent annual percentage rate on the outstanding balance at the end of each month. Based on this assumption, SMUD estimates the total interest during the 4- to 5-year-long Iowa Hill Development construction period will be \$18.7 million. Sales taxes on equipment purchases assume the El Dorado County rate of 7.25 percent. The cost of equipment purchases (including contingencies) subject to sales tax is estimated to be \$133.4 million, which will result in sales taxes of \$9.7 million.

3.3.2 Costs Related to Non-Flow Environmental Measures of Proposed Action

SMUD will expend an annual average of approximately \$1 million in capital and ongoing annual costs related to implementation of non-flow related environmental measures of the Proposed Action. A detailed description of these measures is included in the Preliminary Draft Environmental Assessment of the License Application. These costs are outlined in Table D3.3.2-1.

Table D3.3.2-1. Estimated average annual costs for Proposed Action non-flow related environmental measures, in 2004 Dollars.			
Proposed Environmental Measure	Capital & One-time Costs	Annual Costs, Including O&M	Average Annual Cost
	2004 Dollars	2004 Dollars	2004 Dollars
WATER RESOURCES			
1. Determine water year type each year based on unimpaired flows into Folsom Reservoir. Provide 5-year record to FERC annually. Once every 5 years, recalculate median and, if more than 5% difference, advise FERC of any recommended modifications to water year types.	\$0	\$5,000	\$5,000
2. Implement plan to pass wood at project reservoirs, except for Brush Creek, Gerle Creek and Iowa Hill reservoirs.	\$20,000	\$100,000	\$100,400
3. Develop and implement study plan to investigate value and need for pulse flows from Loon Lake Dam to decrease fine sediment accumulation and maintain stream geomorphic processes in upper portion of reach.	\$120,000	\$0 ^a	\$2,400
4. Install continuous water temperature monitor at downstream end of Ice House Dam Reach, and monitor. Increase minimum flow release from Ice House Dam if mean daily water temperature exceeds 20 °C for 3 consecutive days.	\$100,000	\$5,000	\$7,000

Table D3.3.2-1. Estimated average annual costs for Proposed Action non-flow related environmental measures, in 2004 Dollars.			
Proposed Environmental Measure	Capital & One-time Costs	Annual Costs, Including O&M	Average Annual Cost
	2004 Dollars	2004 Dollars	2004 Dollars
5. Develop and implement an Erosion and Sedimentation Control Plan for construction of Iowa Hill Development.	\$10,000	\$0 ^a	\$200
6. Develop with Chili Bar Project licensee a Coordinated Operations Plan, and implement plan.	\$30,000	\$10,000	\$10,600
7. Develop and implement a Storm Water Pollution Prevention Plan for construction of Iowa Hill Development.	\$10,000	\$0 ^a	\$200
Subtotal	\$290,000	\$120,000	\$125,800
AQUATIC RESOURCES			
8. Implement daily minimum reservoir release schedule, and provide compliance documentation to FERC annually.	\$0	\$5,000	\$5,000
Subtotal	\$0	\$5,000	\$5,000
BOTANICAL & WILDLIFE RESOURCES			
9. Implement protection and enhancement measures for special-status species (Annual Employee Environmental Awareness Program).	\$10,000	\$20,000	\$20,200
10. Conduct annual review of special-status species lists, and prepare study plan and perform study, if necessary.	\$0	\$7,000 ^b	\$7,000
11. Develop and implement Vegetation Management Plan for ENF lands.	\$40,000	\$3,000	\$3,800
12. Develop and implement Invasive Weed Management Plan for ENF lands.	\$10,000	\$55,000	\$55,200
13. Develop and implement a Re-vegetation Plan and Noxious Weeds Management Plan for construction of the Iowa Hill Development.	\$130,000	\$0 ^a	\$2,600
14. Develop and implement a Wildlife Protection Plan for construction of the Iowa Hill Development.	\$130,000	\$0 ^a	\$2,600
Subtotal	\$320,000	\$85,000	\$91,400
CULTURAL RESOURCES			
15. Implement Historic Properties Management Plan.	\$0	\$20,000	\$20,000
Subtotal	\$0	\$20,000	\$20,000

Table D3.3.2-1. Estimated average annual costs for Proposed Action non-flow related environmental measures, in 2004 Dollars.			
Proposed Environmental Measure	Capital & One-time Costs	Annual Costs, Including O&M	Average Annual Cost
	2004 Dollars	2004 Dollars	2004 Dollars
RECREATIONAL RESOURCES			
16. Implement the Recreation Plan. The plan would include the development of a Recreation Facility Reconstruction and New Construction Schedule, funding up to \$1,000,000 every four years for facility construction; reimbursing the ENF for engineering, design, etc up to five percent of the total construction cost; and annually contributing to the ENF up to \$211,000 for facility O&M and for administration of recreation within the FERC Project boundary.	\$25,000	\$486,000	\$486,500
17. Maintain Ice House, Loon Lake and Union Valley reservoir water surface elevations as high as possible, consistent with power generation needs, from June 1 through Labor Day weekend, and assure at least one boat launch is useable from June 1 through Labor Day weekend.	\$0	\$0	\$0
18. Maintain Rubicon and Buck Island reservoir water surface elevations as high as possible from June 1 through September 30.	\$0	\$0	\$0
19. In Wet and Above Normal water years, in September after Labor Day provide 3 consecutive weekends of 400 cfs flow from Ice House Dam for whitewater boating.	\$0	\$5,000	\$5,000
Subtotal	\$25,000	\$491,000	\$491,500
VISUAL RESOURCES			
20. Develop and implement a Visual Resource Protection Plan for construction of the Iowa Hill Development.	\$20,000	\$0 ^a	\$400
Subtotal	\$20,000	\$0	\$400
LAND USE & SOCIOECONOMIC			
21. Implement the Road Maintenance Plan for roads on ENF lands.	\$0	\$250,000	\$250,000
22. Develop and implement a Fire Risk and Protection Plan for construction of the Iowa Hill Development.	\$15,000	\$0 ^a	\$300
23. Develop and implement a Noise Attenuation Plan for construction of the Iowa Hill Development.	\$15,000	\$0 ^a	\$300

Table D3.3.2-1. Estimated average annual costs for Proposed Action non-flow related environmental measures, in 2004 Dollars.			
Proposed Environmental Measure	Capital & One-time Costs	Annual Costs, Including O&M	Average Annual Cost
	2004 Dollars	2004 Dollars	2004 Dollars
24. Develop and implement a Transportation Management Plan for construction of the Iowa Hill Development.	\$15,000	\$0 ^a	\$300
Subtotal	\$45,000	\$250,000	\$250,900
AIR QUALITY RESOURCES			
25. Develop and implement a Dust and Exhaust Emissions Abatement Plan for construction of the Iowa Hill Development.	\$15,000	\$0 ^a	\$300
Subtotal	\$15,000	\$0	\$300
Total	\$715,000	\$971,000	\$985,300

^a Annual costs associated with this measure are unknown at this time since the study has not been performed or the plan has not been developed.

^b Annual costs associated with performing periodic studies for plant species added to special-status species lists unknown since species unknown at this time. SMUD assumed \$350,000 in total over the course of the license.

The total annual cost of implementing the non-flow environmental measures of the Proposed Action is \$985,300. Under the UARP-only Alternative this total cost is reduced by \$7,200 to \$978,100.

3.4 Costs to Prepare License Application

Under the new regulations promulgated by the FERC, 104 FERC ¶ 61,109, which became effective on October 23, 2003, Exhibit D of the license application must identify the costs to prepare the license application. The \$24 million relicensing cost figure reflects SMUD's internal administrative costs, expenditures on outside consultants, including the cost to complete studies, and the cost for the pre-filing consultation process with the stakeholders through June 2005 (Table D3.4-1). The costs do not include any estimated cost to complete the licensing process (post-filing, pre-license issuance) or implementation of license conditions.

Table D3.4-1. Summary of costs to prepare license application, in 2004 Dollars.	
Item	Expenditure
Study Costs	\$ 7,500,000
Project Information System	\$ 2,000,000
SMUD Labor	\$ 5,600,000
Consulting and Administration	\$ 7,150,000
Iowa Hill Development Costs (studies, consulting, admin.)	\$ 1,750,000
Total Cost (through June 2005)	\$ 24,000,000

3.5 Average Annual Project Cost

Total average annual project costs of \$68.2 million for the Proposed Action and the other alternatives are detailed below.

	Proposed Action	UARP-only Alternative	No Action Alternative
Item			
Interest Expense ^{a, b}	\$19,200,000	\$6,400,000	\$6,400,000
Equity ^{a, b}	\$7,300,000	\$2,400,000	\$2,400,000
Depreciation Expense ^{c, d}	\$14,900,000	\$6,100,000	\$6,100,000
Fixed O&M ^{e, f}	\$11,500,000	\$9,800,000	\$9,800,000
Administrative and General	\$5,900,000	\$5,100,000	\$5,100,000
Insurance	\$2,300,000	\$1,700,000	\$1,700,000
Capital Investments ^g	\$4,600,000	\$3,900,000	\$3,900,000
License Application Costs ^h	\$1,500,000	\$1,500,000	\$1,500,000
Non-flow-related environmental measures (Table D3.3.2-1)	\$1,000,000	\$1,000,000	0
Total	\$68,200,000	\$37,900,000	\$36,900,000

^a UARP: Assumes 80/20 debt/equity ratio; \$182M UARP book value; 4.4% Weighted average debt rate. 6.6 % equity return

^b Iowa Hill: 30 year levelized interest expense. Assumes 80/20 debt/equity ratio; \$474M Iowa Hill cost; 4.65% marginal cost of debt; 6.6% equity return

^c 2004 Depreciation expense - (UARP)

^d Straight Line depreciation based on Class of asset (Iowa Hill)

^e UARP 2004 Operation and Maintenance expenses less A&G

^f 2001 FERC Form 1 survey of pumped-storage projects less A&G (Iowa Hill)

^g Replacement and upgrade costs are estimated at 40 percent of O&M cost based on 40 year UARP operating history.

^h Licensing costs per Table D3.4-1 amortized over 50 years at six percent cost of capital.

4.0 VALUE OF PROJECT POWER

In this section, the amount and value of power produced under each of the three alternatives is described and tabulated. With the No Action Alternative serving as the baseline, the relative value of the Proposed Action and UARP-only Alternative are compared. In addition, the resulting generation and value losses due to SMUD's proposed flow-related environmental measures for the various alternatives are also discussed.

As discussed previously, SMUD utilizes FERC's current cost valuation approach by applying 2004 historic market pricing information whenever possible. This valuation approach enables SMUD to focus on the long-term average annual costs and benefits brought forth by the

proposed Iowa Hill Development as part of the Proposed Action, although this development will not be available until approximately 2015. Furthermore, the approach to this analysis focuses primarily on two important and quantifiable aspects of project valuation: capacity and power generation.

By applying this current cost valuation approach, SMUD concludes that in addition to the estimated \$1 million annual contribution towards the cost related to the environmental measures for the Proposed Action (see Table D3.3.2-1), the flow-related environmental measures proposed by SMUD for the Proposed Action will result in 41,000 MWh of generation loss, valued at \$ 2.0 million (see Table D4.2-1). Together, the proposed environmental measures presented in the PDEA represent a \$3.0 million or 3.5 percent of UARP long-term annual project value loss to SMUD, although annual generation losses could fluctuate significantly from year to year due to varying hydrologic conditions.

Because the Northern California power market is expected to remain highly uncertain and volatile, long-term reliability and portfolio planning continues to be a challenge. While the current cost approach provides a reasonable snapshot of the relative value of various alternatives, valuations will be subject to change based upon market, regulatory and/or legislative conditions.

4.1 Valuation Assumptions and Methodology

The value of UARP power under any of the three alternatives is a function of capacity and energy. Accordingly, this section is divided into two subsections: Capacity and Energy Generation. The first subsection discusses assumptions, and supporting rationale used by SMUD to determine the value of capacity credit for each of the alternatives. The second subsection discusses the amount of long-term average annual energy generated by each of the alternatives.

4.1.1 Capacity

In both the No Action and UARP-only alternatives, the maximum capacity provided by the UARP is 688 MW. However, due to water limitations inherent in hydroelectric projects like the UARP, full capacity is not achievable every hour during the year. The capacity of the UARP can be separated into two basic components. The first component is represented by average capacity, in MW, that can be typically generated throughout the year. This component is functionally equivalent, but not identical, to the capacity of a gas-fired, combined-cycle power plant. Because the benefit of average capacity is realized to a large degree in the form of a firm energy benefit, it is not included in capacity valuation calculations summarized in Table D4.2-1. The second component of capacity is the power generation capability of the UARP above the average capacity. Depending upon the need, the UARP has the capability to generate any level of additional power above the average capacity up to a maximum capacity of 688 MW. The maximum additional power capability of the UARP is referred to as the maximum unloaded capacity. The maximum unloaded capacity determines the capacity benefits summarized in Table D4.2-1.

The amount of maximum unloaded capacity at the UARP was determined by computing the estimated average capacity then subtracting it from the overall capacity of 688 MW. Averaging

annual generation over on-peak hours yields an average capacity of approximately 288 MW. SMUD has retained its flexibility in managing water in the storage reservoirs, including an ability to instantaneously generate power at the UARP to its full 688 MW capability, should the power need arise at any given time. As a result, the difference between the 688 MW of maximum capacity and the 288 MW of average capacity, or 400 MW, is considered fully available as the maximum unloaded capacity. However, any constraints placed on water level management at the three storage reservoirs that limit SMUD's capability to instantaneous utilize the full 400 MW may significantly decrease the value of the capacity determined in this analysis. The three alternatives considered in this exhibit pose no such constraints.

The 400 MW of maximum unloaded capacity can be used to provide a multitude of capacity and related ancillary services, including: 1) peaking capacity on a hot summer day; 2) minute-by-minute load balancing; 3) reserve capacity to serve load during unforeseen long-term unavailability of generation or extreme weather; and/or 4) emergency services during situations such as sudden unanticipated large generation and/or transmission outages. Under the Proposed Action, the Iowa Hill Development will provide an additional 400 MW of capacity needed for SMUD's growing summer peak loads and increasing energy balancing needs. Thus, the 400 MW of maximum unloaded capacity from the UARP, plus the 400 MW of Iowa Hill Development, yields 800 MW of unloaded capacity benefits for the Proposed Action.

Because of the existing transmission system configuration in the SMUD service area, one viable alternative source of power to the Iowa Hill Development is the construction of a new local 400 MW peaking plant within the Sacramento region. A \$75.1/kW-yr capacity value is utilized as an avoided-cost proxy for the amortized capital cost, local voltage control, and fixed O&M costs of new simple cycle natural gas-fired generation (see Exhibit H of the License Application for details).

For the No Action and UARP-only alternatives, this same avoided-cost assumption of \$75.1/kW-yr is utilized to value the 400 MW of unload capacity. The remaining 288 MW of average capacity is not converted to a capacity benefit value, as the benefits of this average capacity are, for the most part, already embedded in the NP15 daily price index used to compute the energy benefits.

4.1.2 Energy Generation

Based on the output of the CHEOPS Water Balance Model, the average annual gross energy generation for the Proposed Action is estimated to be 2,779,000 MWh (Table D4.1.2-1). Of this value, 2,222,000 MWh will be generated on-peak and 557,000 MWh will be generated off-peak. The estimated average annual energy generation of the UARP-only Alternative totals 1,794,000 MWh, of which 1,261,000 MWh is on-peak and 533,000 MWh is off-peak. This compares to 1,835,000 MWh for the No Action Alternative, of which 1,287,000 MWh is on-peak and 548,000 MWh is off peak. Thus, the Iowa Hill Development is expected to provide 961,000 MWh of super-peak generation and 24,000 MWh of off-peak generation, over and above the UARP-only Alternative.

Because the 961,000 MWh average annual on-peak generation increase in the Proposed Action represents 400 MW of generation for about half of all on-peak hours available during a given year, it confirms these on-peak generation could occur operationally during the eight most valuable on-peak hours, the so-called super-peak hours during any given day. The small increase in off-peak energy of 24,000 MWh is assumed to be attributable to minor re-operations of the UARP system. It is important to note the 2,779,000 MWh represent a gross generation of the Proposed Action only, as practically all the energy required for pumping at the Iowa Hill Development has not been included. Long-term average annual pumping load of 1,246,000 MWh, expected to occur typically during the lowest cost off-peak hours, is necessary to fill the Iowa Hill Reservoir in order to support the 961,000 MWh of generation during the super-peak hours.

Table D4.1.2-1. Proposed Action long-term average annual energy generation (MWh) during on-peak and off-peak periods, separated by UARP facilities and the Iowa Hill Development.			
	Proposed Action	UARP-only Alternative	No Action Alternative
Super-Peak Generation²	961,000		
On-Peak Generation¹	1,261,000	1,261,000	1,287,000
Off-Peak Generation¹	557,000	533,000	548,000
Total Gross Generation³	2,779,000	1,794,000	1,835,000
Pumping Load	-1,246,000		

¹ On-peak and off-peak periods correspond to the standard WECC definitions.

² Super-Peak period represents the highest-cost 8 hours of the standard WECC On-peak hours

³ 1,246,000 MWh estimated to be required for pumping at the Iowa Hill Development is not included in this line item.

In valuing energy for the existing UARP, SMUD utilized the published 2004 Dow Jones NP15 daily Electricity Price Index to value on-peak and off-peak energy generated from the UARP. The annual averages of the daily price indexes for 2004 were calculated to be \$54.5/MWh and \$42.0/MWh, respectively, for the on-peak and the off-peak periods. The definitions of on-peak and off-peak generation used are consistent with those defined by the WECC.

For the proposed Iowa Hill Development, SMUD utilized the published 2004 Dow Jones NP15 Off-Peak daily Electricity Price Index in determining the off-peak pumping cost. Due to the limited number of generating hours (as compared to pumping operations) during a typical day, SMUD intends to generate, when appropriate, during the most valuable eight on-peak, or “super-peak”, hours. To derive the valuation for the energy generated during these super-peak hours, SMUD utilized the historical California Power Exchange hourly pricing data shape, for the period April 1998 through April 2000, to determine a price adjustment factor that can be applied to the standard 16-hour on-peak daily price index. This methodology yields a 120% price adjustment factor to the 16-hour on-peak daily price index for the super-peak energy. This adjusted on-peak price was then applied to all of the anticipated 961,000 MWh of energy generated from the proposed Iowa Hill Development.

4.2 Comparison of Alternatives

Table D4.2-1 compares the total value, annual costs, and net benefits of SMUD’s Proposed Action, the UARP-only Alternative and the No Action Alternative.

Table D4.2-1. Comparison of long-term average annual net benefits of SMUD's Proposed Action, the UARP-only Alternative, and the No Action Alternative (2004 Dollars).			
	Proposed Action	UARP-only Alternative	No Action Alternative
CAPACITY			
Installed Capacity - MW	1,088	688	688
Average Capacity – MW ¹	288	288	288
Unloaded Capacity – MW ¹	800	400	400
Capacity Benefits	\$60,000,000	\$30,000,000	\$30,000,000
Total 2004 Dollars	\$60,000,000	\$30,000,000	\$30,000,000
ENERGY			
Annual Generation - MWh	2,779,000	1,794,000	1,835,000
Super-Peak ²	961,000	0	0
On-Peak	1,261,000	1,261,000	1,287,000
Off-Peak	557,000	533,000	548,000
Pumping	-1,246,000	0	0
Energy Benefits			
Super-Peak Energy-Iowa Hill ²	\$62,800,000	\$0	\$0
On-Peak Energy-UARP	\$68,700,000	\$68,700,000	\$70,100,000
Off-Peak Energy	\$23,400,000	\$22,400,000	\$23,000,000
Pumping Costs	-\$52,300,000	\$0	\$0
Total 2004 Dollars	\$102,600,000	\$91,100,000	\$93,100,000
TOTAL GROSS BENEFITS	\$162,600,000	\$121,100,000	\$123,100,000
COST			
Average Annual Cost			
Non-Environmental (Table D3.5-1)	\$67,200,000	\$36,900,000	\$36,900,000
Environmental (Table D3.3.2-1)	\$1,000,000	\$1,000,000	\$0
Total 2004 Dollars	\$68,200,000	\$37,900,000	\$36,900,000
LONG-TERM ANNUAL AVERAGE NET BENEFITS			
Total 2004 Dollars	\$94,400,000	\$83,200,000	\$86,200,000

¹ The \$75.1/kW-yr capacity value assumes local construction of a peaking power plant with a new high-pressure gas pipeline; but would require no additional 230kV transmission interconnection. See Section 4.1.1 – Capacity. This capacity value is applied to the unloaded capacity only.

² This value assumes that the 961,000 MWh of annual average super-peak generation is priced 20% higher than the annual average on-peak generation. See Section 4.1.2 – Energy Generation.

Over the course of the next 50-year license term, implementation of the Proposed Action will occur in two steps. The first is the period between license issuance in 2007 to the commencement of Iowa Hill Development operations in 2015. In this 8-year time period, the UARP will operate under the terms of the UARP-only Alternative. In the subsequent 42-year

period, the second step of implementation, the UARP will operate under the terms of the Proposed Action.

The environmental measures of the UARP-only Alternative would result in a \$3.0 million loss of long-term annual net benefit for the UARP compared to the No Action baseline, a 3.5 percent loss in value. This includes project value losses associated with reduced energy output from flow-related environmental measures as well as the cost of implementing non-flow-related environmental measures. There are no differences between baseline and the UARP-only Alternative in terms of the value of the capacity. The \$3.0 million loss in generation will extend, as described above, until 2015, when \$474 million the Iowa Hill Development commences operation. When that occurs, the net long-term annual benefit of the UARP will increase by \$11.2 million above the UARP-only Alternative. This increase is due to a variety of power generation and economic factors shown in Table 4.2-1. The reduction in power generation at the existing UARP facilities (non-Iowa Hill) will continue through this second period but capacity and capacity value will increase. The Iowa Hill Development will incur pumping costs but, in turn, provide super-peak energy value. In the long-term, with all these factors in play, the Proposed Action will result in an increase of \$8.2 million in long-term average annual net benefits compared to baseline.

In summary, the reliability, economic, and operational values of the Iowa Hill Development lie not in the change in net power output, but rather, in the timing of the power generation and in the avoided cost of other reliability services it provides, specifically capacity-based benefits. For the most part, the energy produced by the Iowa Hill Development is expected to be super-peak power, which has a significantly higher value than off-peak pumping power cost. Increases in the value of the Iowa Hill component of the Proposed Action factor into the overall, long-term net annual benefit after all costs, including contingencies, are considered. Moreover, the Iowa Hill Development will provide other ancillary benefits less easily quantifiable, such as those described earlier in this Exhibit (e.g., voltage support, management of non-dispatchable resources).

5.0 OTHER ELECTRICAL ENERGY ALTERNATIVES

Alternative future sources of electricity available to SMUD are limited primarily to gas-fired powerplants and renewable resource facilities based on wind, solar, or biomass. To meet energy and capacity needs of our customer-owners, SMUD currently relies on a resource mix including SMUD/JPA owned generation, long-term contracts and short-term market purchases. SMUD-owned generation resources include natural gas-fired generation, hydroelectric generation, and renewable energy. By 2007, almost half of SMUD's annual energy needs are expected to come from the new natural gas-fired Cosumnes Powerhouse and JPA cogeneration facilities. The second largest resource will be long-term power contracts, contributing up to 22 percent of SMUD's needs. Hydroelectric generation from the UARP will constitute up to 16 percent of the resource mix, while renewable resources are expected to represent an additional 12 percent. The final category is short-term market purchases, which will represent two percent. A more detailed

discussion of the role of these alternative sources of power is presented in Exhibit H of this License Application.

There are essentially no alternative sites in the central Sierra Nevada for the construction of new conventional hydroelectric facilities the size of the UARP. SMUD has examined a total of 158 sites/configurations for the construction of pumped-storage facilities and found Iowa Hill to be the most viable alternative. A more complete description of the alternative sites is included in Exhibit B of this License Application. Given the current state of technology, the primary source of future power is natural gas-fired simple-cycle and combined-cycle power plants. However, as described in Section 2.0, construction of new gas-fired combustion turbines to meet SMUD needs is constrained by air quality and siting issues.

6.0 COST OF TAKEOVER PURSUANT TO SECTION 14 OF THE FEDERAL POWER ACT

SMUD is a municipal utility, established under the laws of the State of California, within the meaning of Section 3(7) of the Federal Power Act. Because SMUD is a state subdivision, the project is not subject to the takeover provisions of Section 14 of the Federal Power Act (16 U.S.C. §807). Accordingly, FERC's regulations do not require SMUD to include an estimate of takeover costs or net investments.

7.0 CONSEQUENCES OF DENIAL OF NEW LICENSE

If SMUD were denied a new license for the UARP, including a denial for the construction of the Iowa Hill Pumped-storage Development, there would be both near- and long-term consequences. In the near term, the complete loss of 688 MW of capacity and 1,835,000 MWh of generation would have a substantial impact on SMUD's ability to provide reliable electric services to our customer-owners. There are no short-term viable options for alternative sources of power to replace the UARP. The existing Sacramento regional transmission configuration limits physical power importation to the SMUD control area to approximately 2,100 MW. This import capability has been and will continue to be fully utilized to reliably meet SMUD customer load. As local generation from the UARP provides voltage support to the existing transmission configuration, the loss of the UARP would further exacerbate the import limitations. Losing the capability to generate up to 688 MW at the UARP would also result in insufficient capacity to fully meet SMUD's current system reliability standards for the summer peak load. Thus, in the near-term, without the UARP in operation, SMUD would be unable to meet its customer demand until a viable alternative was secured.

For the longer term, SMUD would be required to build and/or secure 688 MW of capacity to replace the existing UARP resource. Given the current state of technology, new natural gas-fired simple-cycle capacity and combined-cycle capacity have been and will continue to be the respective primary sources of new peaking and baseload generation in California for the foreseeable future. Therefore, the most likely long-term alternative would be to replace existing UARP capacity and generation with a 400 MW gas-fired simple-cycle peaking plant and a 300 MW gas-fired combined-cycle plant. If construction of the Iowa Hill Development was similarly denied, SMUD would have to replace the facility by building a second 400 MW gas-fired

simple-cycle peaking plant. There are a number of challenges and costs inherent in building these new facilities, including air quality constraints associated with building local power plants within the Sacramento Metropolitan Air Quality District, and cost and siting constraints of building new 230 kV and/or 500 kV transmission interconnection facilities to wheel power from plants built outside the SMUD control area. These options are described in greater detail in Exhibit H of this License Application.

7.1 Alternative Uses of the Proposed Iowa Hill Development Site

The site of the proposed Iowa Hill Development is wooded, and most of the land on which the development will occur is owned by SMUD. The land within the proposed Iowa Hill Development FERC Project Boundary is about 283 acres. Of this, 185 acres are lands of the United States managed by the ENF, 78 acres are owned by SMUD, and 20 acres are owned by SPI. If the Iowa Hill Development is not constructed, the SMUD-owned land would likely remain in its current condition. The ENF-owned land will likely be managed primarily for wildlife habitat and timber harvest, while the SPI-owned land will likely be managed for timber harvest.

8.0 SOURCES OF FINANCING

Annual financing for the existing UARP is provided through issuance of revenue-backed bonds. SMUD does not issue project-specific debt for the UARP. While this practice is likely to be continued for the Iowa Hill Development no this decision has not been made in this regard as of the filing of the License Application.