# 4.0 DEVELOPMENTAL ANALYSIS

In this section, we analyze the project's use of the available water resources to generate hydropower, estimate the economic benefits of the project, estimate the cost of various environmental enhancement measures and operational changes, and assess the effects of these measures on project operations. Idaho Power does not propose any modifications to the project generation facilities, but it does propose numerous environmental measures that would affect project costs.

## 4.1 BASIS FOR POWER, COSTS AND ECONOMIC BENEFITS OF THE PROJECT

The main purpose of the Hells Canyon Project is to provide power for Idaho Power's customers. Idaho Power has studied the existing project facilities, operation, and utilization of flows and concludes that the project, as proposed, would be developed to its optimal capacity.

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.

To determine the value of project power benefits, we assumed the value of generation is similar to the cost of Mid-Columbia forward pricing values, which vary by month and time of day. We use a value of dependable capacity of $114,000 per MW per year (MW-yr). We use these values to provide: (1) a basis for measuring the economic benefits of continued project operation; and (2) a basis for estimating the cost of replacing power for any environmental enhancements that would reduce project generation.

The current-cost economic analysis is not entirely a first-year analysis in that certain costs, such as major capital investments, would not be expended in a single year. Also, some future expenses, such as taxes and depreciation, are known and measurable and are, therefore, incorporated in the cost analysis. Table 100 summarizes the values that we use for key parameters in our analysis; these values were either obtained from Idaho Power's final license application and AIR responses or developed by staff. Table 101 summarizes the annualized costs associated with the project under existing conditions (no-action), which total $41,966,200.

Table 100. Summary of key parameters for economic analysis of the Hells Canyon Hydroelectric Project. (Source: Idaho Power, 2004, as modified by staff)

| Parameter | Value | Source |
|---|---|---|
| Period of analysis | 30 years | Staff |
| Term of financing | 20 years | Staff |
| Discount rate | 7.13 percent | Idaho Power |
| Cost of money | 8.48 percent | Idaho Power |
| General inflation and real growth rate | 0 percent | Staff |
| Depreciation | MACRS | Staff |
| **Taxes and Insurance (%)** | | |
| Federal income tax rate | 39.1% | Idaho Power |

| Parameter | Value | Source |
|---|---|---|
| Property tax rate | 0.5% | Idaho Power |
| Insurance | 0.07% | Idaho Power[a] |
| **Capacity Value ($/MW-year)** | $114,000 | Staff |
| **Energy Value ($/MWh) ($2006) from Idaho Power** | **Heavy Load Period ($)** | **Light Load Period ($)** |
| January | 70.09 | 60.00 |
| February | 64.25 | 55.00 |
| March | 58.41 | 50.00 |
| April | 44.03 | 35.12 |
| May | 39.81 | 31.76 |
| June | 45.90 | 36.62 |
| July | 53.59 | 43.70 |
| August | 62.04 | 50.59 |
| September | 59.12 | 48.21 |
| October | 58.18 | 48.81 |
| November | 56.54 | 47.44 |
| December | 62.28 | 52.25 |

Note: MACRS = Modified Accelerated Cost Recovery System

[a] Computed from Idaho Power data.

Table 101. Costs associated with the No-action Alternative for the Hells Canyon Project.

| | No Inflation | | |
|---|---|---|---|
| | Capital Cost | Annual Expense | Total Annualized Cost |
| Total original net investment[a] | $162,722,900 | | $18,428,500 |
| Committed construction cost[b] | $2,477,100 | | $270,600 |
| Total relicensing cost[c] | $80,700,000 | | $8,354,300 |
| Ongoing environmental measures[a] | $11,600,000 | | $1,267,000 |
| Total net investment | | | $28,320,400 |
| Plant O&M [d] | | $5,480,000 | $5,480,000 |
| O&M for current environmental measures | | $5,542,500 | $5,542,500 |
| KWh Tax[e] | | $903,300 | $903,300 |
| FERC fees[f] | | $1,720,000 | $1,720,000 |
| Subtotal annual expenses | | | $13,645,800 |
| Total annualized cost | | | $41,966,200 |

[a] We include property tax and insurance considerations in our annualized capital costs, while Idaho Power accounts for these costs separately. We revised this figure and subsequent subtotals in the final EIS based on a September 25, 2006, communication between Idaho Power and FERC staff.

[b] We estimated the committed construction cost by applying the ratio of the cash flow for a known cost to Idaho Power's cost of capital in table 1 of Idaho Power's response to AIR DR-4.

[c] We do not include property tax and insurance in annualizing the relicensing costs.

[d] We computed the plant O&M cost by dividing the 30-year total cost of $164.4 million by 30, based on Idaho Power's response to AIR DR-4.

[e] Based on Idaho Power's response to AIR DR-4 and computed by dividing $27.1 million by 30 years.

[f] Based on Idaho Power's response to AIR DR-4 and computed by dividing $51.6 million by 30 years. A higher figure was published in exhibit D of the final license application (Idaho Power, 2003a).

## 4.2 COST OF ENVIRONMENTAL MEASURES

Certain measures proposed by Idaho Power, recommended by agencies and other parties and/or considered by staff for inclusion in a Staff Alternative could affect project economics through costs (capital, O&M, plan development, etc.) or effects on power generation. Since several hundred measures have been put forward in this proceeding, we have placed the cost information for the developmental analysis in a set of three cost appendices. Appendix H provides detailed costs for measures included in Idaho Power's Proposal, while appendix I addresses other measures included in the Staff Alternative. Appendix J addresses section 4(e) mandatory measures not included in the Staff Alternative.

### 4.2.1 Reduced Benefits Associated with Operational Changes

In this final EIS we evaluate alternative operations, which include changes to ramping rates, reregulation of the reservoirs for flow augmentation, and flow management changes to provide minimum navigational flows downstream of Hells Canyon dam. These operational changes, if implemented, would affect both energy generation and dependable capacity, as well as the ancillary benefits of the project. Additional effects could include a loss in generation flexibility and transmission system modifications. We base our estimates of energy impacts on data provided by Idaho Power's CHEOPS model, a hydropower operations computer optimization model.[108]

We determine dependable capacity impacts by estimating project capacity during a critical hydrologic period, which is defined by Idaho Power as July 1994 (a below-normal flow year). In the case of the seasonal 4-inch-per-hour ramping rate measure, capacity losses are associated with Idaho Power's estimated loss of 113 MW of peaking capacity from June 1 through June 15.[109] Table 102, which is based on Idaho Power's response to AIR OP-1(a) (Bowling and Whittaker, 2005) and subsequent Idaho Power comments on the draft EIS, summarizes the effects on power benefits of the environmental measures that would affect generation.

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[108] The CHEOPS model and input files are proprietary tools of Idaho Power. Staff reviewed the model during earlier project proceedings. In response to our AIR OP-1(a), Idaho Power made a number of model runs to simulate certain flow scenarios (see section 3.3.2). Some operational measures, submitted in response to the Commission's Notice of Ready for Environmental Analysis, have not been modeled.

[109] This measure would be effective from March 15 through June 15 each year; however, Idaho Power estimates that it would affect capacity only during June.

Table 102. Annualized lost benefits associated with supplemental operational measures included in the Staff Alternative or recommended by the Corps for navigation purposes.

| Measure | Change in Heavy Load Period Energy Generation (MWh) | Change in Light Load Period Energy Generation (MWh) | Lost Energy Benefits | Reduc-tion in Depend-able Capacity (MW) | Lost Capacity Benefits | Lost Ancillary, Transmission and Flexibility Benefits | Annualized Reduction in Power Benefits |
|---|---|---|---|---|---|---|---|
| **Staff Alternative Measures** | | | | | | | |
| Implement a 4-inch-per-hour ramping rate measured at Johnson Bar from March 15 through June 15, to be adjusted if warranted based on monitoring studies | –10,019 | 11,034 | $76,000 | 0.0 | $1,261,000[a] | $494,000 | $1,831,000 |
| For flow augmentation, refill Brownlee reservoir to full pool by June 20, release 237 kaf of stored water from Brownlee reservoir between June 21 and July 31 (release at least 150 kaf of this water by July 15) and not refill until after August 31 | –53,649 | 39,508 | $2,411,000 | 18.1 | $2,056,000[b] | $4,561,000 | $9,033,000 |
| Total[c] | –63,652 | 50,751 | $2,459,000 | 18.1 | $3,317,000 | $4,702,000 | $10,478,000 |
| **Corps-recommended Measure** | | | | | | | |
| Operate the project in the interest of navigation to maintain a flow of 8,500 cfs above the mouth of the Salmon River[d] | –6,442 | 6,324 | $179,800 | 100.3 | $11,437,600[e] | $931,500 | $12,548,900 |

[a] This represents replacement of lost spring capacity as estimated by Idaho Power on April 25, 2007.

[b] If Idaho Power were able to use simple cycle combustion turbines rather than combined cycle turbines to replace lost dependable capacity, the economic impact on dependable capacity would be $1,329,200, or $726,800 less than using combined cycle. The resulting total annualized reduction in power benefits for both staff measures would be $9,751,200 instead of $10,478,000.

[c] The entries in the rows above represent the cost of each measure on its own, not in combination with the other flow measures. The total equals the combined effect of all measures and does not necessarily equal the sum of rows 1 (ramping rate) and 2 (flow augmentation) because when measures are combined one measure may partially offset another.

[d] The incremental cost of the Corp's navigation measure would have minimal effect on dependable capacity in July when the measure is incorporated into an operational scenario that includes flow augmentation. Dependable capacity is estimated based on typical July flows during the second driest year type (1994). Under the flow augmentation scenario, simulated July 1994 releases from Hells Canyon dam never fall below the 8,500-cfs navigation target level because water is being released from storage during this month to augment downstream fish flows. However, there would still be significant effects on dependable capacity later in the summer once the augmentation flows end. Additionally, an instantaneous minimum of 11,500 cfs below the mouth of the Salmon River as measured at the Snake River below McDuff Rapids gaging station is required. The measure also requires that the instantaneous minimum release from Hells Canyon dam for the current day be equal to the previous 3-day moving average for Brownlee reservoir inflow when the three-day moving average for Brownlee reservoir inflow is less than 8,500 cfs.

[e] If Idaho Power were able to use simple cycle combustion turbines rather than combined cycle turbines to replace lost dependable capacity, the economic impact on dependable capacity would be $7,394,300, or $4,043,300 less than using combined cycle. The resulting annualized reduction in power benefits would be $8,505,600 instead of $12,548,900.

### 4.2.2 Cost of Environmental Measures under the Applicants' Proposal, Staff Alternative, and Staff Alternative with Mandatory Conditions

Idaho Power provided cash flows for capital and O&M costs associated with their environmental measures in their response to AIR DR-4 (Bowling and Whittaker, 2005) or in subsequent filings.[110] Based on our review, we largely adopted these costs and applied the parameters summarized in table 100 to compute annualized costs. The annualized cost of the new environmental measures included in Idaho Power's Proposal is $12,529,900. The distribution of these costs by resource area is summarized in table 103, including capital costs, annualized O&M costs, and total annualized costs.

We created the cash flows for capital and O&M costs for environmental measures that were recommended by agencies and other parties or that we developed. In some cases, we estimated costs by extrapolating costs provided by Idaho Power in its application or response to AIR DR-4. The total annualized cost of the new environmental measures included in the Staff Alternative is $15,225,600 (table 103). The total annualized cost of the new environmental measures included in the Staff Alternative with Mandatory Conditions is $15,255,800 (table 103).

## 4.3 COMPARISON OF ALTERNATIVES

Based on Idaho Power's computer model and hydrologic data for the project, the estimated average annual output of the project under the No-action Alternative (current conditions) is 6,562,244 MWh. This would provide annual power benefits of $351,546,600. Subtracting current costs of $41,966,200 (see table 101) yields an annual net benefit of $309,580,400. This serves as the basis for the analysis of project economic benefits under Idaho Power's Proposal and the Staff Alternative. The project's output is sold to Idaho Power's ratepayers or to other utilities in the northwest region. Idaho Power is an Idaho corporation and is a publicly regulated investor owned utility. Its rates and charges are set by the Idaho Public Utilities Commission in a manner to cover its operating expenses, debt service, and other costs and to provide appropriate operating, capital and other reserves, as well as a regulated return on investment to shareholders.

Table 104 compares the power value, annualized costs, and net benefits of the No-action Alternative, Idaho Power's Proposal, the Staff Alternative, and the Staff Alternative with Mandatory Conditions. In section 5.0, *Staff's Conclusions*, we discuss our reasons for developing the Staff Alternative and explain why we conclude the environmental benefits may be worth these cost increases and benefit reductions. Net benefits would decrease from 47.18 mills/kWh under the No-action Alternative to 45.27 mills/kWh under Idaho Power's Proposal, a drop of 4.05 percent. The decrease in net benefits from 47.18 mills/kWh under Idaho Power's Proposal to 43.34 mills/kWh under the Staff Alternative represents an additional drop of 4.43 percent. Compared to Idaho Power's Proposal, the Staff Alternative causes a greater reduction in net benefits because of measures that would reduce generation and annual power values as well as measures that would increase project costs. If other mandatory measures not included by staff were included in any final license, the results would be almost identical to the Staff Alternative (about $0.005 mills/kWh less net benefit).

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[110] Idaho Power provided costs associated with certain water quality measures in its responses to AIRs for WQ-1 and WQ-2 (Idaho Power, 2005e,g,h).

Table 103. Summary by resource area of capital and one-time costs, annual operation and maintenance costs, and total annualized costs of additional environmental measures included in Idaho Power's Proposal, the Staff Alternative, and the Staff Alternative with Mandatory Conditions.

| | IDAHO POWER'S PROPOSAL[A] | | | STAFF ALTERNATIVE[A,B] | | | STAFF ALTERNATIVE WITH ALL MANDATORY CONDITIONS[C] | | |
|---|---|---|---|---|---|---|---|---|---|
| RESOURCE AREA | CAPITAL COST | ANNUALIZED O&M COST | TOTAL ANNUALIZED COST | CAPITAL COST | ANNUALIZED O&M COST | TOTAL ANNUALIZED COST | CAPITAL COST | ANNUALIZED O&M COST | TOTAL ANNUALIZED COST |
| **SEDIMENT TRANSPORT** | **$0** | **$814,100** | **$814,100** | **$720,400** | **$842,900** | **$921,600** | **$720,400** | **$842,900** | **$921,600** |
| **WATER QUALITY** | **$15,734,400** | **$623,100** | **$1,798,100** | **$15,824,400** | **$650,100** | **$1,835,000** | **$15,824,400** | **$650,100** | **$1,835,000** |
| **AQUATIC RESOURCES** | **$17,000,000** | **$954,900** | **$2,811,700** | **$34,328,000** | **$1,141,400** | **$3,921,900** | **$34,328,000** | **$1,141,400** | **$3,921,900** |
| **HATCHERIES** | **$17,006,000** | **$469,200** | **$2,326,700** | **$17,381,000** | **$697,000** | **$2,591,600** | **$17,381,000** | **$697,000** | **$2,591,600** |
| **OPERATIONAL MEASURES** | **$0** | **$0** | **$0** | **$1,600,000** | **$68,000** | **$242,800** | **$1,600,000** | **$68,000** | **$242,800** |
| **TERRESTRIAL RESOURCES** | **$16,953,900** | **$1,046,000** | **$2,896,400** | **$18,709,000** | **$1,403,700** | **$3,445,500** | **$18,709,000** | **$1,403,700** | **$3,445,500** |
| **CULTURAL RESOURCES** | **$77,000** | **$499,800** | **$508,200** | **$77,000** | **$527,500** | **$535,900** | **$77,000** | **$527,500** | **$535,900** |
| Recreation | $9,929,800 | $358,900 | $1,207,900 | $10,899,800 | $543,000 | $1,486,900 | $10,899,800 | $553,000 | $1,496,900 |
| Land Use and Aesthetics | $840,000 | $83,000 | $166,800 | $950,000 | $149,000 | $244,400 | $1,050,000 | $159,000 | $264,600 |
| Total | $77,541,100 | $4,849,000 | $12,529,900 | $100,489,600 | $6,022,600 | $15,225,600 | $100,589,600 | $6,042,600 | 15,255,800 |

[a] Source: Idaho Power, response to AIR DR-4 and staff estimates.

[b] Sum of all measures included in the Staff Alternative, including those proposed by Idaho Power (see appendix H) and those recommended by agencies or developed by staff (see appendix I).

[c] Sum all measures included in the Staff Alternative plus mandatory measures specified by agencies but not included by staff (see appendix J).

Table 104. Summary of the annual cost, power benefits, and net benefits for the No-action Alternative, Idaho Power's Proposal, the Staff Alternative, and the Staff Alternative with Mandatory Conditions.[a]

| Hells Canyon | No Action | Idaho Power's Proposal | Staff Alternative | Staff Alternative with Mandatory Conditions |
|---|---|---|---|---|
| **Capacity** | | | | |
| Dependable capacity (MW) | 1,277.8 | 1,277.8 | 1,259.7 | 1,259.7 |
| **Generation** | | | | |
| Effect on heavy load generation (MWh) | | | –63,652 | –63,652 |
| Effect on light load generation (MWh) | | | 50,751 | 50,751 |
| Total Generation (MWh) | 6,562,244 | 6,562,244 | 6,549,344 | 6,549,344 |
| **Changes in Capacity and Power Values** | | | | |
| Dependable capacity effects[b] | | | –$2,056,000 | –$2,056,000 |
| Spring capacity effects | | | –$1,261,000 | –$1,261,000 |
| Generation effects | | | –$2,459,000 | –$2,459,000 |
| Ancillary benefits effects | | | –$474,000 | –$474,000 |
| Transmission effects | | | –$2,028,000 | –$2,028,000 |
| Flexibility effects | | | –$2,200,000 | –$2,200,000 |
| **Total Costs and Benefits** | | | | |
| Annual power value | $351,546,600 | $351,546,600 | $341,068,600 | $341,068,600 |
| ($/MWh and mills/kWh) | 53.57 | $53.57 | $52.08 | $52.08 |
| Annual cost | $41,966,200 | $54,496,100 | $57,191,800 | $57,222,000 |
| ($/MWh and mills/kWh) | $6.40 | $8.30 | $8.73 | $8.74 |
| Annual net benefit | $309,580,400 | $297,050,500 | $283,876,800 | $283,846,600 |
| ($/MWh and mills/kWh) | $47.18 | $45.27 | $43.34 | $43.34 |

[a] Small round-off differences of $100 to $200 may carry forward from earlier tables as values are recombined.

[b] If Idaho Power were able to replace lost dependable capacity with simple cycle turbines instead of combined cycle turbines, the dependable capacity effect would drop to $1,329,200. This would add 726,800, or about $0.11/MWh, to annual net benefits.

The measures that Idaho Power proposes, as summarized in table 104, would increase annualized costs from $41,966,200 to $54,496,100 relative to the No-action Alternative. Idaho Power does not propose any significant operational changes and annual generation would remain unchanged at 6,562,244 MWh. This would provide annual power benefits of $351,546,600 and an annual net benefit of $297,050,500. This equals an overall reduction in annual net benefits of $12,529,900 relative to the No-action Alternative.

The measures included in the Staff Alternative, as summarized in table 104, would increase annualized costs from $41,966,200 to $57,191,800 relative to the No-action Alternative. Operational changes would reduce annual generation, which would decrease by 12,900 MWh to 6,549,344 MWh. The Staff Alternative would provide annual power benefits of $341,068,600 and an annual net benefit of $283,876,800. This represents an overall reduction in annual net benefits of $25,703,600 relative to the No-action Alternative. If mandatory measures not included by staff were ultimately made a part of the license, the costs would increase by $30,200 and annual net benefits would decrease accordingly to $283,846,600.

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