



Design Review Committee Briefing #7

Subject: Biogas Resource Recovery Economics Example

Date: November 9, 2018

The Issue

The Design Review Committee (DRC) has expressed an interest in the economics of potential resource recovery opportunities. The Nampa Wastewater Program Management Team (WPMT) recently completed a preliminary evaluation of the potential to modify the current biogas approach and recover biogas for a beneficial end use. This briefing describes this evaluation as a means of highlight the benefits and costs associated with pursuing the beneficial reuse of biogas.

Background and Analysis

The Nampa WWTP currently produces biogas through digestion of solids. The City treats the biogas and re-uses a portion of it for digester and building heating, and any excess gas is routed to a candlestick flare and combusted. For digester gas to be used for pipeline injection, removal of contaminants from the biogas is required, including hydrogen sulfide (H₂S), moisture (H₂O), siloxanes, and carbon dioxide (CO₂), to levels set by the natural gas utility or pipeline owner. Onsite storage is not required for pipeline injection because gas injection occurs in real-time; storage is required for vehicle fuel due to intermittent fuel consumption. Before treatment, digester gas typically consists of 55 to 65 percent methane (CH₄) and 35 to 45 percent CO₂ by volume, in addition to other impurities at low concentrations.

The City preliminarily evaluated the potential to upgrade the existing biogas system to allow for pipeline injection. This evaluation assumed that the City treats its biogas to pipeline quality standards, injects the RNG into the natural gas pipeline and earns revenue from the sale of the gas. The revenue comes from two sources, with the first being the fuel value of the gas sent to the pipeline. By partnering with an organization that purchases the RNG for use in vehicles, the transaction can generate Renewable Identification Numbers (RINs) as part of the Renewable Fuel Standard (RFS) Program. For this analysis, D3 (cellulosic) RINs are assumed, which are the classification for municipal wastewater treatment facilities. For the D3 category, the sale of vehicle fuel RINs is \$2.50/GEE and is applied as a potential revenue source. RINs are sold to Obligated Parties under the Renewable Fuel Standard (Energy Policy Act of 2005; Energy Security and Independence Act of 2007). Obligated Parties include refineries and fuel importers that are required to blend renewable fuels into the US fuel supply. An annual required volume obligation (RVO) for fuel blending sets the goals for each year. The Obligated Parties then either buy the renewable fuels (ethanol or biodiesel, e.g.) and blend them or buy RINs as credits toward their annual goals.

Table 1, below, shows the capital, operating, and repair and replacement costs associated with upgrading the existing biogas system to allow for pipeline injection. An upfront investment in a biogas upgrading system would be required to receive any returns on the resource. However, the potential returns from selling biogas and RINs exceed the cost of capital improvements as demonstrated through the positive net present value over the analysis period. Using the assumptions in this evaluation, the estimated payback is approximately 12 years considering the time to construct the needed upgrades since revenue is not recovered until the biogas can be delivered to the pipeline.

Table 1. Digester Biogas Utilization Net Present Value (20-Year Net Present Value)¹

Description	Capital Cost	O&M Cost	R&R Cost	Benefit Cost	20-Year NPV ³
Invest in Biogas Upgrading System/Monetize Biogas	\$10,040,000	\$15,640,000	\$8,300,000	\$50,630,000	\$16,660,000

1. All amounts are in 2018 dollars

2. Running costs/benefits for Alternative 1 were only applied from 2034 to 2040 (assuming system is not constructed/operational until 2034).

3. NPV = Benefits – Capital – O&M – Risk – R&R. Positive values in the 20-year NPV represent positive cash flow.

Potential Consequences

As demonstrated in Table 1, the recovery and sale of biogas has overall positive economics. In considering the implementation of this approach, there are several areas to highlight for the DRC that impact the overall economics and user rates.

- **Capital Costs:** The budget and funding for the Phase II/III Upgrades does not currently include the capital costs associated with biogas recovery. Including these capital costs would have an upward pressure on rates.
- **Value of RINs:** The results of the evaluation are dependent on the value of RINs. Table 2 demonstrates the changes in the overall economics through changing the RINs value. Additional adjustments to the RINs value were performed to determine what RINS value results in a net positive annual benefit/revenue of \$1M/year (2018 NPV) at 2040 gas production rates. A RIN value of \$1.39/GEE (a 44% reduction from the base assumption) nets \$1M/year in annual benefit (2018 present value) at the 2040 gas production rates. This demonstrates that even with a sizable decrease in the value of RINs, which is not anticipated given the current market conditions, there is still substantial value in the sale of upgraded biogas.

Table 2. Sensitivity to Changes in RINs Value

Description of sensitivity analysis change	Base Assumption	Adjusted Value	20-Year NPV	Payback Period, years
Base case – no change	N/A	N/A	\$16,650,000	12
RINs value, decrease 20%	\$2.5/GEE	\$2.0/GEE	\$9,150,000	14
RINs value, increase 20%	\$2.5/GEE	\$3.0/GEE	\$24,160,000	10
Eliminate RINs value	\$2.5/GEE	\$0/GEE	(\$20,360,000)	N/A

Recommendation

This briefing is intended to provide an overview of the general economics associated with biogas recovery. If this is a topic that the DRC is interested in pursuing further, the Preliminary Design Technical Team recommends developing an evaluation of potential biogas recovery opportunities and selecting the opportunity that is most favorable economically for the City. These opportunities could include cogeneration, biogas recovery for vehicle fueling, and biogas recovery for pipeline injection. Each of these opportunities would require additional capital costs. The DRC could then elect in the future to recommend pursuing the preferred approach to biogas recovery by increasing the overall Program budget or through cost savings realized on other parts of the project.