PINEDALE HYDROPOWER STUDY
LEVEL II PROJECT

PREPARED FOR:
TOWN OF PINEDALE
AND
WYOMING WATER
DEVELOPMENT COMMISSION

SUBMITTED May 1, 2003

Prepared by:

SUNRISE ENGINEERING, INC.
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Afton, Wyoming 83110
Tel: (307) 885-8500
EXECUTIVE SUMMARY

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EXECUTIVE SUMMARY

The Town of Pinedale and the Wyoming Water Development Commission initiated this study to review the feasibility of utilizing the Town's storage water in Fremont Lake and/or the natural streamflow in Pine Creek to generate hydroelectric power. A "run of river" type hydro plant was proposed in the Pine Creek channel at the historic hydro plant site, and a "culinary" type hydro on the Town's water supply pipeline was also proposed. This study reviews these two sites utilizing several flow scenarios and differing diversion locations to estimate the maximum power potential of the sites and the estimated system cost. The study also reviews several other aspects of a hydro system critical to its feasibility. These items included potential intertie locations, area power markets, permitting, licensing, operation plan, benefit/cost analysis, and identification of critical issues.

Culinary Hydro Alternatives

The culinary hydro site, located at the pressure reducing valve (PRV) on Jackson Street, four blocks north of Pine Street, offers three different hydro alternatives:

- Alternative C1 - Utilize full hydraulic capacity of pipeline, discharge power flows to atmosphere.
- Alternative C2 - Limit flow to chlorine contact time, use only excess volume beyond culinary demand for power generation, discharge power flows to atmosphere.
- Alternative C3 - Limit flow to chlorine contact time, use all flows including culinary flows to generate power and discharge into both the culinary system at a pressure of 60 psi, and a tailrace/discharge pipe.

Each of the above alternatives will utilize existing Town storage to run the hydro. The Town has sufficient water right to run any one of the alternatives. Table 1.1 – Site Summary Culinary Hydro summarizes the results of each alternative.

<table>
<thead>
<tr>
<th>Site Summary - Pinedale Hydro Electric Feasibility Study</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>WYOMING WATER DEVELOPMENT COMMISSION</td>
<td></td>
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<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Site</td>
<td>Alternative</td>
</tr>
<tr>
<td>CULINARY</td>
<td>Utilize Full Capacity of Pipeline</td>
</tr>
<tr>
<td>#1 Limit Capacity To Cl2 Contact Time</td>
<td>9</td>
</tr>
<tr>
<td>#3 Discharge At 60psi to Culinary Sys.</td>
<td>11.5</td>
</tr>
</tbody>
</table>

Table 1.1 – Site Summary Culinary Hydro

The most feasible of the above alternatives is Alternative C1. This alternative uses a 180 kW unit and produces 1,377 megawatt hours (MWh) per year with an estimated installation cost of $1,867,000. This alternative will not, however, cash flow at current avoided cost rates published by PacifiCorp (1.5¢/kWh) and the estimated interest rate of 6.0%. The avoided cost rate will need to be in the 7.0¢/kWh range before the project can cash flow. This required rate is as high as current retail rates and under current markets could not be obtained. Under present market conditions, the culinary hydro plant is not feasible. Table 1.2 – Benefit/Cost Ratios – Culinary Hydro demonstrates the effect of the avoided cost rate on the benefit/cost ratio of the culinary hydro alternatives. When the benefit cost ratio surpasses 1.00, the project is financially feasible.

Pinedale Hydropower Study
Executive Summary
### Run of River Hydro Alternatives

The run of river hydro site is located on the north end of Willow Island on the east side of Pine Creek. This is the site of the historic power plant. Several alternatives based on the location of the diversion structure are evaluated in this report.

- Alternative 1 – Divert at historic diversion location
- Alternative 2 – Divert at location upstream of historic diversion
- Alternative 3 – Divert at Fremont Lake

In addition to the diversion locations, several flow regimes utilizing the Town storage are reviewed.

- Supplement historic flows with all available storage to maintain 170 cubic feet per second (cfs) for the turbine from May through September.
- Supplement historic flows with all available storage to maintain 60 cfs for the turbine from April through November.
- Supplement historic flows with all available storage to maintain 40 cfs for the turbine year round.
- Use only historic stream flows as measured by the gauging station located ¼ mile downstream of Fremont Lake.

All alternative diversion locations were evaluated for the most promising flow regime of 170 cfs from May through September. The apparent best Alternative (Alt. #2) was further evaluated using the other flow regimes. Table 1.3 – Site Summary – Run of River Hydro summarizes the results of each alternative.

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**Table 1.2 – Benefit/Cost Ratios – Culinary Hydro**

**Table 1.3 – Site Summary – Run of River Hydro**
The results indicate Alternative 2 using Town storage to maintain 170 cfs for the turbine from May to September has the best benefit/cost ratio. This unit would be an 890 kW unit producing 2,863 MWh per year with an installation cost of $2,132,000. The second best benefit/cost ratio is once again Alternative 2 using Town storage to maintain 40 cfs for the turbine on a year round basis. This unit would be a 620 kW unit producing 2,652 MWh per year with an installation cost of $1,905,000.

This run of river alternative (2) cash flows under either flow scenario at 4.0¢/kWh. This rate is higher than the published PacifiCorp rate schedule, but it is not inconsistent with current power purchase contracts in the west, and may be within reach given the right conditions. However, if PacifiCorp was not interested, and wheeling costs were added to take the power elsewhere, the power would become relatively expensive to potential purchasers.

Table 1.4 – Benefit/Cost Ratios – Run of River Hydro demonstrates the effect of the avoided cost rate on the benefit/cost ratio of the run of river alternatives.

<table>
<thead>
<tr>
<th>BENEFIT/COST RATIO FOR VARYING ELECTRICITY RATES</th>
<th>PINEDALE HYDRO FEASIBILITY STUDY</th>
<th>25-Feb-03</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOCATION/ALTERNATIVE</td>
<td>ENERGY RATE $/kwh</td>
<td></td>
</tr>
<tr>
<td>PINE CREEK</td>
<td>0.01 0.015 0.02 0.03 0.04 0.05 0.06 0.07 0.08 0.09</td>
<td></td>
</tr>
<tr>
<td>MAINTAIN 170 CFS MAY TO SEPT. Run of River ALT # 1 - Old Diversion Site</td>
<td>0.12 0.24 0.31 0.45 0.59 0.72 0.86 1.00 1.14 1.27</td>
<td></td>
</tr>
<tr>
<td>MAINTAIN 60 CFS MAR TO NOV. Run of River ALT # 2 - New Diversion Site 900' Upstream</td>
<td>0.29 0.40 0.51 0.73 0.95 1.17 1.39 1.61 1.82 2.04</td>
<td></td>
</tr>
<tr>
<td>USE ONLY EXISTING FLOWS NO STORAGE Run of River ALT # 2 - New Diversion Site 900' Upstream</td>
<td>0.22 0.30 0.37 0.53 0.69 0.85 1.01 1.17 1.33 1.49</td>
<td></td>
</tr>
</tbody>
</table>

Table 1.4 – Benefit/Cost Ratios – Run of River Hydro

The run of river hydro alternatives are also beset by concerns regarding fish and wildlife and recreation on this reach of the river. The land is administered by the Bureau of Land Management (BLM) and is a good location for local recreational opportunities such as fishing. The proposed plant site also has potential recreational uses that the BLM feels would be diminished if a hydro plant were built. In addition, the remains of the old plant diversion are recorded as a historic resource eligible for National Register inclusion. Wyoming Game and Fish has expressed concern regarding changes to the flow regime in the stream and fish migration disruption caused by the diversion structure.

The culinary and run of river hydro sites reviewed in this study are not feasible given the current published rate schedules. If a contract for a higher energy price were negotiated in the 4.0¢ to 5.0¢/kWh range, the run of river Alternative 2 would be the best alternative to construct. However, the revenue from power sales will just cover the cost of debt service and operation of the hydro and would not be a revenue stream to the Town until the facility is paid off (20 years). During that time the facility could be considered a liability since it will be right on the edge of self sufficiency.