EXECUTIVE SUMMARY REPORT

HIGH STRENGTH LIQUID WASTE MARKET ASSESSMENT FOR CALUMET WRP

BIOGAS UTILIZATION AND RISK ASSESSMENT FOR CALUMET WRP

PRELIMINARY ECONOMICS FOR A LARGE VOLUME HIGH BTU FACILITY SUCH AS STICKNEY WRP

Prepared for:

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in association with

ecoengineers

Executive Summary

INTRODUCTION

The District's commitment to resource recovery and energy neutrality combined with renewable fuel standards and clean energy demand have created exciting opportunities for how to best utilize biogas at the District's WRPs. Some biogas utilization options have the potential to generate significant financial returns, albeit in some cases with equally significant financial risk. Additionally, with lower phosphorus limits, the District must decide on a path forward to supplement the carbon demand for biological phosphorus removal (Bio-P). Schiff Hardin LLP commissioned CDM Smith and EcoEngineers to prepare several financial risk assessments to explore the potential financial outcomes for different biogas utilization options. These assessments evaluated the risk and financial outcomes of several potential improvements at the Calumet WRP, and the implications for a large volume high BTU (a measurement of heat) facility such as the Stickney WRP.

Specifically, these assessments included:

- Market and financial risk assessment of using high strength liquid waste (HSLW) to meet supplemental carbon requirements for biological phosphorus removal at Calumet WRP
- Financial risk of three biogas utilization options at Calumet WRP: Combined Heat & Power (CHP); Renewable Natural Gas (RNG) Pipeline Injection; Compressed Natural Gas (CNG) Production for a vehicle fueling station
- Financial risk of future RNG Pipeline Injection at a large volume high BTU facility such as the Stickney WRP

The objective of these assessments is to evaluate the major risks of each and to present the District with the pertinent information to make informed decisions on the path forward.

HSLW MARKET ASSESSMENT

This assessment provides an independent review of the High Strength Liquid Waste (HSLW) market in the Chicago metropolitan area, considering whether resources are sufficient to meet the Calumet WRP carbon demand for biological phosphorus removal. Additionally, the report provides a financial assessment of a proposed HSLW receiving station and a discussion of the key risks associated with a HSLW program (considerations of quality, delivery, cost, and firm supply).

This assessment surveyed the major HSLW generators, haulers and brokers, quantifying volumes, quality and costs or revenues associated with each waste stream in the Chicago metropolitan area, including parts of southeast Wisconsin and northwest Indiana. The survey identified waste streams from a wide variety of commercial and industrial facilities, with varying characteristics and quality. Only those with characteristics viable as supplemental carbon for biological phosphorus removal were assessed. Major sources of HSLW available outside of the Chicago metropolitan area were also assessed, particularly those from the biofuels industry. The assessment determined that 14.5 million gallons of HSLW, equating to 4.8 million lbs of soluble chemical oxygen demand (sCOD), are produced each day by the major HSLW generators. Figure ES-1 presents a geo-spatial visualization of local high strength waste generators and the assessed pounds of sCOD produced per day.

Figure ES-1: Geo-Spatial Visualization of Local HSW Generators with Assessed Relative Available HSW

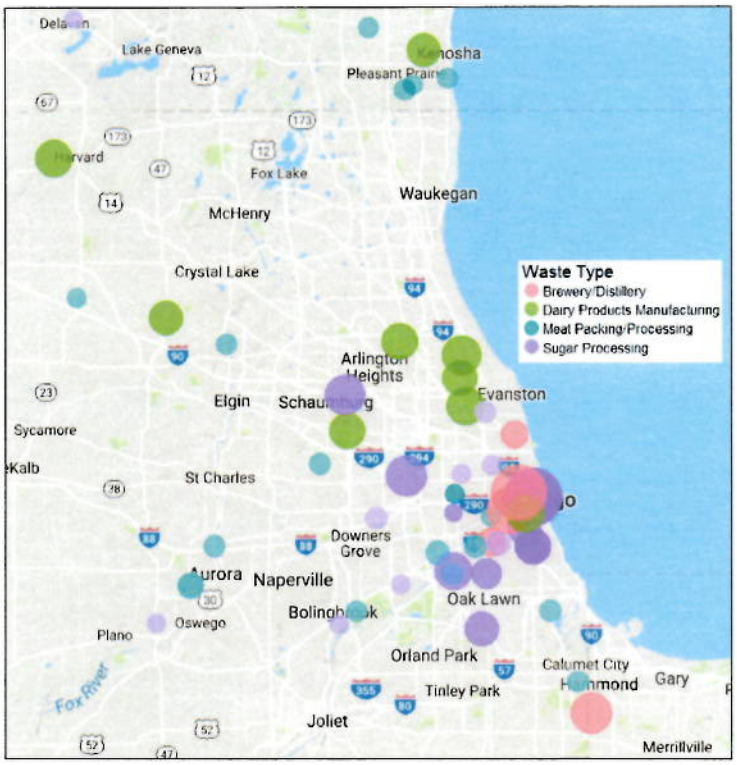


Table ES-1 provides a summary of the market assessment results, comparing a premium carbon source with HSLW streams, including these key parameters: soluble COD range, assessed volume, soluble COD, and tipping fee/cost range.

Table ES-1: Summary of HSLW Quantities, Strength and Tipping Fees/Costs

HSLW Category	Soluble COD Range (g/L)	Assessed Volume (gpd)	Assessed Soluble COD (lb/day)	Tipping Fee/(Cost) Range ($/gal)
Premium - MicroC 2000™	1,000-1,100	NA	NA	(1.50)-(1.75)
Ethanol Waste - Thin Stillage	10-100	12,900,000	3,820,000	(0.00)-(1.00)
Biodiesel Waste - Crude Glycerol	800-1,400	68,200	586,000	(0.80)-(1.15)
Meat Packing/Processing Waste	0.5-20	422,000	17,700	0.01-0.03
Sugar Waste	10-800	700,000	222,000	0.00-0.03
Brewery/Distillery Waste	10-200	288,000	140,000	0.00-0.03
Dairy Waste	0.1-100	111,000	18,500	0.00-0.03
Total	NA	**14,500,000**	**4,800,000**	NA

It is estimated that the Calumet WRP requires 193,000 lbCOD/day of supplemental carbon to meet proposed phosphorus discharge limits. This assessment demonstrates that sufficient HSLW is available to meet the Calumet WRP supplemental carbon demand. Additionally, the volume of HSLW available from tipping fee generating sources is sufficient to meet this requirement and create a positive revenue stream for the District.

If the Calumet WRP implements a phosphorus recovery facility, the expected supplemental carbon demand will decrease to approximately 100,000 lbCOD/day and so revenue would be less with this option.

HSLW Receiving Station and Fermenters Financial Assessment

The variability of the HSLW streams available will require management and the appropriate facilities and equipment to receive, characterize, sort, and properly dose the HSLW into the treatment process. A key component of this program will be a HSLW receiving station and fermenter facility. The HSLW receiving facility, with an estimated capital cost of $5.9 million, would be comprised of a truck unloading station, transfer pumps, storage tanks, fermentation tanks, dosing pumps, and ancillary support facilities.

Using a financial model, this assessment compared using HSLW with a receiving station and fermenters with using premium supplemental carbon and chemical phosphorus removal in five phosphorus removal scenarios. Three scenarios were established for the HSLW program by varying the ratio of HSLW sources based on the perceived difficulty of managing the HSLW program and the quality and availability of the HSLW streams. For the chemical phosphorus removal scenario, it was assumed that the coagulant, aluminum sulfate (alum), is used to remove the required amount of phosphorus to reach an effluent total phosphorus (TP) requirement of 0.5 mg/L. For the premium and HSLW scenarios, a supplemental carbon requirement of 193,000 lb COD/day was used to reach the 0.5 mg/L TP effluent requirement. Table ES-2 presents the composition of the five scenarios, including the typical tipping fee or cost for each HSLW or carbon source or chemical addition.

Table ES-2: Scenario Composition and Selected Tipping Fees/Costs

Chemical/Source	Chemical	Premium	Conservative	Moderate	Aggressive	Tipping Fee/Cost (¢/gal)
Alum	100%	-	-	-	-	(77)
MicroC 2000™	-	100%	-	-	-	(163)
Crude Glycerol	-	-	33.3%	10%	-	(97.5)
Sugar Waste	-	-	33.3%	45%	45%	1.5
Brewery/Distillery Waste	-	-	33.3%	45%	45%	1.5
Meat Packing Waste	-	-	-	-	5%	2.0
Dairy Waste	-	-	-	-	5%	1.5
Total	100%	100%	100%	100%	100%	-

A financial model was developed to project 20-year net value or cost for the proposed financial scenarios. The results of the financial model are summarized in Table ES-3. The table provides the annual chemical costs, annual revenues, annual O&M costs, capital costs and 20-year net value for each scenario.

Table ES-3: Financial Scenario Summary and Selected Tipping Fees/Costs

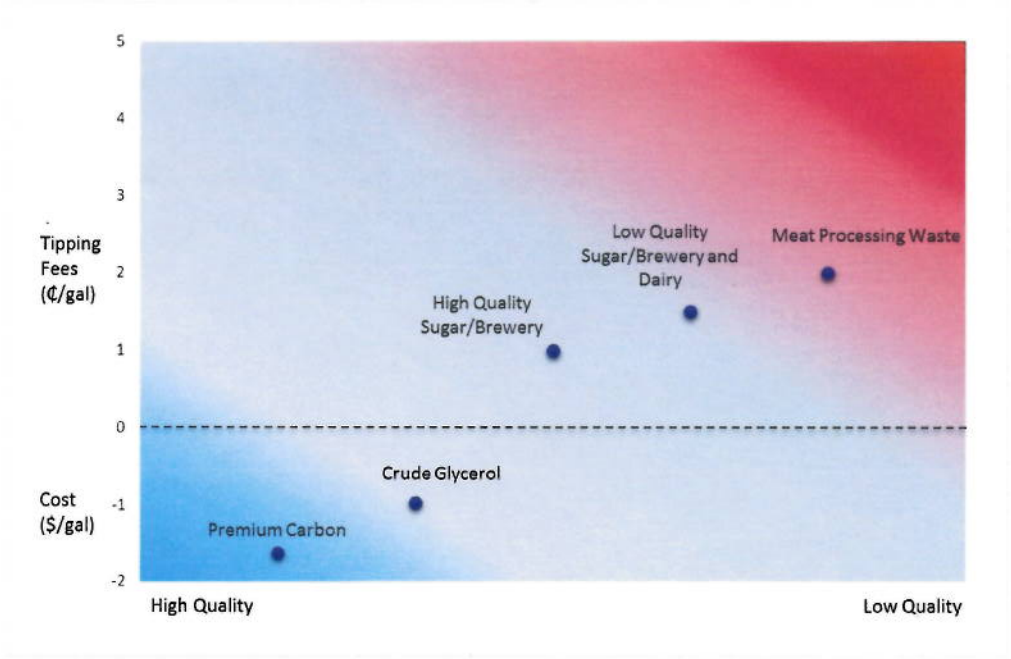
Financial Scenarios	Annual Chemical Cost	Annual Revenue (Tipping Fees)	Annual O&M Costs	Capital Costs with Principal and Interest	20-Year Net Value
Chemical	($4,350,000)	$0	$96,000	$5,215,000	($94,110,000)
Premium	($13,400,000)	$0	$106,000	$3,245,000	($272,992,000)
Conservative	($1,410,000)	$1,840,000	$479,000	$5,977,000	($9,010,000)
Moderate	($422,000)	$2,479,000	$479,000	$5,977,000	$23,531,000
Aggressive	$0	$4,480,000	$479,000	$5,977,000	$71,994,000

The results show that the HSLW conservative, moderate and aggressive scenarios provide a favorable 20-year net value as compared to using a premium carbon source or a chemical coagulant. The conservative, moderate, and aggressive scenarios are estimated to produce positive revenue flow from tipping fees, ranging from $430,000 to $4,480,000 per year, whereas chemical treatment and premium carbon source scenarios have significant costs of $4,349,000 and $13,381,000 per year. Decreasing the carbon demand by implementing phosphorus recovery will decrease the 20-year net value for the HSLW scenarios, as the supplemental carbon volume requirement will decrease; therefore, the tipping fees generated will also decrease.

Risk Assessment

Throughout this assessment, specific risks were identified with the HSLW market. Only market trends for HSLW acceptable for biological phosphorus removal were considered in this risk assessment. Three main risk categories were identified to discuss in this risk assessment: quality, competition, and market disruption. Quality was identified as an immediate risk, as it impacts the potential tipping fee revenue directly, as well as the difficulty in managing the HSLW stream. Competition from other municipal WRPs was not determined to be a significant risk. However, animal feed operations are potential competitors, particularly in the biofuels co-product market. Market Disruption is defined as events that significantly change the flow of products in a particular market and are difficult to predict. However, even if the tipping fees are significantly reduced, a HSLW program is still a financially favorable alternative to premium supplemental carbon or chemical phosphorus removal. Based on this assessment, Figure ES-2 was developed to show the general relationship between the revenue or cost of the HSLW streams and HSLW quality. In Figure ES-2, the red areas denote higher risks and blue area denotes lower risk.

Figure ES-2: HSLW Program Management Risk Diagram



To mitigate these risks, it is suggested that supply agreements and operational flexibility should be implemented as part of the HSLW program. Supply agreements can ensure quality with specifications and can lock in suppliers/haulers to regularly scheduled deliveries, improving reliability and consistency of the waste stream. The District has already obtained under its Resource Recovery Ordinance Program good quality HSLW from sugar manufacturing and brewery sources, which generated tipping fees also. Operational flexibility can

be achieved through comprehensive receiving station design that accounts for the full range of potential quality and quantity of the waste and allows for management of waste volume and characteristics.

Conclusions

This assessment generated the following conclusions on the HSLW market:

- There is sufficient HSLW available to the Calumet WRP to meet the current supplemental carbon demand of 193,000 lb/day.
- Costs/Fees for HSLW are very attractive to reduce treatment costs or generate revenue and provide a favorable 20-year net value as compared to premium carbon sources or chemical phosphorus removal.
- Risks, including quality, competition, and market disruption can be mitigated with supply agreements and an operationally flexible HSLW receiving facility.
- Capital and operational costs to develop a HSLW program and receiving facility are justified by this financial assessment.

Recommendation

Proceed with full utilization of the HSLW receiving station and fermenters to meet biological phosphorus removal carbon demand for the Calumet WRP.

CALUMET BIOGAS UTILIZATION RISK ASSESSMENT

A financial risk analysis of several biogas utilization options for the Calumet WRP were assessed including the following:

- Combined Heat and Power (CHP) Generation
- Renewable Natural Gas (RNG) Pipeline Injection
- Compressed Natural Gas (CNG) Production and Fueling Station

Each of these options were evaluated to determine capital costs, O&M costs, and potential net annual values and project payback periods based on three financial outlook scenarios deemed "Conservative," "Moderate," and "Aggressive." Ultimately, the financial projections of the RNG Pipeline injection and CNG Fueling Station options are highly dependent on the sale of Renewable Identification Number (RIN) credits, which are varied in each of these financial scenarios.

RIN Benefits and Risks

RIN credits offer the District the opportunity to reposition its WRPs as renewable fuel production facilities under the federal Renewable Fuel Standard (RFS) program by utilizing its biogas as a transportation fuel. RIN credits, as well as other related environmental credits such as California's Low Carbon Fuel Standard (LCFS), offer the opportunity for significant added value and financial return for the District beyond the value of natural gas. The value associated with these environmental credits for RNG are driven by current federal legislation and policy that have fixed certain requirements through 2022. One of these requirements, the renewable volume obligations (RVO), establishes the required volume of renewable fuels that must be blended into the transportation sector. Beyond 2022, these requirements will be set annually and are difficult to predict with certainty at this time. Additionally, similar to energy and other commodities, RIN value is also driven by market demand, is difficult to predict long term, is not guaranteed, and can vary widely based on a number of factors. RIN value is one of many risks faced by the District on a biogas utilization project, but RIN value is the one most impactful to the overall financial benefits. Specifically, for the District, addition of non-cellulosic wastes, or organic wastes such as food waste, creates programmatic classification uncertainties that will impact RIN value.

Risk Assessment

The potential biogas utilization options each have unique risk factors with the largest and most significant risk factors summarized for each option below.

Combined Heat and Power (CHP) Generation

- Capital costs for 'right-sized' CHP system
- Project payback is directly dependent on CHP system uptime
- Biogas treatment is required to maximize engine uptime

Renewable Natural Gas (RNG) Pipeline Injection

- Project payback is largely dependent on value of RIN credits generated
- No local pipeline is available for injection; RNG must be compressed and trucked to an offsite unloading and injection point

- Biogas requires treatment to meet pipeline RNG quality standards
- Incorporation of outside non-cellulosic waste sources reduce the value of the RIN credits generated

Compressed Natural Gas (CNG) Production and Fueling Station

- Project payback is largely dependent on the value of RIN credits generated
- CNG production is expected to operate 24/7/365 which will require diversity of CNG outlets to satisfy continuous production
- CNG fuel requires trucking of compressed fuel to offsite fueling station(s)
- Incorporation of outside non-cellulosic waste sources reduce the value of the RIN credits generated

Of the risk factors identified above, the most significant and impactful by a substantial margin is the potential range in RIN value. The risks are related to the RFS program, RIN price variability, and ability to implement risk mitigation strategies. To evaluate these risks, the CDM Smith/EcoEngineers team developed three financial outlook scenarios deemed "Conservative," "Moderate," and "Aggressive," which consider potential market conditions of the future RIN markets. Although these scenarios consider several risk factors, the two with the greatest potential impact are the RIN value and the LCFS credit value as shown in Table ES-4.

Table ES-4: Summary of RIN and LCFS Values by Financial Scenario

	Conservative	Moderate	Aggressive	Current Conditions
D3 RIN Value, $/RIN	$0.50	$2.50	$3.20	$2.60
D5 RIN Value, $/RIN	$0.25	$0.70	$1.25	$0.75
LCFS – Carbon Trading Price, $/MT	$0	$75	$175	$125

Table ES-5 below presents a summary of the financial performance of the biogas utilization options for the three financial risk scenarios.

Table ES-5: Biogas Utilization Option Performance Summary

		CHP System Costs		
CHP Option	Capital Costs	$14,710,000 - $18,770,000		
	Total Annual Costs	$1,309,000 - $2,456,000		
	Total Annual Value	$2,481,000 - $3,967,000		
	Net Annual Value	$1,172,000 - $1,511,000		
	Payback Period, yrs	14.8 - 15		
		Conservative	**Moderate**	**Aggressive**
RNG Pipeline Injection Option	Capital Costs	$33,670,000	$33,670,000	$33,670,000
	Total Annual Costs	$2,046,000	$2,770,000	$3,824,000
	Total Annual Value	$1,247,000	$5,355,000	$10,506,000
	Net Annual Value	($799,000)	$2,585,000	$6,682,000
	Payback Period, yrs	NA [1]	13	5
		Conservative	**Moderate**	**Aggressive**
CNG Production & Fueling Station Option	Capital Costs	$38,820,000	$38,820,000	$38,820,000
	Total Annual Costs	$1,912,000	$2,637,000	$3,690,000
	Total Annual Value	$1,877,000	$5,986,000	$11,137,000
	Net Annual Value	($35,000)	$3,349,000	$7,446,000
	Payback Period, yrs	NA [1]	11.6	5.2

[1]"NA" was noted for options/financial scenarios in which there is no payback period as a result of the net annual costs exceeding the net annual value.

Most notable in these financial modeling results is the sensitivity to the RIN value and the dramatic range of potential Net Annual Value and Project Payback between the conservative and aggressive financial scenarios of the RNG and CNG options. This variability is directly dependent on the fluctuations and uncertainty surrounding the RFS program. Another important consideration is that projecting the future RFS/RIN markets beyond a five-year timeframe is increasingly unknown because of the uncertainty surrounding the future of these programs.

The risk of a RNG or CNG option can be significantly mitigated by the District by entering into a Public-Private Partnership (P3) or Design/Build/Own/Operate (DBOO) delivery option. Generally speaking, the District would be required to provide limited capital investment and receive approximately 5 to 10 percent of the net revenues from sale of both the fuel and energy credits. For example, the moderate scenario Net Annual Value for the RNG Pipeline Injection Option would be reduced from $2,585,000 to a range of $129,000 to $259,000. A P3 or DBOO delivery option would relieve the District essentially of nearly all the risk but also reduces the potential annual revenue by a factor of between 10 and 20.

Conclusions

Table ES-5 indicates a dramatic result in the financial scenarios in that the RNG and CNG options have a net negative payback under a conservative financial scenario. This is to say that if the EPA dramatically lowers the RVO mandates and/or the RIN market drops to historic lows, the paybacks for the capital costs would never materialize, which would indicate a failed project. Although this conservative financial scenario is not anticipated to occur, even a limited possibility of this scenario occurring represents significant and unacceptable risk to the District.

On the other hand, for the CHP option, the range in system costs and potential payback periods is reflective of uncertainty of the biogas available for CHP, the capital costs inclusive of system components, and the

operational and maintenance costs of these facilities. The potential project cost ranges are the largest risk factors of the CHP option. However, a critical point is that the risk factors associated with the CHP option are considered to be significantly smaller than risks associated with RNG/CNG options. This discrepancy in risk is reflected in the potential ranges in project paybacks presented in Table ES-5 above. Also important to note is that the risks associated with CHP are much more predictable and able to be mitigated in subsequent design development stages.

This assessment generated the following summary conclusions for the Calumet WRP biogas risk assessment:

- Risk associated with RIN values and the RFS program increases with longer payback periods that extend beyond 2022. Payback periods for the RNG/CNG options are subject this increased risk and are not optimal at the Calumet WRP.
- RNG or CNG transportation fuel generated revenues from biogas can be very attractive under certain conditions but come with very high risk.
- CHP payback times are low risk, acceptable and independent of RIN value.

Recommendation

Based on the conclusions developed, the most appropriate approach for biogas utilization at the Calumet WRP is to proceed with a CHP option. This approach to biogas utilization produces both power and heat, both of which can be used at the Calumet WRP, largely using existing equipment.

The next phase of implementing a CHP system would be a preliminary engineering phase, which would define important biogas flows and qualities. These design criteria would be utilized to 'right-size' the CHP system for both current and future scenarios. This would also provide the basis for required biogas treatment, which is the single most critical factor in a successful CHP system to maximize engine uptime and payback periods.

BIOGAS UTILIZATION RISK ASSESSMENT FOR A LARGE VOLUME HIGH BTU FACILITY SUCH AS THE STICKNEY WRP

The general financial cost and revenue assumptions from the Calumet WRP were applied to a large volume high BTU facility such as the Stickney WRP to obtain an indication of the potential feasibility of a RNG solution to utilize excess biogas. If a large volume of biogas can be produced, such as may be available at the Stickney WRP, three very important aspects can improve the feasibility of a RNG solution:

- The volume of biogas available would generate significantly more revenue that could offset capital costs. At the Stickney WRP, projected biogas flows range from 6 to 15 times larger than biogas flows projected from the Calumet WRP. This substantial increase in potential biogas flows represents an economy of scale for potential biogas utilization options.

- Adding organic wastes can also escalate projected biogas flows. The escalation of projected biogas flows (Flow A through Flow D, as discussed below) is presented in Table ES-6. The important aspect to highlight is that additional biogas flows beyond Flow A (6,040 Mcf/day) are attributed to imported organic wastes (OW), including food wastes.

- Adjacency of an injection pipeline creates an opportunity not present at the Calumet WRP. For example, available in the immediate vicinity of the facility is an existing high-pressure natural gas transmission pipeline which is capable of receiving significant amounts of RNG produced onsite.

RIN Benefits and Risks

RIN credits and LCFS credits offer the opportunity for significant added value and financial return for a high volume WRP. Biogas produced in municipal wastewater digesters is eligible for RINs, which are classified by fuel type and materials used to create those fuels, and are called "D-codes". There are strict rules relating to the classification for RINs. Biogas created from municipal biosolids (cellulosic biofuels) can generate D3 RINs; while biogas produced from non-cellulosic feedstock (organic waste) is eligible to receive D5 RINs. Currently there is approximately a $1.70/RIN premium for a cellulosic D3 RIN over a non-cellulosic D5 RIN. A large volume high BTU facility such as the Stickney WRP that produces biogas from municipal wastewater and organic waste is eligible for both D3 and D5 RINs. In the case of SWRP potential biogas flows, the base flows for Flow A would receive D3 RIN value, while additional flows from non-cellulosic waste would receive D5 RIN value.

Similar to the discussion for the Calumet WRP, the value associated with these environmental credits for RNG is driven by current federal legislation and policy that have fixed certain requirements through 2022. Beyond 2022, these requirements will be set annually and are difficult to predict with certainty at this time. Conservative, moderate and aggressive risk scenarios were established for assessing the viability of RNG at a large plant. The conservative scenario considers a dramatic scale-back of the RFS program that would remove much of the cellulosic premium and reduce D3 values very close to the D5 floor price. The conservative financial scenario is a true test of the financial feasibility of a project, having removed the majority of the RIN value risk from analysis. Although there are multiple risk factors to consider, RIN value is the most important risk factor relative to return on investment.

Risk Assessment

The production of RNG at a large volume high BTU facility such as the Stickney WRP has several risk factors, which are summarized below:

- Project payback is largely dependent on the value of RIN credits generated.

- Biogas requires treatment to meet pipeline RNG quality standards.
- Projected increases in biogas flows at Stickney WRP are a result of the importing of outside organic wastes (non-cellulosic sources), which will decrease the value of RIN credits generated.

Table ES-6 is a summary of project biogas flows, estimated annual O&M costs, net annual value, and estimated payback periods for a potential RNG project at Stickney. Note that capital and O&M costs associated with acceptance of organic wastes and food waste acceptance are not included.

Table ES-6: Large-Facility, High BTU Upgrade Summary

	Flow A	Flow B	Flow C	Flow D
DG from Sludge, Mcf/d	6,040	6,040	6,040	6,040
DG from OW & Food Waste, Mcf/d	0	4,300	6,690	9,070
Total DG, Mcf/d	6,040	10,340	12,730	15,110
Product Gas, MMBtu/day	3,072	5,260	6,475	7,686
% D3 RIN	100%	0%	0%	0%
% D5 RIN	0%	100%	100%	100%

Annual RIN Values	Flow A	Flow B	Flow C	Flow D
Conservative	$6,575,000	$5,628,000	$6,929,000	$8,225,000
Moderate	$32,877,000	$15,759,000	$19,402,000	$23,029,000
Aggressive	$42,082,000	$28,141,000	$34,646,000	$41,123,000
Annual LCFS Value				
Conservative	$0	$0	$0	$0
Moderate	$4,170,000	$7,140,000	$8,790,000	$10,433,000
Aggressive	$19,161,000	$32,801,000	$40,383,000	$47,933,000
Total Annual O&M				
Conservative	$5,373,000	$5,325,000	$5,573,000	$5,819,000
Moderate	$10,390,000	$8,659,000	$9,671,000	$10,678,000
Aggressive	$15,519,000	$16,932,000	$19,856,000	$22,767,000
Net Annual Value				
Conservative	$4,567,000	$6,063,000	$8,447,000	$10,822,000
Moderate	$30,021,000	$19,999,000	$25,611,000	$31,200,000
Aggressive	$49,088,000	$49,770,000	$62,264,000	$74,706,000
Payback Period, years				
Conservative	14.72	11.09	7.96	6.21
Moderate	2.24	3.36	2.62	2.15
Aggressive	1.37	1.35	1.08	0.90

Conclusions

Table ES-6 illustrates that a potential RNG project has a payback range of 1 to 15 years, depending on the biogas production and the financial scenario of the RIN credit market. The moderate financial scenario, which closely represents the current RIN market conditions, provides paybacks of 2 to 4 years, which is significant considering the initial capital investment exceeds $50 million. These accelerated project paybacks are reflective of the tremendous economy of scale at a large plant and the current lucrative market RIN values. In

addition, shorter payback periods reduce the risks associated with RINs and the RFS program. The financial results indicate that a RNG biogas utilization solution is financially feasible even with potential variability of RIN value in the future.

A key issue to note is that Flow A includes only digester gas produced from sludge, while Flows B, C, and D include digester gas produced from both sludge and non-cellulosic waste. Digester gas from sludge is eligible for D3 RIN credits, while digester gas produced from non-cellulosic waste is only eligible for generation of the less lucrative D5 credits in accordance with current EPA-approved pathways. As a result, although receiving these outside waste sources increases the amount of biogas produced and RNG available for pipeline injection, the less lucrative D5 RIN credits generated decreases the RIN profit and increases risks to the project. These risks include ensuring that these outside waste sources are available in addition to unknown regulatory aspects surrounding the classification of D3 and D5 RIN credits. Efforts are currently underway within the industry to get EPA to establish a protocol for a D3/D5 RIN split, but there is no timetable for resolution. These are important risks to consider when evaluating the financial results for the moderate and aggressive scenarios.

Recommendation

Based on the conclusions developed, the most appropriate approach for biogas utilization at a large volume high BTU facility such as the Stickney WRP is to proceed with generation of RNG for pipeline injection into a nearby natural gas transmission pipeline. Financial results are generally attractive without requiring an increase in biogas production attributed to outside waste sources, but are enhanced with additional biogas production.

The large volume of biogas production, even for the relatively low volume Flow A scenario, municipal cellulosic-based biogas production offers a tremendous economy of scale for RNG production and pipeline injection. This economy of scale corresponds to significant RIN generation and a projected payback period of less than three years under the moderate financial scenario, which is modeled to represent current RIN market conditions.

Additionally, the proximity of an existing natural gas transmission pipeline with sufficient capacity for RNG injection simplifies the ability to move the RNG to market without the construction of a costly pipeline or a virtual pipeline transporting compressed RNG in trailers. This reduces the risk of the potential project and would provide a single interconnection point for all of the RNG produced.

The next phase of implementation of a RNG system would be to perform preliminary engineering, to begin identifying specific sources of organic waste, and to define equipment sizing, pipeline interconnection details, and equipment layout. The District could also engage a potential third-party developer to design, build, own, and operate (DBOO) the RNG facility. This reduces the risk for the District while providing a smaller revenue source, typically 5 to 10 percent royalty of the revenues generated.

Timing is also a critical factor to consider relative to a potential RNG project. As the risk associated with RINs and the RFS program increase post-2022, the sooner a project is installed and is generating revenue, the lower the overall risk for the project.