Renewable Advisory Council Meeting

Project Review

August 14, 2011

The information presented in this review is based on Energy Trust's current understanding of the project and is subject to change.

Project Name:	Three Sisters Irrigation District Main Canal Pipeline Hydro Project
Staff Evaluator:	Jed Jorgensen
Utility:	PacifiCorp
Power delivery:	QF, standard PPA contract
Capacity:	800kw
Generation:	3,100MWh annually
Commissioning:	March / April 2013
Total cost:	~$2,230,000

Brief Project Overview

For over a decade the Three Sisters Irrigation District (TSID) has pursued an aggressive water conservation program, piping over half of the district's 60 miles of open canals. The water savings from these efforts have restored 15.6 cubic feet per second (cfs) of flow in Whychus Creek, the source of the district's water, while increasing on-farm deliveries by as much as 25%. TSID plans to continue its conservation program, intending to have the district fully piped and pressurized within the next 10 years.

Within the larger water conservation plan for the district, the Main Canal Pipeline Project is a proposed hydroelectric generating plant located on the TSID main canal. The plant will be fed by over 3.5 miles of side-by-side 54" high density polyethylene (HDPE) penstock which has been built in three phases. The first two phases of pipeline installation are complete. The third phase is nearly complete, pending the installation of a valve house.

The hydro project will be owned and operated by TSID. Much of the construction will be completed by TSID staff, having gained significant construction experience from the district's piping projects. The project is being designed by Bill Cronan, a National Resources Conservation Service engineer with over 20 years of experience in water resources. TSID's main goal of the proposed hydro plant is to utilize energy revenues to service the debt from the third phase of piping. Having the hydro plant pay for itself and the last phase of piping enables the district to move forward with their additional piping plans.

The pipeline and hydro plant are part of a larger Whychus Creek restoration project that includes a fish screen, fish passage, and stream channel restoration. As a result of piping the open canal, the project will permanently restore an additional 6 cfs of flow to the creek, benefiting Steelhead, Bull Trout, Chinook salmon, Redband Trout and other native fish species. The increased flow will also improve water quality by lowering water temperature in Whychus Creek. The combined water savings (21.6 cfs in total) is enough to fill 24 Olympic swimming pools each day during the irrigation season.

The cost of the piping and restoration work only is approximately $12 million. About $7 million was paid for with grant funding, $3 million in cash and in-kind installation on the part of the district, and $2 million from a DEQ loan. The hydro plant is estimated to cost an additional $2.3 million, and the electricity revenues are needed to service the $2 million DEQ loan. If revenues from the hydro plant are not realized, the district will be forced to levy a special assessment of

approximately $3,000 annually per member for the next 20 years. The district is prepared to do that, but would far prefer the hydro option.

The total drop in elevation from the TSID head gate on Whychus Creek to the hydroelectric turbine is 194 ft. The net head available to the project changes with the flow that is available. The penstock will provide up to 160 cfs of water to the hydro plant, depending on flows during the irrigation season. The project will employ one Francis turbine, yielding an overall nameplate capacity of 800kW and an annual generation of approximately 3,100MWh.

Irrigation season water flows tend to follow a bell curve, ramping up and down at the beginning and end of the season. A large variation in flows classically results in two different development choices for hydro projects: utilizing two turbines to maximize production, or running one turbine at maximum capacity much of the time but not taking advantage of peak flows. The proposed plant chooses the second option: to run at maximum capacity and efficiency for the majority of the irrigation season, and forgo generation from peak flows. After the water passes through the turbine it will flow into TSID's Watson reservoir and on to delivery to water users through TSID's canal and pipeline system.

Interconnection and wheeling issues have driven the project's capacity and economics. The project is located in Central Electric Co-op (CEC) territory, but the co-op is not interested in purchasing the power. Instead, the project intends to wheel the output to PacifiCorp via CEC's distribution lines to a Bonneville substation. PacifiCorp also connects at the Bonneville substation and the power will be transferred to their system at that point.

Wheeling power is a fee service based on peak power delivery scheduled. The fee pays for reserving capacity on the lines where the power will flow. The project incurs wheeling costs from CEC and, to a lesser extent, Bonneville Power Administration (BPA). The wheeling rate set by CEC is very high relative to BPA and Pacific Power transmission tariffs ($6.15/kW mo vs $2.025/kW mo for PacifiCorp transmission as an example) and has presented a strong challenge to the project's economics. Indirectly, the wheeling rate also caused the project to lose its BETC precertification[1].

The project has been awarded a $600,000 grant from the Bureau of Reclamation's (BOR) WaterSMART program, contingent upon showing the BOR a financial pathway to success for the project by the end of August. TSID views Energy Trust as a critical piece of the project's financial plan. TSID applied to Energy Trust in June with the hope that we will complete our review and be able to commit an incentive in time for the project to secure the BOR award.

[1] The project was initially slated to utilize two turbines at a 1.8MW nameplate capacity, generating approximately 4,100 MWh annually. Because wheeling is a capacity-based fee the project reduced its capacity 56% to the point where a single turbine will produce the most energy (75% of original design). The high fee, forcing the capacity reduction, was announced by CEC after the project had applied for and won a BETC in the Tier II process. Changing the project's capacity more than 10% disqualified it from the BETC process.

Figure 1. District Map: Yellow dot shows approximate powerhouse location.

Figure 2. Project piping route.

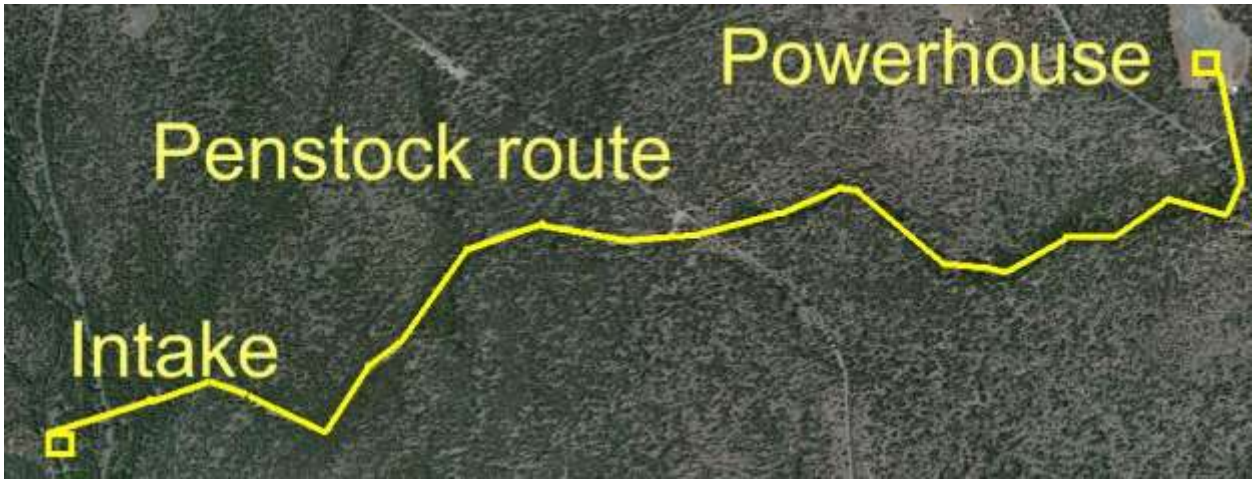

Figure 3. Pipeline installation.

Site Control, Interconnection, Offtake, Design, and Permitting

The project has many development stages left before it, but TSID has the time and expertise to complete them. TSID has chosen to secure funding for the project prior to spending the district's resources on the next steps in development. This is consistent with the district's general approach to the piping projects it has completed in the past.

Site Control: The district owns and has full control of all the sites involved in the project.

Permitting: No permitting work has yet begun. The following permits will be required:

- Federal Energy Regulatory Commission (FERC): conduit exemption
- Oregon Water Resources Department: expedited hydroelectric water right
- Deschutes County: conditional use permit for the project powerhouse

None of the permits are expected to be problematic or challenging. The pipeline is already nearly fully constructed and the district's strong commitment to restoring water in stream for aquatic species should ease environmental reviews. The permitting processes must wait until the final design of the powerhouse has been completed. At that point, it should be possible to apply for and be granted all of the above permits within about four to eight months.

Design: Final design has not yet begun. Over the winter and spring TSID explored alternatives and options related to the interconnection and wheeling challenges. Because wheeling is a capacity based fee, the total capacity and configuration of the project was in play while alternatives were evaluated. TSID plans to engage in the final design process pending successful outcomes with Energy Trust and the BOR.

Interconnection & Wheeling: The project will interconnect to a CEC distribution line that runs very close to the proposed powerhouse site. Despite that fact, the first stage in the interconnection process is actually managed by BPA. According to TSID, because BPA delivers power to CEC they have to ascertain if there will be any impacts to their power distribution. TSID has applied to BPA for the first interconnection study. TSID hopes that BPA's study will help to inform, and reduce, the costs of further interconnection studies with CEC.

Power will be wheeled from the interconnection point to the BPA substation where PacifiCorp interconnects. CEC has assessed TSID charges of $5.05/kW mo for Distribution Demand and $1.10/kW mo for Transmission Demand, for a total charge of $6.15 per kW of capacity per month. The charge is levied for 12 months, an industry standard, despite the fact that the project will only be online during the irrigation season. The annual charge from CEC is $59,040 (800kW * $6.15 * 12). BPA also assesses a facility fee for moving the power to PacifiCorp at its substation. The BPA fee is estimated at $9,300 annually.

Both the CEC and BPA fees are based on rates that can change during the project term. The CEC rate is board approved and is a function of CEC's cost to distribute power to its customers and is tied to large infrastructure expenditures. Because it serves a large rural area, distribution costs are high. Doug Cleavenger, a CEC representative, told Energy Trust that the area where the TSID project will interconnect was recently upgraded and that the utility does not have any infrastructure expansions or upgrades planned for the foreseeable future. Cleavenger also noted that CEC does not change rates often: the most recent rate increase was in October of 2010. Prior to that, the last rate increase occurred in 2001. Cleavenger thought that the wheeling rate would be equally long-lived. Notwithstanding Cleavenger's assertions, the inability to contract these rates for the term of the project presents a risk that is difficult to quantify.

Interconnection studies have not yet been completed so costs for the interconnection are engineer estimates, not utility quotes. As such, there is a certain amount of risk associated with not knowing the final costs of interconnection. That said, the project has made conservative estimates about total interconnection costs that appear to be reasonable given the plant's capacity and interconnection costs seen by other projects.

Offtake: TSID is applying for a standard Schedule 37 Qualifying Facility power purchase agreement with PacifiCorp. TSID is aware that new Schedule 37 rates are likely to be filed late this fall and is working to secure an agreement under the current rate structure. There is some risk associated with power pricing by not having a PPA secured. However, past projects, including the Swalley and COID facilities, were grandfathered in to an older Schedule 37 rate by virtue of the fact that they had already applied for a PPA at the time of the rate change. TSID believes the same precedent will apply to them.

As a result of wheeling their power to PacifiCorp the district will be responsible for scheduling hourly power deliveries on a day-ahead basis. Depending on the final interconnection setup with BPA, the district may also have to provide a schedule to Bonneville. TSID has said it plans to learn from Middle Fork Irrigation District which has a 3.3 MW hydro plant that also schedules power deliveries to PacifiCorp over BPA lines.

According to Middle Fork manager Craig Dehart, managing hourly scheduling is mainly an administrative task that takes the district about 20-30 minutes to complete each day. It is possible to set up automated systems to take care of the tasks, but DeHart says he prefers to do the scheduling manually as it keeps them on top of the hydro plant's operations on a daily basis. Staff does not think it will be difficult for TSID staff to manage this aspect of the plant operations.

Resource Evaluation

TSID has the senior water rights to Whychus Creek, dating to 1895. Because of the seniority of the rights, water availability has never been an issue for TSID. Furthermore, while most irrigation water rights restrict usage to certain times of the year (the irrigation season), TSID's water rights are so old that they do not have any such restriction (known as a 'duty'). As such, TISD has more flexibility in setting the beginning and end of the irrigation season than most districts. They can also access water in the winter for stock runs as necessary.

TSID's typical season starts between April 1st - 15th and runs to October 15th- 25th, a range of 184-208 days. However, as more of the district is piped, and more water is available at pressure for irrigators, water use behaviors are changing somewhat. This leads to the seeming contradiction mentioned at the beginning – more water is back in stream, and more water is being delivered as customers who previously ran pumps are now willing to take water deliveries in earlier in the growing season. Due to these behavioral changes, TSID has indicated that they may be able to start the irrigation season in mid-March and run until mid-November, adding perhaps as many as 36 days of generation potential.

Flow records from the TSID diversion on Whychus Creek are available dating back to 1924. Staff evaluated 45 years of flow records, from 1960-2005 to model the resource and generation. While there is variation in the flows across the years, the amount of flow is sufficient in 40 of the 45 years to generate the expected output of the plant. In the years where flows were lower, the generation would drop by 10-20%. Staff's modeling agrees with TSID's: the sizing and

configuration of the turbine is appropriate, and given the historical data, it appears the turbine and generator will run at maximum output for the majority of the irrigation season.

The 3,100MWh of annual energy appears to be a valid and conservative generation figure, and leaves room for the project to perform better than anticipated if the district is able to extend the irrigation season on an on-going basis.

Cost, Expenses, Revenues, Incentives, and Financing

Costs: The total up-front cost of the project is approximately $2.23 million. As mentioned above, this does not include $2M of piping costs, which have already been paid separately via a low interest loan from DEQ which will be repaid through the hydro project revenues . The capital costs for the project break down as follows:

Feasibility/Design/Construction Management	$	315,000
Site & Civil, System Components	$	1,119,228
Electrical and Interconnection	$	455,000
Repair Reserve	$	150,000
Contingency	$	150,000
Construction Interest	$	40,000
Total	**$**	**2,229,228**

The up-front capital costs for the project appear reasonable and compare favorably to similar projects we have evaluated recently. The Klamath and Swalley irrigation district projects are similar capacity and make good comparisons. The turbine and generator costs for TSID are slightly higher than the Klamath project, but significantly less than Swalley. Interconnection costs are estimated at roughly twice the cost of Klamath, a conservative approach that staff thinks is valid. Design and permitting are comparable between all the projects. Powerhouse costs for TSID are higher than the other project's as TSID is choosing to build a concrete building while the others choose metal structures. This may be a place where money can be saved during final design.

Expenses: Expenses are where this project differs significantly from others we have seen. TSID estimates $7,500 annually for scheduled and unscheduled maintenance. This figure, which is lower than most projects estimate, is meant to reflect costs for parts and materials and not labor. The district intends to operate the project itself and is paying for the labor off of its existing balance sheet in an effort to reduce annual expenses as seen by the project.

The wheeling fees noted above are also included in the annual expenses: $59,040 to CEC, and $9,300 to BPA.

Other expenses include $7,500 for insurance, a standard cost, and a $15,000 annual water banking fee to the Deschutes River Conservancy (DRC). Water banking provides a payment to irrigation patrons for temporarily leasing irrigation water for in-stream environmental use. The water is typically leased for one year and the patron does not draw water that year. Water banking is seen as a temporary measure to provide additional in-stream flow for fish while piping projects proceed. The DRC was a major grant funder for the piping of the main canal. TSID designed this water banking fee to increase its chances of winning the BOR grant.

Finally, the debt service from the outstanding $2 million, twenty-year loan for the third phase of piping has also been included as an annual expense. DEQ loaned TSID the money at the very low interest rate of one half of one percent (0.5%) and payments are deferred until 2013. As described earlier, one of TSID's main goals is for the hydro project to service this debt. The easiest way for Energy Trust to evaluate the DEQ debt in our current financial model is to treat it as an annual expense. Over the twenty year project life, as evaluated by Energy Trust, the annual payment for this debt declines from $109,750 to $100,250.

Total annual expenses for the project do not vary greatly, declining from $200,000 in year one to $194,500 in year twenty. Debt service on the DEQ loan and wheeling make up 89% of the project's expenses.

Revenues: Using the expected 3,100 MWh of generation annually and the current Schedule 37 avoided cost rates, the project's revenues range from $168,500 in year one to $302,000 in year twenty. Because of the high expenses and low power rates, net cash flow to the project is negative for the first four years. This is a place where Energy Trust can help out.

Incentives and other funding sources: As a special district TSID does not pay taxes and is not eligible for Federal tax credits or depreciation benefits. The project applied for a Tier II BETC in the fall of 2010 and won a precertification in the spring of 2011. However, the precertification was lost when the project had to reduce its capacity to manage the wheeling costs imposed by CEC. The project has been tentatively awarded a $600,000 WaterSMART grant from the BOR. Once contracted, the WaterSMART grant is awarded much like a line of credit. As the district spends money on the project it expenses the BOR who then repays the district. This reduces the district's need for construction financing for the project.

Financing: Given the project's revenues and expenses, it has limited borrowing ability. Using a debt service coverage ratio of 1.35, the project can sustain only $300,000 in additional debt at a 6% interest rate and a 1% financing fee. TSID understands this limitation and expects to put additional equity into the project.

Independent, Third-Party Analysis

Staff has contracted with Steve Anderson to provide an independent analysis of the project. Anderson will evaluate the resource, project risks, and the project's financial outlook, and provide a report on its abilities to be successful and meet TISD's goals. This analysis will be completed prior to the RAC and Board meetings and staff will disseminate the results of this analysis once it has been finished.

Above Market Cost Analysis

Staff analyzed the project using our current financial modeling tool over a 20 year PPA life at a 10% discount rate. The discount rate was chosen to reflect the level of risk in the project as well as the fact that it is being developed by a public entity.

Without Energy Trust incentives the project presents an above market cost of $1.251 million and a 23 year payback. Without an incentive the project cannot meet appropriate debt service coverage ratios in the first five years. The project's IRR under this scenario is -5.7%.

The major factor dragging down the project's performance is the wheeling fee. Absent this charge the project's financial situation would be vastly improved. Unfortunately, it appears highly

unlikely that the project will be able to change this fee structure. It may be possible for the project to achieve some minor cost savings elsewhere in the project. Staff believes any Energy Trust award must provide further incentive for TSID to find cost reductions to improve the project's financial health.

Despite the relatively poor financial performance, it appears possible to meet TSID's goals for the project.

Proposed Incentive, RECs, Impact Analysis

Staff looked for an incentive structure that would help TSID meet its goals (DEQ loan service, positive project cash flows each year) while also ensuring the project can service the additional debt it requires. An incentive of $1,000,000 paid in four installments helps the project achieve these goals. Staff proposes the following payment scheme:

Year 1	$700,000
Year 2	$100,000
Year 3	$100,000
Year 4	$100,000

Staggering the payments like this helps the project to pay down its initial debts and also provides funding during the early years when power rates are lowest, ensuring positive cash flows and appropriate debt service coverage. A staggered payment stream is also a form of incentive security, and enables Energy Trust to withhold payment if the project does not perform as expected. (Energy Trust would also require repayment provisions for drastic underperformance or other situations which result in project failure, as we do with all project incentive contracts.)

With this incentive, the project would be fully paid back in year 18, with an IRR of 1.9%. While this is quite marginal by typical standards, it does meet the goals of TSID.

Paid over five years, Energy Trust's incentive would have a net present value of $862,441, representing 69% of the project's above market cost. Energy Trust would be paying a levelized cost of $33/REC, more than market value, meaning that Energy Trust would ask for 69% of the project's RECs; 42,780 RECs over our typical contractual term of 20 years. TSID is fine with delivering 100% of its RECs to Energy Trust until this obligation is met.

Assuming Energy Trust takes its share of RECs first, the project would be able to sell RECs in the last 6 years of the PPA. At a value of $10/REC, the additional revenues would boost the project's IRR to 3.4% and payback would occur in year 17.

Under this incentive structure, the cost to Energy Trust is $2.8 million per aMW, slightly less than the Swalley hydro project.

TSID has said that this incentive structure will enable them to move forward with the project and meet their goals.

Underperformance Risk, Project Stress Test

From the resource evaluation it appears there is an ~11% chance of the project generating between 10-20% less than expected in any given year due to flow variation. Staff evaluated

risks to the project from underperforming for a year and/or a series of years due to insufficient water flows.

The project is somewhat sensitive to underperformance issues, depending on when they occur. However, the total dollar exposure due to an underperformance in the 10-20% range is only about $40,000, lessening the overall risk.

In the first four years of operation, Energy Trust's proposed incentive would buffer the project as long as its performance did not lag by more than 25% of expected (at that point Energy Trust's incentive would be at-risk to the district). In years 5-17, an underperformance of 20% would cause the project to have trouble covering its debt in that year and the district might need to put an assessment on its members to cover any shortfall.

Of course, a larger underperformance could occur as a result of a catastrophic system failure or an unprecedented water shortage. Total loss of revenue in any year would almost certainly necessitate a special assessment on water patrons to offset revenue shortfalls.

In staff's opinion, the district's ability to levy a special assessment in cash of a shortfall mitigates the risk due to underperformance.

Recommendation

Though the project has strong challenges to its financial health, it appears viable and able to meet TSID's needs. Staff recommends Energy Trust offer the incentive structure proposed above.

Staff recommends that Energy Trust's incentive be reduced by $0.25 for each $1 of project cost that TSID is able to save. This enables both Energy Trust and TSID to share in any cost savings.

In addition, staff will recommend that TSID hire a contractor to assist it in interconnection negotiations with BPA and CEC and to evaluate other areas for cost savings within the project.

Internal Review Committee

The project was reviewed internally on July 26, 2011 by the following Energy Trust staff members: Rob Del Mar, Betsy Kauffman, Tara Crookshank, Brien Sipe, Elaine Prause, and Thad Roth. The internal review committee supported the project but wanted more information about daily power scheduling, the changeable nature of CEC and BPA rates, how the WaterSMART grant is paid, and risks due to underperformance. Staff investigated these areas and added the results to this report. The findings did not change staff's recommendation.

Next Steps

Since the proposed incentive is greater than $499,999 it requires RAC and Board approval. The project will be presented the RAC on August 10, 2011. If the RAC approves the project it will be presented to Energy Trust's board on August 17, 2011.