Energy from Waste Project

Executive Summary

The Southern Alberta Energy from Waste Association (SAEWA) is a coalition of waste management jurisdictions with an interest in implementing technologies to recover energy from residual waste and reduce long-term reliance on landfill disposal.

With membership totalling 62 municipalities, encompassing 12 waste authorities and waste commissions, SAEWA represents a large portion of the population of Southern Alberta outside of the greater Calgary area.

SAEWA has completed a research study confirming the feasibility of establishing an energy from waste (EFW) facility and also issued an REOI to gauge interest and support for an EFW facility.

Proceeding with the next-step in decision-making, SAEWA has prepared a plan to map-out the steps, information needs, resources, schedule and budgets that are required to move forward with development of an EFW facility for Southern Alberta. The project development plan is made up of the following four sub-plans:

- Regulatory Requirements Plan
- Siting Process Plan
- Communications Plan
- Procurement Process Plan

An Initial Business Plan was developed, building upon the four project development plans listed above, to fulfill the following purposes:

- Explore the elements of energy from waste from a commercial business perspective
- Integrate and expand on key business related aspects of the four project development plans listed above
- Describe a recommended framework for implementation of an energy from waste business for SAEWA's consideration
- Identify additional tasks and/or investigations needed to assist with future business planning

This Executive Summary provides a high-level overview of the Initial Business Plan.

1. Description of the Proposed Business

1.1 Core Activities of the Proposed Business:

- Capital Development (approvals, design, construction, commissioning, capital financing, project management)
- Operations (Receiving, handling, processing of waste, recovery of materials and energy from waste, control of emissions, disposal of residue, ash and unprocessible materials)
- Maintenance (preventative, routine and non-routine)
- Administration (marketing, staffing, regulatory compliance, accounting etc.)

1.2 Primary Waste Sources and Quantities

WASTE STREAM	SAEWA TARGETED WASTES (TONNES/YEAR)
MSW from SAEWA Members	196,850
MSW from Non-SAEWA Members	13,300
Other Waste Sources:	
Biosolids (SAEWA Municipalities)	1,232
Combustible Oilfield Waste (IC&I)	2,500
Railway Ties (IC&I)	124,650
Specified Risk Materials (IC&I)	27,500
TOTAL	366,032

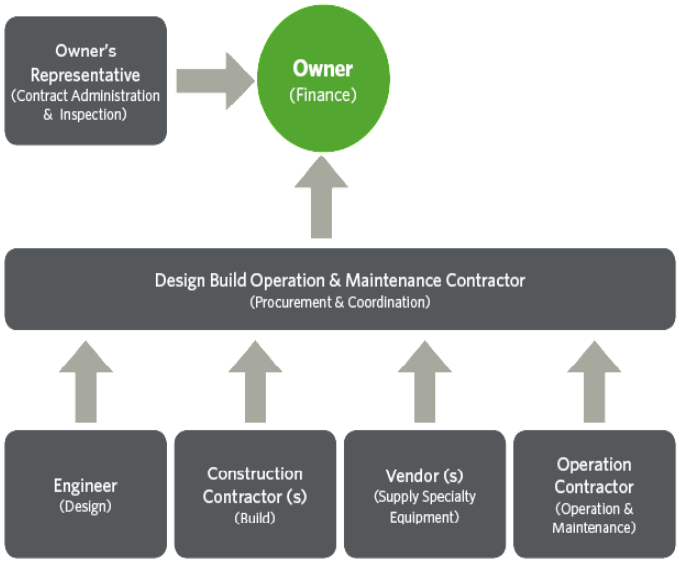
1.3 Facilities and Infrastructure

- Utilities and services
- Site
- Building areas
- Primary equipment

A waste stream analysis and characterization is recommended to:

- Confirm the available waste streams and quantities from both SAEWA's and potential non-member customers
- More precisely define the anticipated waste composition and energy value
- Assist with securing waste supply commitments
- Support final decisions on facility size and processing capacity to inform the regulatory and procurement processes

2. Business Model



Design Build Operate & Maintain (DBOM) Project

2.1 Ownership

In the context of a DBOM project delivery structure the Owner typically:

- Funds and/or obtains financing for the project;
- Defines the project requirements at a high-level;
- Makes contractual commitments necessary to conduct the work of the project;
- Delegates control, authority, responsibility and risk for certain aspects of the project to Contractor(s) and/or others; and,
- Retains ownership of assets and liabilities of the business, as well as primary responsibility for the commercial, financial, regulatory and legal commitments of the business.

2.2 Operations, Management and Administration

EFW facilities generally operate on a continuous basis, with brief turndowns for routine maintenance and shut-downs scheduled periodically for major maintenance and overhaul activities. Certain functions (i.e. waste receiving, management and administration and some routine maintenance) are scheduled to be carried out during normal working daytime periods.

Management and administration of EFW facilities spans the period from project development, through facility commissioning and operations, to decommissioning and closeout.

Dependent on the specific technology, an EFW facility of the size SAEWA is contemplating can create in the range of 300 to 400 jobs during the construction period and may require a full-time staff complement of 40 to 50 personnel for facility operations. Many of these operational positions required skilled and highly trained personnel.

2.3 Costs and Revenue

	ENGERY FROM WASTE BASED SYSTEMS			
FINANCIAL LIFECYCLE SUMMARY ($2014)	RDF AND COMBUSTION	MASS BURN COMBUSTION	GASIFICATION	PLASMA ARC GASIFICATION
Total Waste Disposed (tonnes)	*16,425,000*	*16,425,000*	*13,687,500*	*12,775,500*
Operating Lifespan (years)	*50*	*50*	*50*	*50*
Lifecyle Expenditures				
Capital	$485,211,318	$472,078,618	$476,856,468	$436,630,548
Operating	$1,701,063,914	$1,386,790,125	$1,300,688,771	$1,445,816,655
Total Expenditures	$2,186,275,232	$1,858,868,743	$1,777,545,239	$1,882,447,203
Gross Lifecyle Unit Cost ($/tonne waste)	133	113	130	147
Lifecycle Revenues				
Electricity Sales	$715,502,565	$792,652,860	$524,481,047	$329,798,960
Sales of Recyclables	$84,190,000	$84,178,125	$70,148,438	$65,471,875
Total Revenue	$799,692,565	$881,830,985	$594,629,484	$395,250,835
Residual Asset Value	$25,550,000	$25,550,000	$25,550,000	$25,550,000
Net Lifecycle Cost	$1,361,032,667	$951,487,758	$1,157,365,755	$1,461,646,368
Net Lifecyle Unit Cost ($/tonne waste)	83	58	85	114

There is potential to realize additional revenue from the sale of greenhouse gas emission offsets. This has not been included in the financial lifecycle summary as there remains uncertainty regarding securing GHG emission offsets. **It is recommended that SAEWA further explore the Alberta offsets market and capitalize on this potential source of additional revenue if possible.**

Similarly, sale of heat from an EFW facility is another potential source of revenue but has not been included in the financial lifecycle summary as the potential for heat sales is dependent on the location of the preferred site. **It is recommended that the proximity of suitable heat consumers be considered in development of potential evaluation criteria in the site selection process.**

2.4 Project Funding

Two different stages for funding of the project should be considered including:

- **Project Stage A** - Planning, siting, procurement and approvals activities (i.e. preparatory work); and,
- **Project Stage B** - Capital works and operations (i.e. long-term investment commitments in terms of waste supply, financing, partnerships and revenue streams).

	PROJECT STAGE	
POTENTIAL FUNDING SOURCE	A	B
Alberta Community Partnership Program (formerly the Regional Collaboration Program)	✓	
The Municipal Sustainability Initiative	✓	✓
Alberta Rural Community Adaptation Grant Program	✓	
Canada-Alberta Gas Tax Fund	✓	✓
The New Building Canada Fund	✓	✓
PPP Canada		✓
Revenue from sales of energy and recovered materials		✓
SAEWA membership's capital contributions	✓*	✓
SAEWA membership's tipping fees		✓
Non-member tip fees		✓**
Private sector partner financing		✓
Additional revenue from sale of GHG offsets		✓**
Additional revenue from sale of heat energy		✓**

*May wish to include minor 'in-kind' support. **Subject to future investigations and decisions.

Recommendation:

"that SAEWA investigate the above potential funding sources to pursue those it feels are applicable"

Particular attention should be paid to the need to establish the funding for Stage A activities as soon as possible; while also investigating and determining the implications, eligibility requirements and constraints associated with funding sources that may be applicable to the future Stage B activities.

It is important to recognize that some Federal Government funding programs can trigger a requirement to conduct a Federal Environmental Assessment, which would increase the costs and schedule for project development. Further, some of the Stage B funding sources identified have certain pre-requisite requirements which may need to be fulfilled during Stage A activities.

Developing a better understanding of the alternatives available for funding Stage B activities will assist SAEWA in making informed decisions regarding partnering and financing alternatives during its future business planning activities.

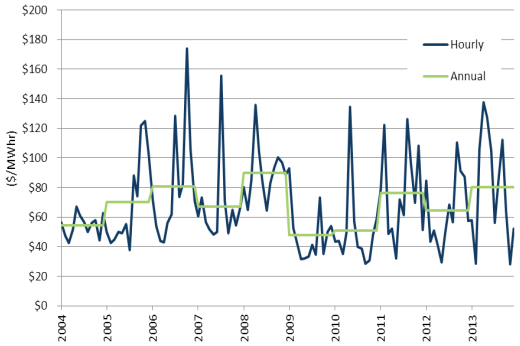
3. OVERVIEW OF KEY ELEMENTS OF RISK

3.1 Cost and Revenue Fluctuations

Other elements of the facility cost and revenue profile (i.e. construction materials, equipment, labour, consumable chemicals, fuel, recyclables, etc.) will also be subject to the dynamics of market price fluctuations.

One key measure to address the uncertainties associated with these fluctuations in decision making is to update the cost and revenue projections periodically as the project development proceeds and additional information is developed.

Historical Average Power Pool Prices



Ultimately, it is only once the siting, regulatory and procurement processes have been completed, detailed information about the project is well-known and a firm and reliable contract proposal has been offered by a project Developer/technology Vendor, that the project financial profile can be precisely determined.

3.2 Waste Supply Competition

Recommendations:

- Prepare a detailed business plan and final business case at key decision making milestones during project development
- Include analyses and projection of market pricing and potential fluctuations for major cost and revenue elements of the project

It is important to recognize that EFW (and other alternative waste management approaches) differ fundamentally from landfill disposal in terms of a number of key characteristics as explored in detail SAEWA's 2011/2012 research reports. Consistent with these fundamental distinctions, in its hierarchy of environmentally sound strategies for waste management, the US Environmental Protection Agency has designated energy from waste as being preferred above landfill disposal, while being less desirable than higher value reduce, reuse and recycling/composting activities.

When considering competition for waste feedstocks and comparing costs of waste management options, it is important to account for the full life- cycle costs and benefits of the alternatives. As described in SAEWA's research report,

Landfill sites are the primary competition for waste but are also an important component of any waste management system, including one with EFW.

"Phase 3, Task 7: Capital and Operating Costs", (January 2012), historically some landfill tipping fees were not necessarily reflective of the actual full life-cycle costs of landfill disposal. In recent years, the costs of siting and development of new landfills has been steadily increasing as: public concern and opposition to reliance on landfilling intensifies; and regulators apply more stringent standards to mitigate the potential impacts of waste management facilities, internalizing some of the cost elements that may not have been fully acknowledged historically.

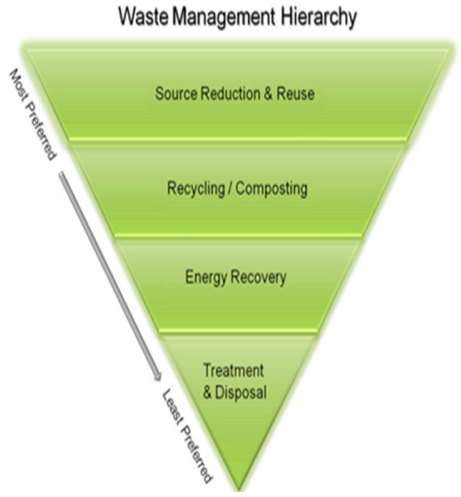
To support the substantial capital investment that more advanced waste management facilities require and "level the playing field", in some jurisdictions where EFW has been implemented, local waste flow control regulations have been created. These waste flow control regulations require that specific waste streams (i.e. municipal solid waste and/or certain IC&I wastes) are regulated to be managed at designated facilities such as energy from waste plants. In the context of SAEWA's planned project, implementation of a waste flow control regulation would be beneficial for the longterm security of the project and would likely require extensive collaboration between Municipal governments and the Province. At this point it is not known whether such a regulation could be established in Southern Alberta.

Recommendation:

- SAEWA carefully consider how its formal structure could facilitate establishment of regional waste flow control in Southern Alberta

Other considerations to mitigate potential competition for the waste supply include:

- Conduct education regarding the importance of recognizing the real, life-cycle costs/benefits of waste management alternatives (see Communications Plan)
- Secure waste supply commitments from SAEWA members
- Establish non-SAEWA pricing as close as possible to local competitive rates for alternatives to capture local non-SAEWA waste (subject to ensuring SAEWA's incremental costs are covered) and actively market any available surplus processing capacity
- Explore the practicality and scope of a potential waste flow control regulation
- Recognizing potential for impact on aspects of SAEWA member's other interests (i.e. existing SAEWA member owned landfills)
- Recognizing that the appropriate timing for a possible flow control regulation may be adjusted to coincide with projected closures of existing SAEWA member owned landfills and other nearby landfills.



USEPA Waste Management Hierarchy[1]

3.3 Stakeholder Relations

Communication is the means to raise stakeholder awareness and build understanding regarding the importance and implications of the project, while engaging key audiences in actively participating in various phases of the work. In order to successfully raise awareness and build knowledge regarding the project it will be necessary to understand the audiences to be engaged. There are some stakeholders that have already been introduced to the project through prior work tasks completed by SAEWA. These include the SAEWA municipalities, certain provincial agencies, the energy from waste vendor community and some media outlets. Other audiences that remain to be more fully engaged include: the general public, residents, businesses, local interest groups, Aboriginal peoples, non-governmental organizations and others. For all stakeholder audiences it will be necessary to gather and analyze data to understand the values, priorities, beliefs, perceptions, experiences, culture and attitudes of these audiences including developing an understanding of their current knowledge and attitudes regarding waste management and energy from waste.

1. Source: http://www.epa.gov/waste/nonhaz/municipal/hierarchy.htm

4. IMPLEMENTATION PROGRAM

4.1 Pre-Development Organizational Tasks

1. Establish SAEWA governance structure including the legal authority to bind SAEWA
2. Secure SAEWA's combined waste supply and conduct waste stream analysis and characterization
3. Establish funding for initial project pre-development activities
4. Establish plans for financing the capital investment required to develop the facility as well as operation, maintenance, and administration cost

SAEWA is currently moving forward with this task and recently retained a consultant to develop a comprehensive Governance Policy.

Concurrent with completion of the governance task, SAEWA will be in a position to work closely with its member organizations to secure commitments for supply of waste to the proposed energy from waste facility. Dependent on the specific legal requirements governing commitments that may be made between SAEWA and its members, at this time it is envisioned that the initial waste supply commitment will take the form of memoranda of understanding.

SAEWA Member Memorandum of Understanding

The memoranda of understanding should reflect an agreement in principle regarding waste supply to an energy from waste facility as well as commitment to proceeding with the development project, subject to certain pre-defined conditions and opportunities where members may elect to opt-out of the project.

4.2 Recommended Additional Business Planning Activities

Waste Stream Analysis and Characterization
As a pre-development organizational activity, it is recommended that SAEWA undertake a waste stream analysis and characterization to:

- Confirm the available waste streams and quantities;
- More precisely define the anticipated waste composition and energy value;
- Assist with securing waste supply commitments; and,
- Support final decisions on facility size and processing capacity to inform the regulatory and procurement processes.

Waste Transportation Business Review and Analysis
As a business planning activity, it is recommended that SAEWA undertake a review and business analysis of the potential options and implications associated with transportation of residual waste to the preferred location of the SAEWA energy from waste facility, with a view to making a decision on whether to include waste transportation in SAEWA's energy from waste service offerings.

Detailed Business Plan
It is recommended that SAEWA update its business plan once the major components of the recommended pre-development organizational tasks are largely completed, the preferred site is identified, waste input sources are secured and energy/product output markets are well-defined and the waste transportation business analysis is complete.

Final Business Case Analysis
It is recommended that SAEWA complete a final business case analysis once siting, procurement and regulatory processes are largely complete. It is at this time that the specific requirements for development of an energy from waste facility in Southern Alberta will be largely known and understood with a degree of certainty. The final business case analysis should be completed to inform a decision by SAEWA on whether to proceed with the substantial commitments necessary to enter into a contract for development of the facility.

4.3 Resource Requirements

Several different resources will be required to complete the recommended business planning activities. Carrying out the work described requires an experienced project leadership group working in collaboration with a diverse group of specialists and subject-matter experts. To provide effective leadership of the overall project development plan and contribute to the regulatory program, it is recommended that SAEWA designate the following key roles from among its representatives as shown below in the following table.

	WASTE STREAM ANALYSIS AND CHARACTERIZATION	WASTE TRANSPORTATION BUSINESS REVIEW AND ANALYSIS	DETAILED BUSINESS PLAN	FINAL BUSINESS CASE ANALYSIS
SAEWA's project steering group	✓	✓	✓	✓
Waste Management Planner	✓			
Waste Audit Support	✓			
EFW Project Management Lead		✓	✓	✓
Traffic Assessment		✓		
Business Management Advisory Lead			✓	✓
Energy Market Analyst			✓	✓
Commodity Markets Analyst			✓	✓

4.4 Budget

The costs to execute the business planning activities can be influenced by a number of factors including:

- The specific outcomes of the siting and procurement processes
- Details of SAEWA's plans regarding governance, pursuit of funding opportunities, financing and partnership arrangements
- Changes to the SAEWA membership and addition of non-SAEWA customer sectors/waste streams that SAEWA may choose to pursue as merchant capacity
- Energy content laboratory analysis of wastes, if required
- Outcomes of membership consultation on the waste transportation business review
- Revisions to the scope of business planning activities to respond to and/or accommodate outcomes of the siting, regulatory, procurement and communications project development activities
- Scheduling and coordination needs with other aspects of the project development program.

Bearing in mind that costs vary based on factors mentioned above and recognizing that there remain a number of areas of uncertainty and potential for change, an initial budget estimate for the business planning activities is presented below. It should be recognized that this budget estimate is approximate and cannot reasonably address all eventualities that may occur.

Preliminary Business Planning Budget

TASK DESCRIPTION	TASK COST
Management & Coordination of Business Planning	$83,800.00
Waste Stream Analysis and Characterization	$160,000.00
Waste Transportation Review and Analysis	$100,000.00
Detailed Business Plan	$225,000.00
Final Business Case Analysis	$270,000.00
Business Planning Activities Total*	$1,006,560.00

*Includes 20% contingency

The following table presents the budgets associated with the Project Development Plan.

PROJECT DEVELOPMENT PLAN BUDGETS	TOTAL BUDGET*
Regulatory Requirements	$3,073,400.00
Silting Process	$2,158,200.00
Communications Plan	$1,498,200.00
Procurement Plan	$1,796,300.00

*Including 10% contingency

4.5 Schedule

A preliminary schedule for business planning activities has been developed; it has been designed to correspond with other elements of SAEWA's project development plan. Some of activities may be carried out in parallel with others and some may be carried out concurrently with activities identified in the other Project Development Plan reports.