Renewable Advisory Council Meeting

Project Review

August 14, 2011

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

Project Name: City of Pendleton Energy Project
Staff Evaluator: Thad Roth
Fast Track ID:
Utility: PacifiCorp
Power delivery: Net Metered
Capacity: **195** kW
Generation: 1,385 MWh annually
Total capital cost: $3,702,400
Expected commercial operation date: June 2012

Brief Project Description

The City of Pendleton Wastewater Treatment facility proposes to replace their existing methane/natural gas boiler with three Capstone microturbines rated at 65 kW for a total of 195 kW of generation capacity. The microturbines will utilize methane produced through anaerobic digestion of biosolids treated at the facility and will provide heat to meet the thermal needs of the digester and buildings at the plant presently provided by the methane/natural gas boiler.

In addition to installing electricity generation, the plant will install a receiving facility for septage, FOG (Fats, Oils and Grease), and food waste to increase methane production through co-digestion with the biosolids. The receiving station will improve disposal options of challenging waste streams in the community while allowing the extraction of renewable energy prior to land application of the resulting solids.

To accommodate co-digestion materials and address aging equipment, the digester mixing system will be upgraded as part of much larger plant upgrade. Additional gas cleaning equipment will also be installed to remove siloxanes and H2S contaminants that are detrimental to the operation of microturbines.

This project will demonstrate the opportunity to generate electricity at a smaller (< 5 mgd) wastewater treatment facility and determine the viability of diverting low solids organics from the solid waste stream to capture embedded energy, improve environmental disposal of challenging waste streams and reduce wastewater collection system maintenance costs.

Project Evaluation

In reviewing this project the evaluation addresses the following issues: project qualification, off take rate, adequate fuel supply (biogas), conversion technology, project costs, grants, financing, operational expertise, electrical interconnection and additional revenues.

Project Qualification

This project utilizes methane produced from biosolids to generate electricity and to offset electricity use at a facility served by Pacific Power.

Off Take Rate

This project will be net-metered. The value of the electricity is based on the energy costs for Pacific Power's Rate Schedule 30. This rate is escalated 2% annually. Due to the multiple engine configuration it is assumed that there will be an opportunity to reduce demand charges at the facility but no financial value was attributed to this benefit.

Fuel Supply

Kennedy/Jenks conducted a feasibility study for the City of Pendleton in 2009 (Energy Trust co-funded the study) to determine methane production from existing wastewater treatment activities over a twenty year horizon. In addition the study conducted an assessment of low solids organic residues available within the community, the methane potential available from the residues and possible tipping fees currently available for those residues.

The results of the feedstock assessment indicate that methane production from existing biosolids treatment in 2012 would support approximately 130 kw electric capacity. Assessment of known FOG and food waste available locally was calculated to generate potentially an addition 200 kw. However, attempts to contract for 5-10 years for these co-digestion feedstocks at currently favorable tipping fees was unsuccessful due to hauler uncertainty over the potential future value of some of the waste streams.

To address this uncertainty the City has chosen to install three microturbines over a three year period, leaving space to add additional engines as feedstock supply became more certain. Capital costs include three turbines with two installed in year one and the third to be installed by year three.

K/J also reviewed the digester capacity to determine the maximum co-digestion scenario open to the City. The result of that review indicated that the City would encounter capacity limitations in 2030 in its primary digester assuming forecast growth and utilization of all identified existing co-digestion feedstocks. However the City has two secondary digesters that could be utilized if expansion is necessary.

Conversion Technology

There are two components to consider in this proposal with respect to the conversion technology: the prime mover proposed; and the co-digestion of low solids organics at wastewater treatment facilities.

Microturbines - The City is proposing to install three Capstone Microturbines, each rated at 65 kW. Combustion gas turbines have been available for energy production for many years while microturbines (small-capacity units of less than 200 kw) have been on the market since the late 1990s. They feature light compact designs, high power density, easy installation, low emissions, long life and low maintenance cost.

The attractiveness of the microturbine in this application is ability to add additional units as the availability of methane increases and the lower operating costs compared to IC engines. The challenge of microturbines is the need for clean biogas and the lack of operating experience by plant personnel. The project is proposing a robust gas scrubbing system to remove both H2S and siloxanes. Particular attention will need to be paid to monitoring contaminants. To address the operations and maintenance expertise the project will purchase O&M services from Capstone.

Co-digestion – To maximize methane production and to assure effective AD operation proper materials processing and mixing is essential. Kennedy/Jenks, the consulting design engineer,

has experience in designing co-digestion systems in a number of wastewater treatment plants in the US. In this project the receiving station will be preheated and a new mixing system will be installed in the AD. The proposed system has been successful in other similar projects in the US and is considered a proven approach.

Project Costs

The capital cost of this project is significantly higher on a per kw basis than is typical for similar projects. At $3.7 million the cost is just under $19,000/kw. This compares to similar sized generation capacity projects like the RES dairy projects at a cost of $9,500/kw. This higher cost is a reflection of an investment in an asset that will meet the City's growth for 20 years and the fact that this project is also providing additional waste disposal services for the community which will be recovered by tipping fees.

The O&M costs, including both engine O&M and gas cleaning O&M, are similar in cost to other projects. Since existing plant staff does not have experience operating microturbines the City has reduced this risk by purchasing an O&M contract with Capstone for the engines. The upgrades to the mixing system in the AD should reduce overall maintenance costs due to the age of the existing system being replaced.

Project Name	**Cost per Mwh**
TMF Biofuels	$36/mwh
AgPower Boardman	$39/mwh
RES	$68/mwh
City of Medford	$27/mwh
Stahlbush	$49/mwh
City of Pendleton	$48/mwh

Grants/Incentives

This energy project is a subset of a larger series of plant upgrades at the treatment facility. The City received ARRA funding, state and federal low interest loans, some with certain portions being forgiven, for the total package of proposed upgrades.

The City also received a BETC precertification in the final Tier 2 process for the energy portion of the project. The City received $1,337,564 in tax credits. They expect to pass through the tax credit retaining just under $992,000. The City is not eligible for any of the federal tax benefits available to comparable private sector renewable energy projects.

Financing

As described above, this project is a portion of a much larger capital improvement plan at the treatment plant (approximately $15.8 million total cost). The City is funding the energy project as a subset of the larger project improvements that is funded through City bonds, state and federal low interest loans and ARRA funds. The City Council approved the energy project as part of the total set of upgrades under the assumption that the energy project would recover its capital cost within a twenty year period.

To model this project, instead of estimating the cost of capital based on the various debt financing available to the City, the project was evaluated as unlevered with the intention of recovering all costs within a twenty year period in line with the goal of the City Council.

Operational Expertise

The City has extensive experience operating anaerobic digesters to treat biosolids received in their collection system. They also have extensive experience utilizing the methane production for beneficial energy use in an onsite boiler for building and digester use.

They have little direct experience in operating and maintaining a prime mover to generate electricity, particularly a microturbine. They also have not had experience in co-digesting potentially challenging organic materials (FOG and food waste).

The City's consulting firm (Kennedy/Jenks) does have significant experience in designing and providing engineering support for co-digestion projects at wastewater treatment facilities. The City will rely on K/J for advice in operating their facility utilizing co-digestion and (as mentioned above) and will contract with Capstone to provide operation and maintenance services.

Interconnection

The City has notified Pacific Power of their intention to add additional generation as a net metered project at the treatment facility.

Co-product Revenues

For this project the co-product revenues are tipping fees for disposal of low solids waste streams. The City identified a number of potential customers that had difficult to dispose of organic waste in their feasibility study. Customers include the Eastern Oregon Correctional facility, a local solid waste hauler and food processors. All waste generators indicated that the City's fees for disposal were very attractive compared to market alternatives.

Efforts to establish contracts for delivery of these wastes have met with resistance due to the uncertainty of how a market for these organic residues might develop over the 5-10 years. Experience at other wastewater treatment plants that have provided this type of expanded service in their communities has seen significant growth in materials delivered and the related tipping fees.

In recognition of the lack of contractual commitments, the City has chosen to take a conservative approach in the assumptions for available residues and the associated tipping fees. Based on the feedstock assessment completed in 2009 and the interest from local wastes stream producers, the project will install two microturbines initially (matching existing gas production) and proposes to install the third engine at the beginning of year three based on the volumes of residues available.

The 2011 Oregon Legislature's extension of the Biomass Collector Producer Tax Credit through 2017 should help the City attract these additional co-digestion residues. This program provides tax credits for the delivery of certain biomass materials to an energy production facility. Of particular interest to this project, brown grease (a key co-digestion residue that the City is focusing on), is eligible for a $0.10 a gallon tax credit.

While the City would not receive this credit directly, a hauler choosing to deliver the brown grease to the City would, making the City a more attractive/competitive disposal site for a hauler. At present there is no cap on this program and the tax credit can be sold once it is certified by the Oregon Department of Energy. Brokers of these tax credits indicate that there is presently more appetite for these credits than availability.

It is important to note that revenues for waste streams are comparable to the energy revenues for this project. This is the primary reason for the higher capital cost of this project on an energy basis. The tipping fees used to model this revenue component were compared to two other feasibility studies co-funded by Energy Trust. The City of Gresham and Clean Water Services have evaluated tipping fees for brown grease and the values ranged between $0.10-$0.15/gallon (also confirmed in Pendleton's study). The tipping fee used for this project ranged from $0.05-$0.10/gallon and is therefore considered conservative.

Above Market Cost Evaluation

To determine the AMC for custom projects in a consistent and transparent manner, each project must undergo a due diligence evaluation of key development requirements (noted under Project Evaluation above), establish the term for the project, and select an Internal Rate of Return for the project.

The project term used to conduct the financial analysis is based on the unique requirements of the project and typically ranges from 15-25 years. The IRR applied to each project is determined by a matrix that reflects the risk of the project, the returns reflected in recent market activity, project ownership (public versus private) and how the project will be financed.

Once the Above Market Cost is established, the final project incentive attempts to provide a financial floor to the expected return of the project, reflect the budget constraints of Energy Trust, and to align the interests of all parties around a successful project.

Proposed Incentive

Based on the selected IRR and including the BETC pass through dollars, the project has an above market cost of $1,622,568 in 2012 dollars.

I propose a total incentive of $450,000 paid in three installments: $150,000 paid upon commissioning and a second payment of $150,000 paid when the project has achieved an agreed upon electricity production (typically one year of operation). A third payment would be paid when the project achieves commercial operation for third engine. The NPV of the incentive is $386,565 in 2012 dollars. The proposed incentive (NPV) is 24% of the above market cost. The incentive cost of the project is $2.2 million/aMW.

While the proposed incentive falls short of the IRR assumed for this project it does exceed the City's minimum criteria of a 20 year payback for the project. At $2.2 million/aMW the project is similar in cost to the RES project at $2 million/aMW. The project will also retain 75% of the RECs as additional income to the project. There are adequate dollars in the Pacific Power budget to cover this incentive.

As mentioned above the City believes that there are available waste streams to support an additional electricity production. However, due to the inability to secure contractual control of those waste streams they proposed a project with more conservative energy production (and related tipping fees) but with adequate capacity to receive and digest additional waste streams if and when they become available. This provides the opportunity to add incremental engines that would result in capital cost recovery in less than 5 years, significantly improving the project's financial performance.

Renewable Energy Certificate (REC) Allocation

Based on an incentive of $386,565 (NPV) the levelized cost of 24% of the 1384 RECs associated with this project per year over 25 years is $84.86/REC. We estimate the market value for RECs currently to be $8.11/REC levelized. Because our incentive for this project produces a higher value for the prorated portion of RECs than market, we base our allocation on a percentage of the incentive to total above market cost (24%).

Evaluation Reviewed and approved by:

Elaine Prause, Sr. Business Program Manager

Internal Review Committee:

Elaine Prause
Betsy Kauffman
Jed Jorgensen
Debbie Menashe
Sue Sample
Sue Fletch

Renewable Advisory Council:

This project will be presented to the RAC at the August 2011 meeting.