Southern Alberta Energy from Waste Association Energy from Waste Project:

Initial Business Plan

June 2014

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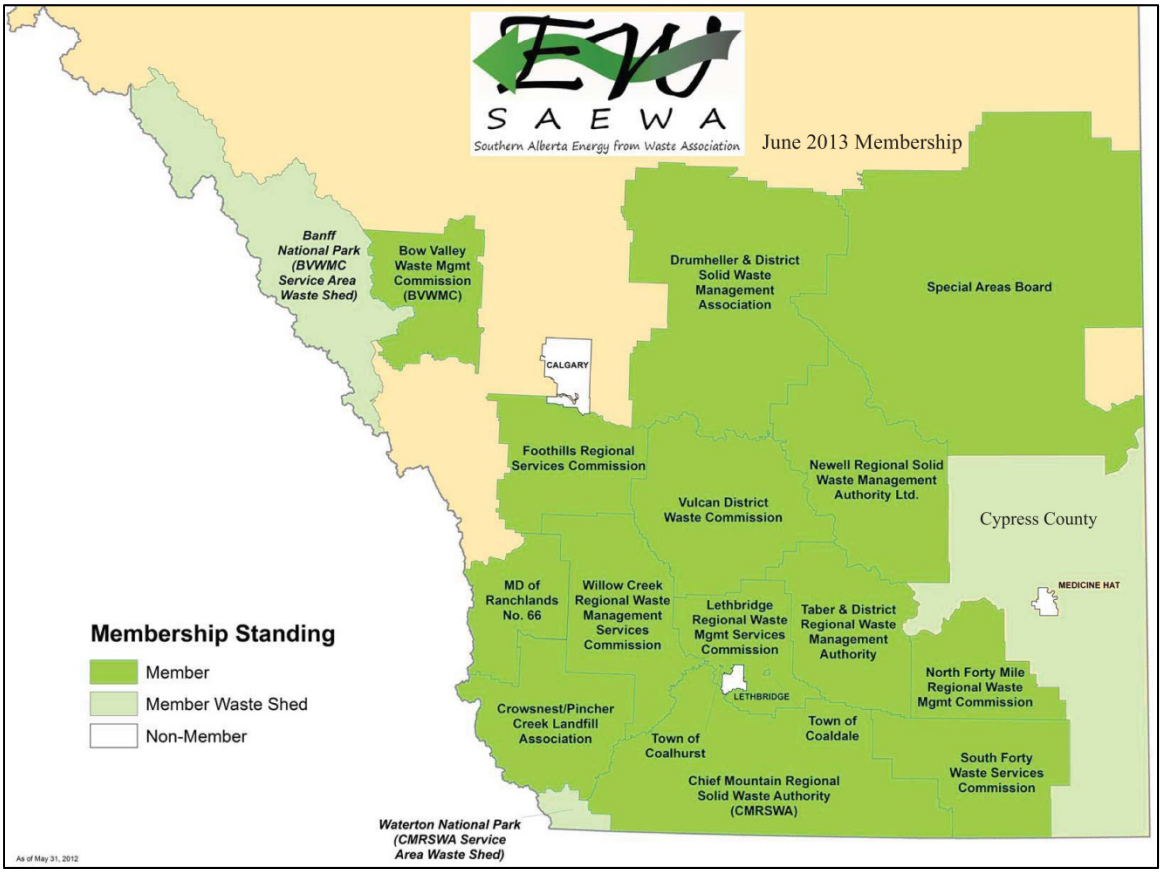
1.0 INTRODUCTION

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.

Figure 1: SAEWA Membership Map



In 2011/2012 SAEWA completed a research study confirming the feasibility of establishing an energy from waste facility for Southern Alberta. The research study reports are available on-line at www.saewa.ca.

Subsequent to completion of the research study SAEWA completed a Request for Expressions of Interest (REOI) process targeting:

- Potential host communities for an energy from waste facility;
- Potential energy from waste project developers/technology vendors; and,
- Potential energy hosts/customers.

Responses to the REOI demonstrated that there is a strong base of positive interest and support for a Southern Alberta energy from waste facility among numerous potential host communities and technology vendors. The REOI also provided valuable information to help shape SAEWA's plans moving forward.

Proceeding with the next-step in decision-making, SAEWA is preparing a plan to map-out the steps, information needs, resources, schedule and budgets that would be required to move forward with development of an energy from waste 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; and,
- Procurement Process Plan.

This Initial Business Plan builds upon the four project development plans listed above, to fulfil the following purposes:

- Document the outcomes of SAEWA's procurement and business planning workshop;
- 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; and,
- Identify additional tasks and/or investigations needed to assist with future business planning.

It is important to recognize that this Initial Business Plan is an early step in assisting SAEWA with its objective of proceeding towards implementing energy from waste for Southern Alberta. Business planning is an iterative activity requiring updates, refinement and revisions as additional information is learned and/or the direction of the project changes. This Initial Business Plan is a "living document", requiring periodic revisions and updates to reflect significant changes to the project which may arise as additional information becomes available and decisions are made. As a minimum it is anticipated that two additional updates will be required as implementation of the project proceeds. An interim update to the business plan

will be warranted once SAEWA's 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. Other interim updates may also be needed at significant project milestones, if determined by SAEWA. A final update to the business plan will also be needed concurrent with completion of the procurement process as a business case to support the final decision on commitment to proceed with the substantial capital investment required to construct the facility. Recommendations for other specific business planning activities, interim updates to this Initial Business Plan and preparation of a final business case are identified in Section 7.0 of this report.

2.0 SAEWA'S PROCUREMENT AND BUSINESS PLANNING WORKSHOP

A workshop was held on February 25, 2014 in Nanton, Alberta and was attended by 13 representatives of SAEWA. The primary purpose of the workshop was to explore and understand the implications of several key considerations regarding procurement and business planning, essential to SAEWA proceeding with an energy from waste project. In addition to fulfilling this informative function, the SAEWA representatives present were asked to provide feedback on their preferences among alternatives related to procurement and business planning for SAEWA's energy from waste project. The materials presented and discussed at the workshop are included in Appendix A.

The following summarizes key outcomes of the workshop:

- ***Waste Supply:*** Attendees concluded that establishment of a method to secure SAEWA's combined waste supply is critical to being able to proceed with an energy from waste project in Southern Alberta and that establishment of a governance model for SAEWA is key to being able to accomplish this.
    - Attendees concluded that the waste supply commitments could be initially established on the basis of memoranda of understanding between SAEWA and each member, defining certain conditions under which waste supply commitments are made and providing future opportunities for members to "opt-out" under certain pre-defined conditions as development of the project progresses.
- ***Project Funding:*** Attendees concluded that establishment of a method to fund the project is critical to being able to proceed with an energy from waste project in

Southern Alberta and that establishment of a governance model for SAEWA and securing the combined waste supply are keys to being able to accomplish this.
    - Potential options for project funding/financing were identified as including some combination of: member capital contributions and tipping fees, Provincial/Federal government funding, private sector financing and/or partnerships (i.e. public-private partnerships per Alberta Infrastructure's Alternative Capital Financing Office and/or PPP Canada).
    - It was acknowledged that some degree of initial project funding will be required to allow SAEWA to proceed with implementation of the early stages of the project development plan (i.e. work activities associated with siting, initial approvals, procurement and communications) prior to engagement of a project Developer/Vendor.
- ***Scope of Services:*** Attendees concluded that the core elements of SAEWA's energy from waste business should include: receiving and processing of waste, recovery of energy, recovery of materials, marketing and management of outputs and administration of the business.
    - Attendees also acknowledged that future consideration should be given to how a transportation business model (see below) could be addressed as a separate initiative or possibly combined with the energy from waste project.
- ***Project Delivery Model:*** Attendees expressed a preliminary preference for use of the general Design Build Operate & Maintain (DBOM) project delivery model for development of an energy from waste facility, with funding/financing methods still to be determined as noted above.
- ***Ownership:*** A preliminary preference was expressed for SAEWA (on behalf of its membership) to retain a degree of ownership and control over key aspects of project development and business operations.
- ***Waste Transportation:*** Attendees expressed that development of a business model for transportation of waste to a proposed energy from waste facility would be important to many of SAEWA's members. It was acknowledged that development of a business model for transportation would depend on the preferred facility location chosen as the outcome of the siting process. Attendees indicated that consideration of a transportation business model should address:
    - Ways that transportation costs could be averaged among the members (i.e. utility model) to recognize the shared benefit of a large combined waste supply and encourage members to commit their waste supply to the facility;

  - Flexibility to address the diverse situations and needs of SAEWA's membership; and,
  - A process for consultations with SAEWA's membership on development of the transportation business model.
- ***Waste Stream Analysis:*** Attendees expressed a preference for SAEWA's project development plan to address the need to complete detailed waste stream analysis and characterization to support:
  - Securing waste stream commitments; and,
  - Identifying waste composition and energy value; and,
  - Development of information on facility size and processing capacity to inform the regulatory and procurement processes.

3.0 GOALS AND OBJECTIVES

The consumptive nature of our society continues to result in production of many different types of waste materials. As examined in SAEWA's 2011/2012 research study, there are numerous existing and emerging technologies which seek to liberate energy, materials and valuable by-products from these waste streams. When we apply life-cycle thinking to the activities that drive our society, it may be concluded that labelling these materials with the term "waste" is misleading. In essence, a large portion of the materials that we define as waste can actually be viewed as unconventional or secondary resources. Implementation of waste resource recovery technologies relies on a program of development and application to:

- Operate efficiently to manage the wastes and recover resources;
- Fulfill a market demand for energy and/or material outputs and/or other by-products;
- Perform to ensure environmental and health protection;
- Achieve overall benefits in terms of waste management alternatives (i.e. diversion from landfill);
- Manage risk exposures;
- Cost effectively reflect the overall life-cycle value achieved; and,
- Meet with public acceptance.

It is in this context that SAEWA is considering the potential for implementing energy from waste in Southern Alberta, with the following fundamental goals and objectives in mind:

- Advance its member communities towards more sustainable management of residual wastes for the long-term;

- Recognize the energy and material resource potential inherent in materials currently defined as solid waste and take steps to recapture and make beneficial use of those unconventional resources;
- Reduce long-term reliance on landfill disposal, diminishing the need for future replacement of existing landfill sites as well as lessening the costs and implications of long-term post-closure care and potential landfill site legacy concerns; and,
- Establish an energy from waste facility that:
    - Is protective of human health, the environment and ecology;
    - Reliably, efficiently and cost-effectively serves the residual waste management needs of SAEWA member municipalities over the long-term;
    - Is a positive presence in its host community and an asset to all SAEWA member municipalities;
    - Is compatible with an integrated waste management hierarchy that prioritizes reduce, reuse and recycle above recovery and subsequent disposal; and,
    - Is compliant with all applicable regulatory requirements.

It is important to recognize that implementing energy from waste requires a shift in perspective from the traditional disposal service approach that is associated with owning and operating a landfill. While energy from waste is fundamentally a solid waste management solution, it is also a production-based commercial business. This is a key distinction that shapes how an energy from waste business must be built and managed. As a production-based business, energy from waste relies on revenue streams from sale of outputs as part of the financial picture. To support the financial viability of the undertaking, it is necessary to secure and protect all of the elements that contribute to revenue generation, while also working to contain costs. This perspective drives many of the business planning considerations to be discussed in subsequent sections regarding: waste supply, marketing of outputs, risk mitigation and protection of the operational value of assets contributing to production.

4.0 DESCRIPTION OF THE PROPOSED BUSINESS

The core service provided by the proposed energy from waste business can concisely be described as: processing solid waste to recover energy and materials, while carefully managing emissions and residues in a manner that is protective of human health and the environment.

4.1 CORE ACTIVITIES

The following lists the core activities of the proposed energy from waste business:

- Capital development of the facility:
  - Approvals/permitting
  - Design
  - Construction and commissioning
  - Capital financing
  - Project management
- Operations:
  - Receiving and handling of wastes
  - Processing of wastes
  - Recovery of materials from waste
  - Recovery of energy from waste
  - Control of emissions (and/or syngas clean-up)
  - Disposal of residues, ash and unprocessible materials
- Maintenance:
  - Preventive maintenance of the facility
  - Routine and non-routine overhauls and upgrades
- Administration:
  - Management of the facility and operations
  - Supply of inputs (e.g. waste feedstocks, fuel, water, consumables, etc.)
  - Marketing of services
  - Marketing of products (e.g. electrical power, heat energy, recyclables, etc.)
  - Management of other outputs (e.g. emissions, wastewater, residues, etc.)
  - Engineering and project management of major facility repairs and upgrades/modifications
  - Staffing
  - Regulatory compliance
  - Stakeholder relations
  - Accounting and financial administration of operations
  - Ownership of assets (e.g. land, building(s), equipment, etc.)

The energy from waste business should be structured with appropriate roles and responsibilities allocated to ensure that each of these elements is conducted as necessary to contribute to the overall success of the business.

4.1.1 Potential Supplementary Activity - Waste Transportation

As noted in Section 2.0, consideration of a potential business model for transportation of waste to a proposed energy from waste facility has been expressed as being important to some of SAEWA's members.

It should be recognized that determination of the preferred location of the energy from waste facility (at the outcome of the Siting Process Plan) is a key factor in being able to proceed with developing a business model for transportation. As indicated in the Siting Process Plan report, the implications of transportation will be a significant criterion to consider in comparing and evaluating potential candidate site locations.

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 a SAEWA facility. The details of the recommended waste transportation business review are described in Section 7.2.

4.2 CUSTOMER BASE AND WASTE SUPPLY

Energy from waste is fundamentally a residual waste management solution and therefore the supply of waste is a critical element. SAEWA's "*Phase 1 Task 1: Waste Generation Rates and Facility Sizing (January 2012)*" research report identified customers and input waste materials for the proposed energy from waste facility as listed in Table 1.

Table 1: 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**

As identified in Section 2.0, a waste stream analysis and characterization is recommended 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.

Details of the recommended waste stream analysis and characterization are described in Section 7.2.

Other potential customer sectors and waste streams have been identified including certain types of agricultural wastes (i.e. plastics and film materials as well as other production and processing wastes) and other IC&I sourced wastes. These other sources of waste material are not controlled currently by SAEWA members, but may be suitable for processing at SAEWA's proposed energy from waste facility.

Receipt of non-SAEWA wastes (i.e. for "merchant capacity") as feedstocks offers the advantage of additional revenue as well as fuel for generation of energy; however, it should be recognized that reliance on non-SAEWA wastes also introduces an element of market risk.

The primary determinant of whether agricultural, IC&I and other non-SAEWA controlled materials will be directed to an energy from waste facility will be the pricing that is available for other applicable waste management solutions. If SAEWA chooses to pursue these other non-SAEWA customers and wastes as part of its plans, active marketing of waste processing services will be a necessary element to include in the core business activities.

While conceptual level cost and revenue projections are included in this Initial Business Plan, all factors necessary to determine a potential pricing structure are not yet defined and will need to be examined in future more detailed business case analyses as the project progresses. It is recommended that SAEWA consider developing a rationale and pricing structure for processing non-SAEWA member materials as part of its future business planning process.

Analysis and decisions regarding merchant capacity and pricing will rely heavily on information to be developed in the recommended waste stream analysis and characterization detailed in Section 7.2.

4.3 FACILITIES AND INFRASTRUCTURE

Recognizing that specific elements of energy from waste facilities vary dependent on the technology applied, the following major facilities and infrastructure are typically required:

- Utilities and services:
  - Water supply
  - Fire protection

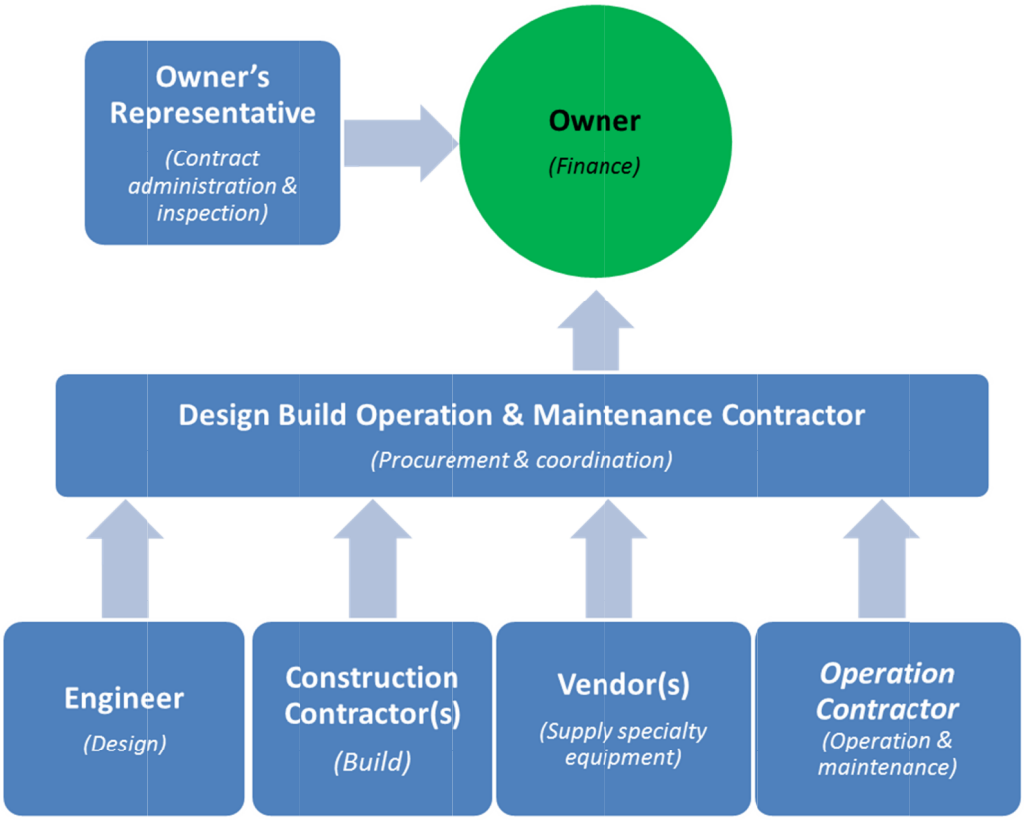
  - Natural gas/fuel supply (for start-up and shut-down)
  - Waste water management
  - Electrical supply
  - Electronic communications
- Site:
  - Entrance(s), parking and roadways
  - Stormwater management and drainage
  - Landscaping
  - Fencing
- Building areas:
  - Waste receiving, handling and storage
  - Waste processing
  - Control room
  - Power plant
  - Air pollution control
  - Residue processing, storage and loading
  - Electrical substation
  - Administration, public reception and staff facilities
- Primary equipment:
  - Waste handling and pre-processing
  - Waste conversion equipment (boiler, gasifier, RDF processing)
  - Energy generation equipment
  - Steam piping
  - Cooling system
  - Ash handling/ conditioning
  - Air pollution control system
  - Water treatment
  - Compressed air system
  - Fire protection
  - Electrical controls and substation

5.0 BUSINESS MODEL

As indicated in Section 2.0, SAEWA has identified a preliminary preference for a Design Build Operate and Maintenance (DBOM) project delivery structure, with some or all ownership to be retained by SAEWA depending on funding and financing options that may be available. Figure

2 schematically illustrates the relationships, roles and responsibilities typical for a DBOM project delivery model. Variations on the typical DBOM arrangements shown are also possible. The Procurement Process Plan report discusses the range of project delivery models available; as well as the typical roles, responsibilities and relationships of the parties to the project.

Figure 2: Design Build Operate & Maintain Project Delivery Structure



Design Build Operate & Maintain (DBOM) Project

SAEWA's preferred approach implies that a large portion of the capital development, operations and maintenance activities would be delegated to Contractor(s), while the administrative and ownership functions would be shared between SAEWA, Contractor(s) and any project partner(s).

Delegation of specific roles and responsibilities to the various parties involved with the project is a matter to be defined in more detail during implementation of the Procurement Process Plan. In proceeding with procurement activities (See Procurement Process Plan) the relationships of the parties to the project should be assigned to suit SAEWA's objectives. The

roles and responsibilities of the parties should be clearly defined in the procurement documents, which will be used to form the basis for any contractual arrangements between SAEWA and the DBOM Contractor.

5.1 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.

There is generally some degree of flexibility to negotiate the specific roles and responsibilities of the parties to the project, which should be clearly defined in the contractual agreements that are established.

Because of the on-going obligations and risks associated with ownership, the Owner needs to maintain control over the business. There are numerous arrangements available to accomplish this, depending on the degree to which the Owner wishes to exert control versus delegation to others. While determination of the specific form of business organization SAEWA may wish to implement is beyond the scope of this report; the matter relates closely to the governance structure SAEWA establishes as part of its recommended pre-development organizational tasks described in Section 7.1.

The combined and secured waste supply of SAEWA's members is a key component of SAEWA's ability to establish an ownership role for itself in the project. In addition to any grant and/or deficit funding sources that may be available to SAEWA, guaranteed payments against supply and processing of future waste quantities will form the basis for financing the facility.

5.2 OPERATIONS, MANAGEMENT AND ADMINISTRATION

For reference, Section 4.1 provides a listing of the core activities of an energy from waste business including major project development, operational and management/administration functions.

Energy from waste facility operations vary somewhat dependent on the technology applied. Appendix B presents schematics illustrating the primary operational elements of the technology categories that were recommended for further consideration (RDF and combustion, mass burn combustion, and gasification/plasma arc gasification) in SAEWA's 2011/2012 research reports.

Energy from waste 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 energy from waste facilities spans the period from project development, through facility commissioning and operations, to decommissioning and closeout.

Dependent on the specific technology, an energy from waste 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. Table 2 lists the staffing requirements anticipated for SAEWA's energy from waste facility during its operating lifespan.

Table 2: Facility Staffing

Personnel	Approximate Number of Staff Anticipated
Plant Manager	1
Administrative Support	3-4
Plant Engineer	1
Shift Supervisors	3
Safety and Environmental Compliance Coordinators	3
Scale Operators	3-4
Control Room Operators	2-4
Facility Operations	8-10
Waste Receiving, Screening and Crane Operators	8-10
Maintenance	8-10
Sales and Marketing*	1-2*

*Required if waste is to be sourced outside of a secured waste supply agreement from non-members.

5.3 COSTS AND REVENUE

Information presented in this section updates and summarizes the cost and revenue projections which were presented in SAEWA's "*Phase 3, Task 7: Capital and Operating Costs (January 2012)*" research report. Please refer to the historical research report for details regarding the founding assumptions and basis for the information presented in these tables. While these financial projections remain consistent with the conceptual level of information and key assumptions contained in the 2011/2012 the research study, the following adjustments have been made to update the cost and revenue tables:

- Inflation adjustment of 2.2% (National CPI) from 2012 to 2014;
- Changes to electricity pricing:
    - Decrease power premium ($0.017 - 0.020/kW•hr) due to cancellation of the Bioenergy Producers Credit Program
    - Increase pool market price for power ($0.081/kW•hr) applicable to all technologies
- Change to reflect current higher ferrous metal pricing;
- More precise estimate of planning, siting and approvals costs as presented in the four project development plans and this Initial Business Plan; and
- Identification of potential revenue from sale of GHG offsets.

Table 3: Capital Costs – Energy From Waste Systems

	Capital Costs ($2014)			
Phases & Cost Components	***RDF Processing & Combustion***	***Mass Burn***	***Gasification***	***Plasma Arc Gasification***
Pre-Development Period				
Planning, siting and approvals	9,532,660	9,532,660	9,532,660	9,532,660
Land acquisition	511,000	511,000	511,000	511,000
Development & Operating Period				
Transfer Stations				
Design & siteworks	10,838,310	10,838,310	10,838,310	10,838,310
Facility construction	59,610,705	59,610,705	59,610,705	59,610,705
Equipment & installation	37,934,085	37,934,085	37,934,085	37,934,085
Energy from Waste Facility				
Sitework	234,038	234,038	126,728	126,728
Site improvements	1,533,000	1,533,000	1,533,000	1,533,000
Pre-processing equipment	20,133,400	$0	$0	14,512,400
Design / engineering	17,374,000	17,374,000	17,374,000	15,330,000
Buildings	31,579,800	17,987,200	17,987,200	31,579,800
Power block equipment	168,578,900	193,198,880	196,673,680	142,303,280
Capital contingency	44,457,000	42,617,400	43,230,600	38,018,400
Periodic technology upgrades	82,894,420	80,707,340	81,504,500	74,800,180
Total Capital Cost	**485,211,318**	**472,078,618**	**476,856,468**	**436,630,548**

Table 4: Annual Operating Costs – Energy From Waste Systems

Cost Components	*Operating Costs ($2014)*			
	RDF and Combustion	**Mass Burn Combustion**	**Gasification**	**Plasma Arc Gasification**
Labour	$7,627,186	$5,605,670	$5,605,670	$7,627,186
Facilities maintenance	$463,988	$130,816	$156,366	$463,988
Stationary equip maintenance	$2,817,654	$2,930,074	$3,075,198	$2,376,150
Rolling stock maintenance	$270,830	$26,572	$26,572	$264,698
Equipment replacement costs	$246,302	$99,134	$99,134	$246,302
Utilities	$143,080	$142,058	$152,278	$146,146
Reagents	$1,425,690	$1,425,690	$1,188,586	$1,108,870
Fuel	$865,634	$89,936	$89,936	$840,084
Ash Disposal	$4,291,378	$3,577,000	$2,980,152	$2,781,884
General & administration	$363,035	$280,539	$267,478	$317,106
Overhead & profit	$1,851,864	$1,430,800	$1,364,370	$1,616,804
Insurance	$197,246	$197,246	$197,246	$197,246
Waste haul & transfer	$6,714,540	$6,714,540	$5,595,450	$5,222,420
Contingency (10%)	$2,727,843	$2,265,008	$2,079,844	$2,320,888
Annual Operating Costs	**$30,006,270**	**$24,915,083**	**$22,878,279**	**$25,529,773**

Table 5: Primary Revenue Streams

Revenue Streams	*RDF and Combustion*	*Mass Burn*	*Gasification*	*Plasma Arc Gasification*
Power				
Price ($/kW•h)	0.081	0.081	0.081	0.081
Unit Power Production (kW•h/tonne)	540	602	475	320
Annual Production (kW•h/yr)	177,390,000	197,757,000	130,031,250	81,760,000
Electricity Revenue ($/yr)	$14,310,051	$15,953,057	$10,490,000	$6,596,000
Metals Recovery				
Ferrous Recovery (%)	2.50%	2.50%	2.50%	2.50%
Ferrous Recovery (tonne/yr)	8,213	8,213	6,844	6,388
Ferrous Recovery ($/tonne)	$100	$100	$100	$100
Ferrous Recovery Revenue ($/yr)	$821,300	$821,250	$684,000	$639,000
Non Ferrous Recovery (%)	0.35%	0.35%	0.35%	0.35%
Non Ferrous Recovery (tonne/yr)	1150	1150	958	894
Non Ferrous Recovery ($/tonne)	$750	$750	$750	$750
Non Ferrous Recovery Revenue ($/yr)	$862,500	$862,313	$719,000	$671,000
Total Metals Recovery Revenue ($/yr)	$1,683,800	$1,683,563	$1,403,000	$1,310,000
Total Revenue ($/yr)	**$15,993,851**	**$17,636,620**	**$11,893,000**	**$7,906,000**

Table 6: Financial Lifecycle Summary

	Energy From Waste Based Systems			
	RDF and Combustion	**Mass Burn Combustion**	**Gasification**	**Plasma Arc Gasification**
Total Waste Disposed (tonnes)	*16,425,000*	*16,425,000*	*13,687,500*	*12,775,000*
Operating Lifespan (years)	*50*	*50*	*50*	*50*
Lifecycle 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	$1,882,447,203
Gross Lifecycle Unit Cost ($/tonne waste)	133	113	130	147
Lifecycle Revenues				
Electricity Sales	$715,502,565	$797,652,860	$524,481,047	$329,778,960
Sale 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	$1,461,646,368
Net Lifecycle Unit Cost ($/tonne waste)	**83**	**58**	**85**	**114**

For illustrative purposes, Table 7 quantifies the potential to realize additional revenue from sale of greenhouse gas emission offsets. Offsets have not been included in the financial lifecycle summary as there remains uncertainty regarding securing this as a potential revenue stream for an energy from waste facility. It is recommended that SAEWA further explore the Alberta offsets market and capitalize on this potential source of additional revenue if possible.

Table 7: Potential Revenue from Greenhouse Gas Offsets

Potential Additional Revenue	***RDF and Combustion***	***Mass Burn***	***Gasification***	***Plasma Arc Gasification***
Greenhouse Gas Emission Reductions				
Offsets Sale Price* ($/tonne eCO2)	$12.00	$12.00	$12.00	$12.00
Annual Offsets** (tonne eCO2/yr)	91,100	116,200	75,700	44,500
Offsets Revenue Potential ($/yr)	$1,093,200	$1,394,400	$908,400	$534,000
Offsets Revenue Potential ($/tonne waste)	$3	$4	$3	$2

* Alberta Agriculture http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/cl13212

** Relative to landfill.

For illustrative purposes, Table 8 quantifies the potential to realize additional revenue from sale of heat from an energy from waste facility. This potential revenue stream has not been included in the financial lifecycle summary as the potential for heat sales is dependent on the location of the preferred site and the proximity to suitable heat consumer(s), which will not be determined until completion of the siting process. It is recommended that proximity to an

existing suitable heat consumer be considered in development of potential evaluation criteria in the site selection process.

Table 8: Potential Revenue from Heat Sale

Technology	Potential Steam (1000's kg/hr)	Potential Annual Revenue
RDF processing and combustion	160 – 200	$10.3 - $13.0 Million
Mass Burn Combustion	180 – 220	$11.7 – $14.3 Million
Gasification	120 – 180	$6.5 - $9.7 Million
Plasma Arc Gasification	55 – 125	$2.8 - $6.3 Million

5.4 PROJECT FUNDING

As discussed during SAEWA's procurement and business planning workshop (see Section 2.0), two different stages for funding of the project should be considered including:

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

The following table summarizes potential funding sources for the two stages of the project identified above:

Table 9: Potential Project Funding Sources

Potential Funding Sources	Project Stage	
	A	B
Alberta Community Partnership[1] Program (formerly the Regional Collaboration Program)	✓	✓
The Municipal Sustainability Initiative[2]	✓	✓
Alberta Rural Community Adaptation Grant Program[3]	✓	
Canada-Alberta Gas Tax Fund[4]	✓	✓
The New Building Canada Fund[5]	✓	✓

[1] http://www.municipalaffairs.alberta.ca/albertacommunitypartnership.cfm
[2] http://www.municipalaffairs.alberta.ca/msi.cfm
[3] http://www.municipalaffairs.alberta.ca/municipalgrants-description.cfm?program_id=31
[4] http://www.infrastructure.gc.ca/prog/gtf-fte-tab-eng.html

Potential Funding Sources	Project Stage	
	A	B
PPP Canada[6]		✓
Revenue from sales of energy and recovered/converted 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.

As part of the recommended pre-development organizational tasks outlined in Section 7.1, should SAEWA choose to proceed with its project it is recommended 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. For example, PPP Canada has certain requirements relating to procurement processes. 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.

6.0 OVERVIEW OF KEY ELEMENTS OF RISK

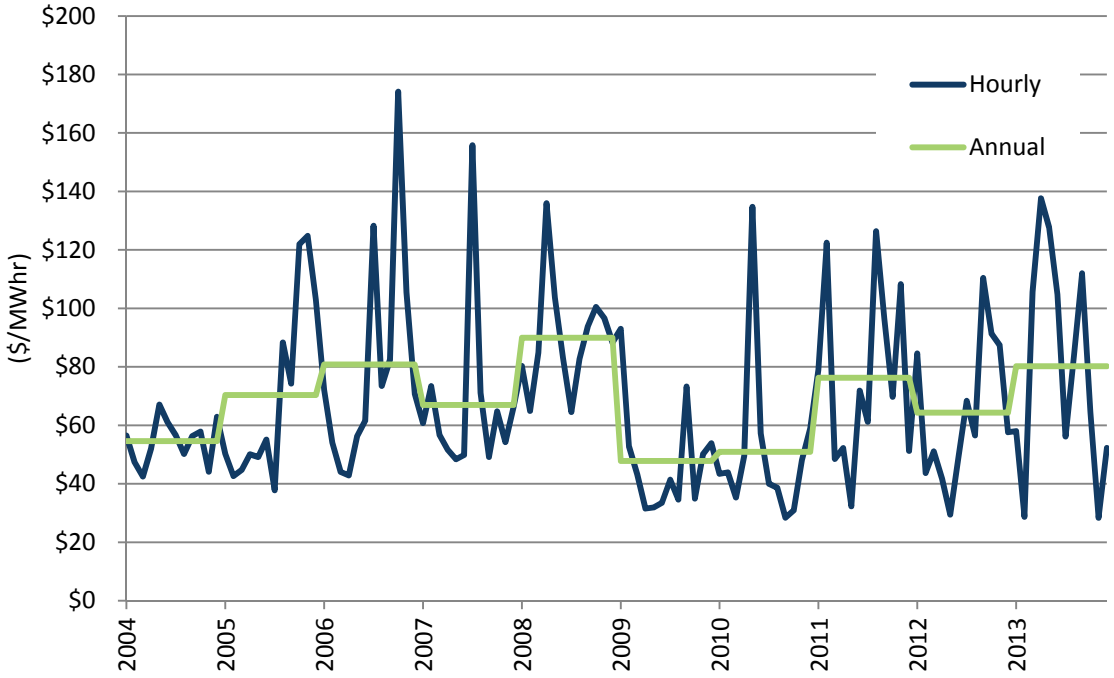
6.1 COST AND REVENUE FLUCTUATIONS

The cost and revenue updates presented in Section 5.3 are estimated current average values that are largely based on historical experience. It is important to recognize that all businesses

[5] http://www.infrastructure.gc.ca/plan/nbcf-nfcc-eng.html
[6] http://www.p3canada.ca/~/media/english/resources%20library/files/application_guide_round_six_en.pdf

are subject to fluctuations in costs and revenues resulting from external market forces. In the context of an energy from waste facility, the importance of the electricity power price on the financial profile of the project is illustrated on Table 6 contained in Section 5.3. Figure 3 shows the recent historical record of power pricing in Alberta.

Figure 3: Historical Average Power Pool Prices



Source: AESO Annual Market Statistics reports and data files

As an illustrative example of price sensitivity, if the power pool price were to vary by $10.00/MW•hr from the 2013 annual average price of $80.10/MW•hr used in the revenue projections contained in Section 5.3, the corresponding annual revenue for the facility would vary in the range of roughly $1 to 2 million/year, depending on the technology. If this price variance were to span a period of ten years, the impact on the net lifecycle cost would be expected to be in the order of roughly $1.00/tonne of waste processed.

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. 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.

In response to these uncertainties it has been recommended that a detailed business plan and final business case be prepared at key decision making milestones during project development. It is further recommended that the detailed business plan and final business case include analyses and projection of market pricing and potential fluctuations for major cost and revenue elements of the project.

6.2 WASTE SUPPLY COMPETITION

Because energy from waste is first and foremost a solid waste management solution, the primary competition for a potential SAEWA energy from waste facility would be existing and future residual waste management options in the SAEWA area. Currently this consists of landfill sites. In the future, additional landfills and/or other alternative waste management facilities could be established in the SAEWA area. Such facilities would compete with SAEWA's proposed facility for waste supply input.

It is important to recognize that energy from waste (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, "*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 some cases this may have been due to narrow definitions of some long-term factors and/or externalization of potential legacy costs on future generations. 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.

Figure 4: USEPA Waste Management Hierarchy[7]

To support the substantial capital investment that more advanced waste management facilities require and "level the playing field", in some jurisdictions where energy from waste 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 long-term 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. In consideration of its own approach to governance (see Section 7.1), it is recommended that SAEWA carefully consider how its formal structure could facilitate establishment of regional waste flow control in Southern Alberta.

[7] Source: http://www.epa.gov/waste/nonhaz/municipal/hierarchy.htm

The substantial investment of time, resources and money that is required to establish any new waste management facility represents an existing barrier to competition for the waste supply. 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, subject to:
    - Recognizing potential for impact on aspects of SAEWA member's other interests (i.e. existing SAEWA member owned landfills); and,
    - 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.

6.3 STAKEHOLDER RELATIONS

The Communications Plan report outlines a proactive approach to establish stakeholder relations during development of an energy from waste facility. Maintaining positive stakeholder relations during the operating phase of a waste facility's lifespan are also very important.

Key aspects of stakeholder relations during a facility's operation phase are primarily focused on dealing with the local community, the media and regulators. Through these relations, the facility ownership and management has an important task demonstrate commitment to operational quality, compliance, the community and willingness to respond to and address issues and concerns should they arise. Several measures that are often applied to assist with supporting positive stakeholder relations over the long-term include:

- Extension and refinement of communications policies and best practices established during the project development phase to be applicable to the operating phase of the project lifespan;
- Maintain open transparent communications with stakeholders;
- Achieve timely, correct and accurate reporting for compliance purposes;
- Implement a program whereby concerns and/or complaints directed at the facility can be quickly and easily communicated, validated and responses are provided in a timely fashion;

- If possible, establish and maintain an operating public liaison group as an additional mechanism for stakeholders to communicate with facility management; and,
- Work to make the facility a positive asset in the community in terms of supporting various local events and contributing to environmental/conservation awareness and education.

6.4 POTENTIAL SHORT-TERM DISRUPTIONS

The implementation program for an energy from waste facility is focused on ensuring that inputs (i.e. wastes, consumables and utilities), operations (i.e. labour and equipment), and outputs (i.e. energy, recyclables, residues and emissions) are reliably managed on a continuous basis. Despite this, it is important to recognize that occasional circumstances can arise which can result in disruptions to the inputs, operations and/or outputs. The following lists several methods commonly applied to avoid or minimize the impact of temporary disruptions that may occur in each of these areas:

- Inputs:
    - Establish long-term waste supply agreements with put or pay conditions;
    - Maximize allowable temporary on-site storage capacity for different types of input wastes;
    - Monitor customer waste supply rates and regularly communicate with customers to anticipate variances;
    - Monitor changes in waste feedstock composition;
    - Actively market waste processing services and periodically adjust pricing to reflect anticipated waste supply conditions;
    - Routinely stock sufficient consumables to meet operating requirements for several weeks and establish supplier relationships that allow for short-term rush deliveries;
    - Size utilities to meet full range of anticipated demands and develop contingency plans for short-term alternatives (i.e. back-up power, on-site fuel storage etc.);
- Operations:
    - Maintain adequate human resources available to meet routine and contingency operational requirements at all times;
    - Augment the routine program of preventive maintenance with supplementary inventory of supplies and critical parts on-site;
    - Establish formal written contingency plans to be implemented in the event of unplanned operational disruptions;
- Outputs:

- Actively monitor and communicate with power utility operator to anticipate and respond to outages;
- Maximize flexibility in energy and material output supply contracts;
- If heat sales are considered, contingency plans may be required to provide heat supply to customers during planned or un-planned operational disruptions;
- For regulatory compliance, routine monitoring and contingency action plans are required to ensure that emissions remain within approved limits.

7.0 IMPLEMENTATION PROGRAM

7.1 PRE-DEVELOPMENT ORGANIZATIONAL TASKS

There are several key organizational tasks that need to be completed prior to conducting the major efforts of project development, including:

- Establish SAEWA governance structure including the legal authority to contractually bind SAEWA;
- Secure SAEWA's combined waste supply and conduct waste stream analysis and characterization (see Section 7.2);
- Establish funding for initial project pre-development activities; and,
- Establish plans for financing the capital investment required to develop the facility as well as operation, maintenance and administration costs.

SAEWA is currently moving forward with the task of establishing its governance structure and has recently retained consultant to work with the SAEWA 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. 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.

7.2 RECOMMENDED ADDITIONAL BUSINESS PLANNING ACTIVITIES

7.2.1 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.

The waste stream analysis and characterization should include the following, as a minimum:

- For all SAEWA members' potential input waste streams:
    - Identify individual member's waste streams and major source locations;
    - Quantify and confirm individual member's planned waste contributions to SAEWA;
    - Identify individual member's current and future residual waste management practices, costs and constraints;
- Contact major prospective non-SAEWA customers and/or sector representatives to:
    - Identify non-SAEWA customer waste streams and source locations;
    - Quantify residual waste management needs of major prospective non-SAEWA customers and identify their current and future residual waste management practices, available alternatives, costs and constraints;
- Conduct detailed waste audits of a representative cross-section of the above SAEWA and non-SAEWA waste streams identified as prospective inputs to SAEWA's planned energy from waste facility to characterize each according to the following breakdown (as a minimum):
    - Primary categories: Recyclables, residual waste, construction and demolition waste, waste electronics, hazardous materials, liquid wastes, bio-medical wastes and other unacceptable materials (i.e. materials that are unprocessible by energy from waste technologies);
    - Specific materials: Paper, plastics, wood (treated and un-treated), organic materials (specific types to be identified), textiles, drywall, rubber, carpet, metals (ferrous and non-ferrous), glass, process wastes (specific types to be identified), inert materials, and other specific wastes that may be present in significant quantities but do not fit into one of the above categories;
- Estimate seasonal variations in composition of waste streams based on known/anticipated variations and available data;

- Estimate energy the energy content of the SAEWA and non-SAEWA waste streams identified as prospective inputs to SAEWA's planned energy from waste facility (Note: for some unique waste materials, energy content laboratory analysis may be required if surrogate published energy content data is not available); and,
- Summarize results of the waste stream analysis and characterization in a report.

7.2.2 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 a SAEWA facility. Key factors that should be addressed include the following, as a minimum:

- Definition of key principles to guide consideration of a waste transportation business model, including:
    - Recognition of the collective benefits to SAEWA's membership from aggregation of their residual wastes;
    - Flexibility to address the diverse situations and needs of SAEWA's membership;
    - Options to consider for sharing and/or allocation of transportation costs;
- Proactive consultations with SAEWA's membership to direct and shape the waste transportation business review and analysis;
- Confirmation of locations, quantities and sources of residual waste (i.e. to be developed from the recommended waste stream analysis as recommended in above);
- Confirmation of the location of the preferred site of SAEWA's proposed energy from waste facility;
- Current residual waste transportation practices and costs being incurred by SAEWA members;
- Existing SAEWA member's waste transportation infrastructure and fleet assets;
- Opportunities for back-haul of ash for disposal at suitable member landfill(s);
- Principles for efficient waste transportation (i.e. direct haul vs. transfer, and potential rail haul) as identified in SAEWA's research report, "*Phase 2, Task 3: Waste Collection, Handling and Transportation (January 2012)*";
- Additional infrastructure and fleet assets that would be required to transport waste to SAEWA's proposed facility;
- Business analysis of options for waste transportation including:
    A. Incorporate waste transportation to the energy from waste facility into the SAEWA business service offering (i.e. utility model); or,

B. Members to retain independent responsibility for transportation of waste to a SAEWA facility as they see fit; or
C. Hybrid alternatives or other options as may be proposed.

The intended outcome of this review and analysis is a report which will allow SAEWA to make an informed decision as to whether:

- It should proceed with option A, B or C (listed above); and,
- Dependent on which option is chosen, how best to proceed in the context of SAEWA's project development plan.

The work of this business analysis can begin concurrent with the later stages of the site selection process and be completed once the preferred site is identified. If SAEWA should then choose to incorporate elements of the waste transportation business model into its energy from waste initiative, it would then have the opportunity to include transportation services in the Request for Proposals (RFP), if it should chose to do so. If this approach is considered, then it is recommended that the possibility of inclusion of the waste transportation in the procurement process be identified as a potential optional service in the Request for Prequalification (RFPQ) preceding the RFP, to allow prospective proponents to assemble qualified teams and provide feedback to SAEWA. Alternatively SAEWA also would have the option to procure waste transportation services separately from its energy from waste facility development at any time prior to commencement of operations. Section 7.5 presents the consolidated project development plan schedule incorporating activities recommended herein.

7.2.3 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. Key factors that should be addressed in the detailed business plan include the following, as a minimum:

- Outcome of the waste transportation business analysis and decision on inclusion in the scope of services;
- Measures required to address specific factors for the preferred site and location that impact the planned energy from waste development;
- Parties to the project, partnering arrangements and roles and responsibilities;
- Analyses and projections of market pricing and potential fluctuations for major cost and revenue elements of the project;

- Confirmation of:
    - Input waste quantities and characteristics;
    - Scope of the planned energy from waste business;
    - SAEWA's planned governance and business operation structure;
    - Cost estimates including:
        - Site acquisition and development;
        - Infrastructure requirements;
        - Capital, operating, maintenance and administration;
        - Closeout;
        - Project management and administration;
    - Revenue streams, funding and financing
- Financial analysis and projections including range of pricing for SAEWA's energy from waste services;
- Identification of project-specific risk exposure elements, uncertainties and mitigations that can be defined at this time;
- Progress status review with cost and schedule updates of procurement, regulatory and communications aspects of the project development plan; and,
- Affirmation and/or refinement of SAEWA's goals, objectives, project direction and decision to continue with project development

7.2.4 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. The final business case analysis should:

- Review status of public acceptance of the proposed energy from waste project development;
- Report on fairness and due diligence aspects of the procurement process;
- Summarize proposals received from energy from waste project Developers/technology Vendors, review proposals from the perspective of achieving value for money and identify the preferred proponent;

- Verify or adjust the founding assumptions and information incorporated into the detailed business plan (see above);
- Verify financial analysis and projections incorporating details of the preferred proposal, any partnering arrangements and planned project funding/financing options;
- Review implications of any remaining business risk exposures, uncertainties and available mitigations;
- Affirm each individual SAEWA member's commitment to proceed with the project or opt-out, as the case may be;
- Decision in-principle to proceed to enter into a contract for development of the energy from waste project, subject to negotiation of acceptable final contract details; and,
- Establishment of negotiation positions and authorization of the negotiation team to enter into good faith negotiations with the preferred proponent with a view to execution of the DBOM contract.

7.3 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:

SAEWA's project steering group:

- Liaison between SAEWA membership and the project team;
- Guides implementation of the project development plan;
- Provides direction to the project team and expedites day-to-day decisions on behalf of SAEWA as necessary to advance the project;

The following table summarizes the credentials recommended for the members of the business planning team.

Table 10: Business Planning Team

Activity	Required Resources	
	Description	Minimum Credentials
Waste Stream Analysis and Characterization	SAEWA's project steering group	—Designated and authorized by SAEWA —Experience in management of municipal capital works

Activity	Required Resources	
	Description	**Minimum Credentials**
	Waste Management Planner	Minimum 10 years experience in: —Planning for a range of different types of waste management projects in Canada
	Waste Audit Support	Minimum 10 years experience in: —Performance of waste audits
Waste Transportation Business Review and Analysis	SAEWA's project steering group	As above
	Energy from Waste Project Management Lead supported by subject matter expert:	Minimum 10 years experience in: —Development and approvals for large waste management projects in Canada —Energy from waste facility, engineering, specifications, design, construction and operation —Procurement, public consultation and project management.
	Traffic Assessment	Professional transportation engineer/planner with minimum 10 years of experience licensed in Alberta
Detailed Business Plan	SAEWA's project steering group	As above
	Business Management Advisory Lead supported by:	Minimum 10 years experience in: —Business advisory consulting services for municipal sector clientele in Canada —Business planning for waste management projects and large infrastructure projects
	Energy Market Analyst	Minimum 10 years experience in: —Strategic market advisory services in the electrical power sector in Alberta
	Commodity Markets Analyst	Minimum 5 years experience in: —Strategic advisory services in the recyclables commodity market in Canada
	Energy from Waste Project Management Lead supported by technical subject matter experts as needed	As above
Final Business Case Analysis	SAEWA's project steering group	As above
	Business Management Advisory Lead supported by:	As above
	Energy Market Advisor	As above
	Commodity Markets Advisor	As above

Activity	Required Resources	
	Description	Minimum Credentials
	Energy from Waste Project Management Lead supported by technical subject matter experts as needed	As above

7.4 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; and,
- 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 in Table 11. It should be recognized that this budget estimate is approximate and cannot reasonably address all eventualities that may occur. It is recommended that project budgets be periodically reviewed and revised to address changes in the work plan that occur as the project proceeds.

Table 11: Preliminary Business Planning Budget

Task	Description	Units	Qty	Unit Price	Task Totals	Activity Totals
						$ 838,800
1.1	Management and Coordination of Business Planning	%	10	NA	$ 83,800	
1.2	Waste Stream Analysis and Characterization	LS	1	$ 160,000	$ 160,000	
1.3	Waste Transportation Review and Analysis	LS	1	$ 100,000	$ 100,000	
1.4	Detailed Business Plan	LS	1	$ 225,000	$ 225,000	
1.5	Final Business Case Analysis	LS	1	$ 270,000	$ 270,000	
				Recommended Contingency (20%)		**$ 167,760**
				Business Planning Activities Total		**$ 1,006,560**

An increased contingency amount is recommended for business planning activities in recognition that some business scenarios available to SAEWA, such as public private partnerships, have additional administrative and oversight costs for the business planning tasks.

7.5 SCHEDULE

A preliminary schedule for business planning activities has been developed and is presented in Appendix C. The schedule presented 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. A detailed master schedule for the overall project development plan is also included in Appendix C.

There remains some uncertainty as to some of the specific elements of the work program and as such the schedules presented are preliminary. It is recommended that schedules be periodically reviewed and revised to address changes in the work plans that occur as the project proceeds.

8.0 FINDINGS AND RECOMMENDATIONS

This report presents the Initial Business Plan component of SAEWA's project development plan. The preceding sections include: a summary of SAEWA's business planning and procurement workshop; a description of the planned energy from waste business along with key aspects of the business model that SAEWA has indicated as its preferred approach; an overview of some of the key elements of risk; a recommended program to carry additional business planning activities in concert with advancing the overall project development plan;

and, identification of resources, budgetary estimate and coordination schedule for SAEWA to carry out the recommended business planning activities.

Key organizational tasks are identified that need to be completed as part of conducting project development including:

- Establish SAEWA governance structure including the legal authority to contractually bind SAEWA;
- Secure SAEWA's combined waste supply and conduct waste stream analysis and characterization (as recommended herein);
- Establish funding for initial project pre-development activities; and,
- Establish plans for financing the capital investment required to develop the facility as well as operation, maintenance and administration costs.

Elements of the recommended business planning activities will need to interface and coordinate with other elements of the overall project development plan. The recommend additional business planning activities presented in this report consists of:

1. **Waste Stream Analysis and Characterization** – build on preliminary information identified in the research study to confirm in greater detail, quantities and characteristics of potential waste stream inputs (including both SAEWA's and potential non-member customers) and energy content analyses, if required.
2. **Waste Transportation Business Review and Analysis -** 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.
3. **Detailed Business Plan** – confirm, update and expand on details of SAEWA's business plan to reflect more detailed and improved information to be gained as a result of completion of: pre-development organizational tasks; siting; waste analysis and characterization; and, waste transportation business review and analysis.
4. **Final Business Case Analysis –** make use of verified and reliable information obtained as a result of completion of siting, procurement and regulatory processes to inform a decision by SAEWA on whether to proceed with the substantial commitments necessary to enter into a contract for development of an energy from waste facility.

To complete the work involved with the recommended business planning activities, SAEWA will need to engage several resources including: a business management advisory lead with

support from key market analysts; a waste management planner and waste auditor; and, a project management lead with technical support specialists.

APPENDIX A
PROCUREMENT AND BUSINESS PLANNING WORKSHOP MATERIALS

Southern Alberta Energy from Waste Association

Procurement and Business Planning Workshop

February 25, 2014

Agenda:

A. Background Information:

- Energy from Waste Overview ("EFW 101")
- SAEWA Vision and Research Project
- Overview of Project Delivery Models
- Overview of Risk and Control

Southern Alberta Energy from Waste Association

Procurement and Business Planning Workshop

February 25, 2014

Agenda (cont'd):

B. Key Issues

- Scope of waste management services
- Project delivery
- Ownership and partnering
- Funding
- Waste supply
- Competition in procurement
- Fairness in procurement
- Due diligence in procurement
- Other important issues raised by participants

Background: Energy from Waste Overview

Energy from Waste Procurement and Business Planning Workshop

What is Energy from Waste?

- Terminology: Energy from Waste (EFW) = Waste to Energy(WTE) = Thermal Treatment = Incineration*
- An approach to managing residual waste that also produces energy
- A category that includes several different types of technologies
- Wastes are processed to produce:
  - Energy (electricity and/or heat); or,
  - Fuel from which energy is then produced
- Additional outputs:
  - Emissions – treatment required
  - Ash (two types) – disposal, treatment or beneficial use
  - Process residues – disposal required
  - Additional recyclables – send for recycling

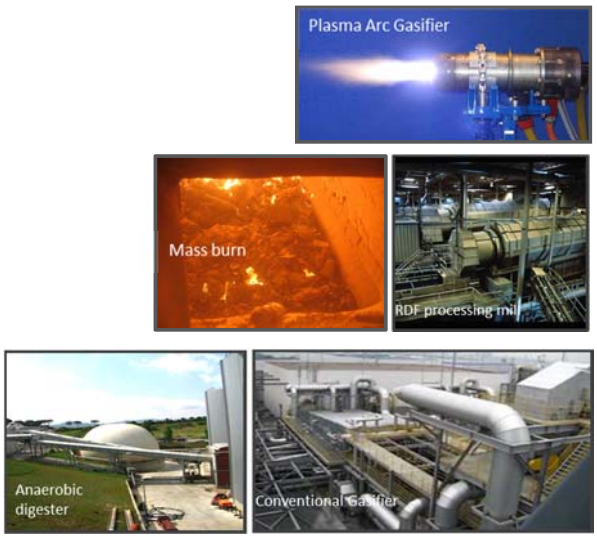
*With energy recovery

Background: Energy from Waste Overview

Energy from Waste Procurement and Business Planning Workshop

Technology Classes

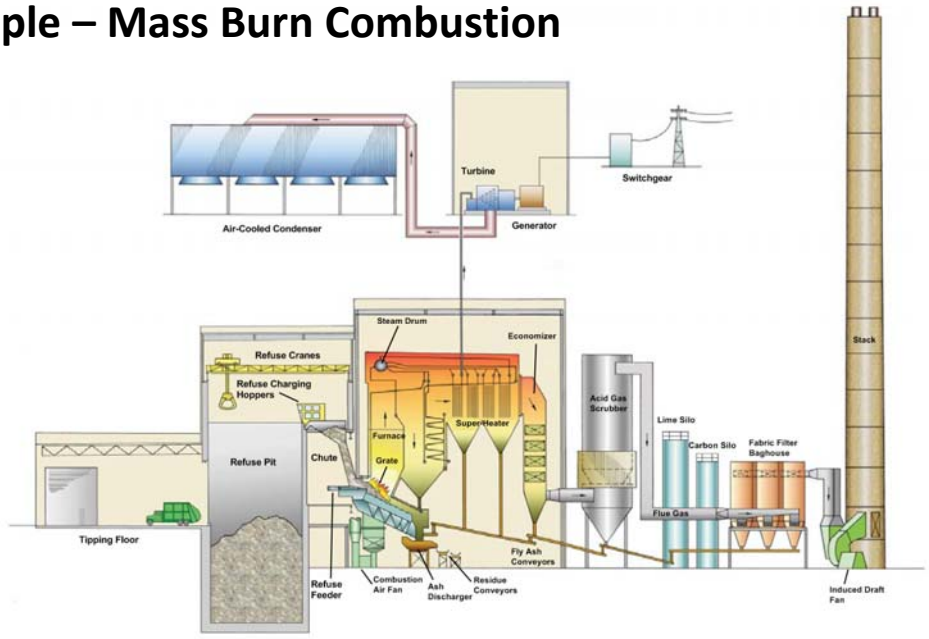
- **Thermal**
  - Conventional Gasification
  - Pyrolysis
  - Plasma Arc Gasification
  - Mass-burn combustion
- **Biological**
  - Anaerobic digestion
- **Chemical**
  - Hydrolysis
  - Depolymerization (thermal & catalytic)
- **Mechanical**
  - Mechanical biological treatment (MBT)
  - Refuse-derived fuel (RDF)



Background: Energy from Waste Overview

Energy from Waste Procurement and Business Planning Workshop

Example – Mass Burn Combustion

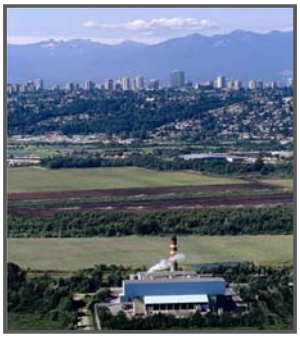


Background: Energy from Waste Overview

Energy from Waste Procurement and Business Planning Workshop

Why EFW?

- Reduce reliance on landfill disposal
- Recovery of useful energy that would otherwise be lost
- Lower greenhouse gas emissions
- Long-term sustainability
- Environmental performance
- Long and proven track record

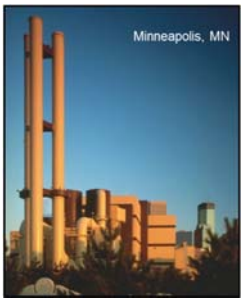


Background: Energy from Waste Overview

Energy from Waste Procurement and Business Planning Workshop

Key Considerations

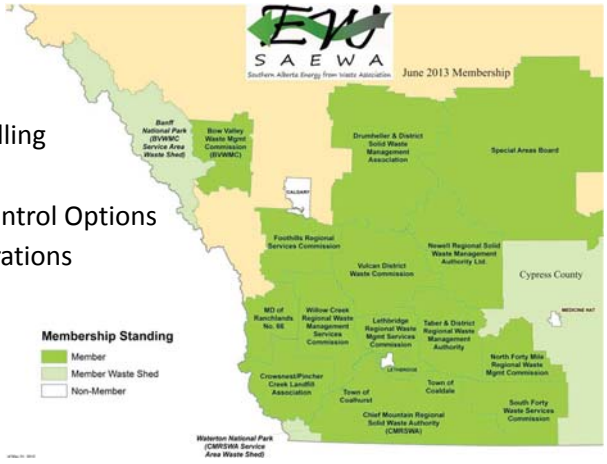
- Modern pollution controls are needed for protection of the environment and air quality
- Siting can be controversial and sometimes challenging, depending on:
  - Host community perspectives
  - Stakeholder perceptions, attitudes and background
- Life cycle costs are comparable to other options, but up-front capital investment is high
- Implementation can be long and issues can be complex



Background: SAEWA's Vision and Research Project

Energy from Waste Procurement and Business Planning Workshop

- SAEWA Established in 2009
- Committed to research and implementation of energy recovery from non-recyclable waste materials to reduce long-term reliance on landfills
- **Research Project Reports:**
  1. Waste Generation Rates & Facility Sizing
  2. Technology Review
  3. Waste Collection, Transportation & Handling
  4. Energy Recovery Options
  5. Air Emissions, Greenhouse Gases and Control Options
  6. Permitting, Siting and Schedule Considerations
  7. Capital and Operating Costs
- **Requests for Expressions of Interest:**
  1. Community Hosts
  2. Energy Hosts
  3. Developers and Vendors



Waste Quantities

Up to 366,000 tonnes/year of waste potentially available to the facility

Background: Research Project

Waste Stream	Total Waste Quantities (Tonnes/year)	Potentially Available Waste for SAEWA (Tonnes/year)
MSW from SAEWA Members	196,850	196,850
MSW from Non-SAEWA Members	919,300	13,300
Other Waste Sources:		
ICI Sector Waste	290,000*	0**
Agricultural Waste	0***	0
Biosolids	22,232	1,232
Contaminated Soils	66,500	0
Combustible Oilfield Waste	2,500	2,500
Railway Ties	124,650	124,650
Specified Risk Materials - MBM	27,500	27,500
TOTAL	**1,649,532**	**366,032**

HDR

Background: Research Project

Energy from Waste Procurement and Business Planning Workshop

SAEWA

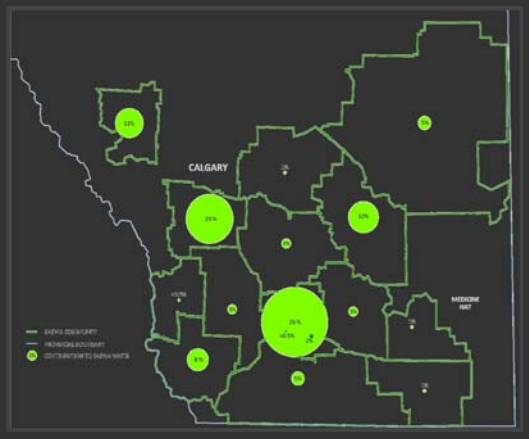
Technology Review

- Key Criteria Examined:
  - State of development of the technology
  - Environmental considerations
  - Greenhouse gas emission reductions
  - Suitability to process the anticipated waste stream
  - Energy recovery efficiency
  - Costs
  - Potential risks – development, performance, markets
- Recommended for consideration:
  - RDF processing and combustion
  - Mass Burn Combustion
  - Gasification
  - Plasma Arc Gasification

HDR

Transportation Logistics

- Waste sources widely distributed*
- Transport costs a significant factor
- Extensive highway and rail network



**Note: SAEWA membership and waste distribution has changed since completion of the research study*

Background: Research Project

- Direct haul limit = 80 km round trip
- Material aggregation, transfer and rail haul can assist with transport logistics

HDR

> > Background: Research Project

Energy from Waste Procurement and Business Planning Workshop

SAEWA

Energy

	Energy Outputs		
	Electricity	*Heat*	*Gas Fuel*
Technologies			
RDF Processing and Combustion	✔	✔	
Mass Burn Combustion	✔	✔	
Gasfication	✔	✔	⊙
Plasma Arc Gasification	✔	✔	⊙
Key Market Characteristics (Non-financial)			
Access Mechanism	Grid	Pipeline	Pipeline
Nature of Market	Widespread	Local	Local or Widespread
Demand Variability Risk	Stable	High	High or Stable
Market Security Risk	Reliable	Customer Specific	Variable
Primary Barriers	Administrative	Geographic Opportunity	Product Quality

Note: ✔ represents a primary output. ⊙ represents an alternative output.

HDR

Background: Research Project

Energy from Waste Procurement and Business Planning Workshop

Emissions

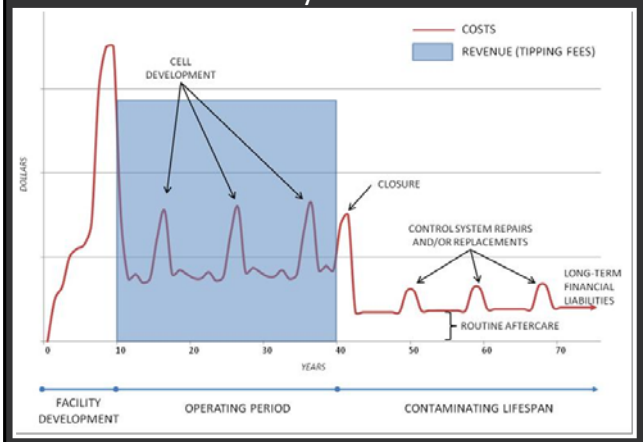
- EFW facilities with modern air pollution controls are capable of meeting stringent air quality criteria
- All energy from waste options considered offer substantial GHG emission reductions compared to landfill

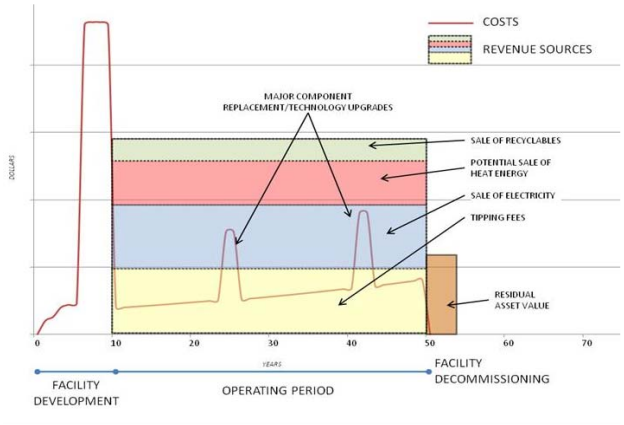
Summary of Estimated GHG Annual Emissions	Refuse Derived Fuel with Combustion	Mass Burn Combustion	Gasification	Plasma Arc Gasification	Landfill
Disposal (MTCO2/yr)	7,030	0	7,030	7,030	58,587
Combustion (MTCO2/yr)	84,140	78,116	84,140	84,140	0
Transportation (MTCO2/yr)	2,483	2,456	2,483	2,474	1,635
Facility Fuel Usage (MTCO2/yr)	244	228	244	238	532
Electrical Purchase and Sales (MTCO2/yr)	-92,276	-104,265	-76,894	-45,650	0
Ferrous & Non FerrousRecovery (MTCO2/yr)	-31,906	-31,906	-31,906	-31,906	0
Net GHG Estimated Emissions (MTCO2E/yr)	**-30,300**	**-55,400**	**-14,900**	**16,300**	**60,800**
GHG Emissions Reduction Relative to the Landfill (MTCO2E/yr)	91,100	116,200	75,700	44,500	-
Percent Reduction	150%	191%	125%	73%	-

- Mass burn combustion achieves the greatest reductions due primarily to higher energy generation efficiency

Lifecycle Cost Profiles

Landfill Lifecycle Cost Profile





EFW Lifecycle Cost Profile

When **true** long-term liabilities and revenue potential are taken into consideration, net unit lifecycle costs are roughly comparable

Background: Research Project

Background: Research Project

Energy from Waste Procurement and Business Planning Workshop

Estimated Life Cycle Costs

	Base Case Landfill System	*Energy From Waste Based Systems* RDF and Combustion	Mass Burn Combustion	Gasification	Plasma Arc Gasification
Total Waste Disposed (tonnes)	*11,000,000*	*16,425,000*	*16,425,000*	*13,687,500*	*12,775,000*
Operating Lifespan (years)	*30*	*50*	*50*	*50*	*50*
Lifecycle Expenditures					
Capital	$266,717,000	$476,889,000	$464,039,000	$468,714,000	$429,354,000
Operating	$763,333,950	$1,664,446,100	$1,356,937,500	$1,272,689,600	$1,414,693,400
Total Expenditures	$1,030,050,950	$2,141,335,100	$1,820,976,500	$1,741,403,600	$1,844,047,400
Gross Lifecycle Unit Cost ($/tonne)	94	130	111	127	144

- Sources of revenue:
  - Energy sales: electricity, heat, fuel products
  - Greenhouse gas offsets
  - Sale of recyclables
  - Residual asset value
  - Tip fees

Background: Requests for Expressions of Interest

Energy from Waste Procurement and Business Planning Workshop

3 Different Requests issued:

1. Technologies & Vendors
   - 24 Responses
2. Potential Energy Users
   - 0 Responses
3. Potential Willing Hosts
   - 6 Responses

Six (6) Communities responded with Potential Interest in Hosting the Facility

Energy from Waste Procurement and Business Planning Workshop

Does anyone need a short break?

Energy from Waste Procurement and Business Planning Workshop

Elements of Project Delivery

- Design
- Construction
- Operations
- Maintenance
- Administration:
  - Project management – primarily focused on capital works
  - Management of business operations:
    - Supply of inputs (e.g. waste feedstocks, fuel, water, consumables, etc.)
    - Marketing of products (e.g. electrical power, heat energy, recyclables, etc.)
    - Management of other outputs (e.g. emissions, wastewater, residues, etc.)
    - Asset management
    - Staffing
    - Regulatory compliance
    - Financial administration
- Ownership of assets (e.g. land, building(s), equipment, etc.)
- Project financing

Background: Project Delivery Models

Energy from Waste Procurement and Business Planning Workshop

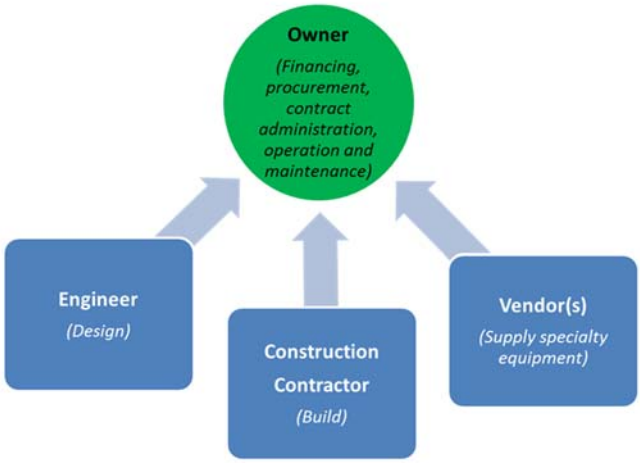
Project Delivery Models

- "Who Does What"
- Parties involved in project delivery:
  - Owner(s)
  - Contractor(s)
    - Sub-contractor(s) and trades
  - Equipment Vendor(s)
  - Engineer(s)
  - Others (financiers, surety, insurers etc.)
- Project delivery models:
  - Traditional Design-Bid-Build
  - Design Build
  - Design Build Operate
  - Design Build Operate and Maintain
  - Design Finance Build Own & Operate
- Choice of model is primarily based on:
  - Allocation of responsibility for elements of project delivery to the party (or parties) best able to manage those responsibilities
  - Preferences for risk/control

Background: Project Delivery Models

Energy from Waste Procurement and Business Planning Workshop

Project Delivery Models

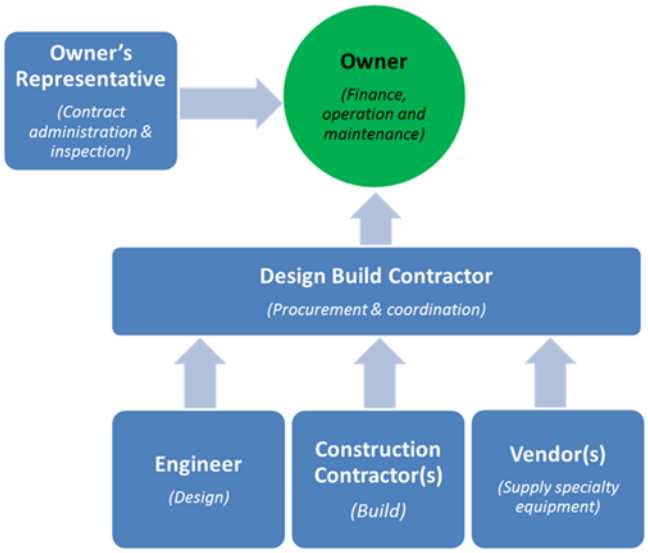


Traditional Design-Bid-Build (DBB) Project

Background: Project Delivery Models

Energy from Waste Procurement and Business Planning Workshop

Project Delivery Models

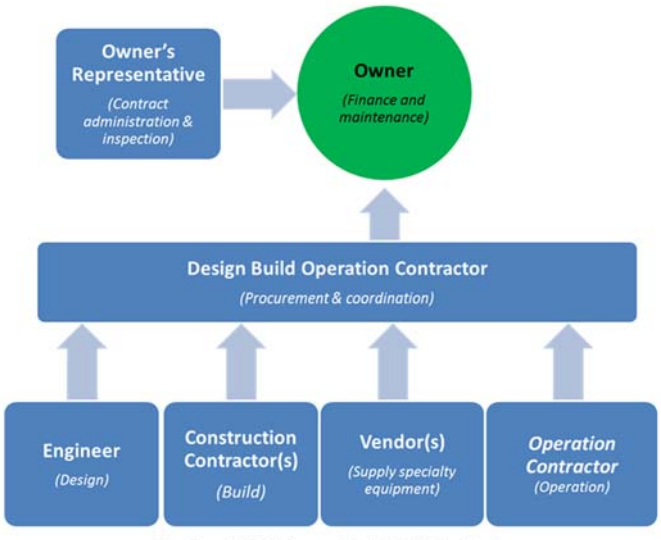


Design Build (DB) Project

Background: Project Delivery Models

Energy from Waste Procurement and Business Planning Workshop

Project Delivery Models

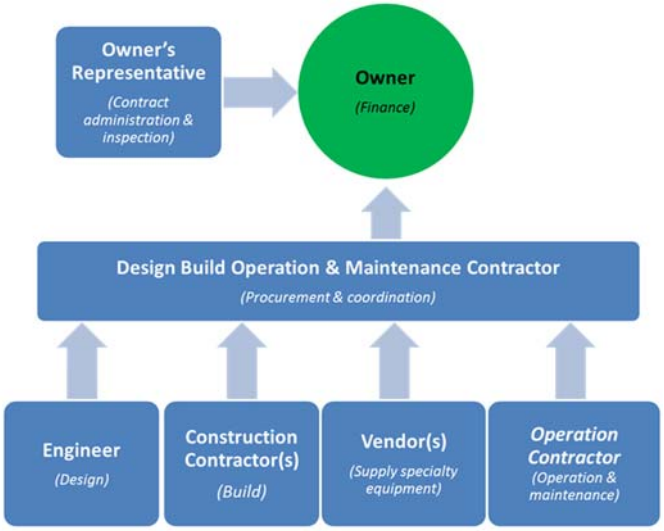


Design Build Operate (DBO) Project

Background: Project Delivery Models

Energy from Waste Procurement and Business Planning Workshop

Project Delivery Models

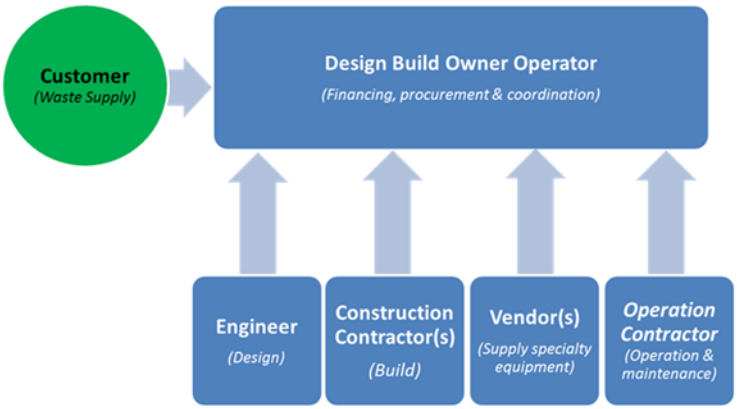


Design Build Operate & Maintain (DBOM) Project

Background: Project Delivery Models

Energy from Waste Procurement and Business Planning Workshop

Project Delivery Models



Design Finance Build Own & Operate (DFBOO) Project

Key Issues: Project Risk and Control

Energy from Waste Procurement and Business Planning Workshop

- A Balancing Act
  - Risk and control are two sides of one coin
  - To effectively manage risk, the responsible party must also have a degree of control
  - Risk off-loading in the absence of control leads to "risk" pricing, inflating costs
  - Risk off-loading can create a false sense of security dependent on ability and willingness to exercise contract remedies
  - Hand-over of too much control can unbalance the relationship
- Elements of Risk:
  - Financial
  - Performance
  - Asset value
  - Schedule
  - Regulatory compliance
  - Public perceptions
  - Others

Key Issues: Project Risk and Control

Energy from Waste Procurement and Business Planning Workshop

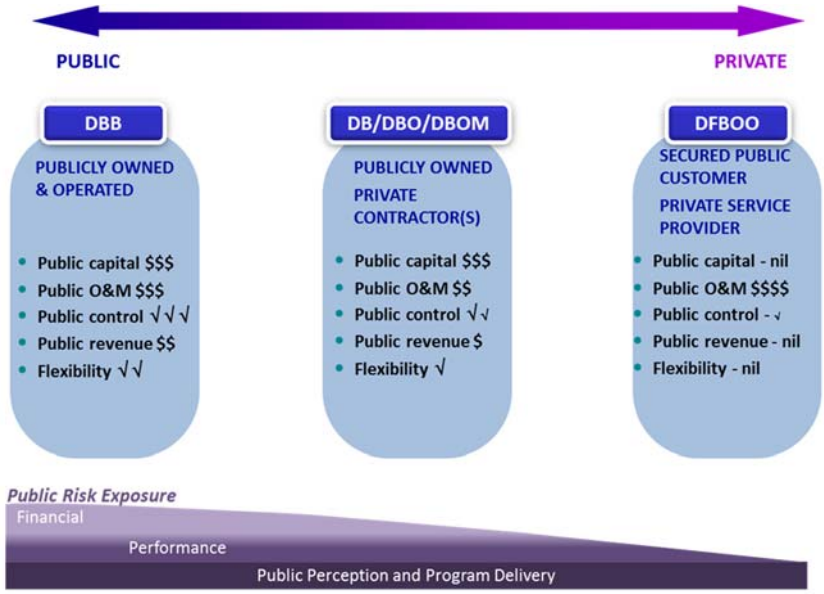
Project Risk and Control (cont'd)

- Risk/Control Management Tools:
  - Selection of the appropriate project delivery model and structure of roles to reflect careful choices and commitments to fulfilment of the obligated responsibilities
  - Careful construction of the Contract terms and conditions
  - Clear, unambiguous specification of performance requirements
  - Management of cash flow linked to performance of obligations
  - Firm, clear and enforced consequences tied to performance:
    - Incentives and disincentives

Background: Risk and Control

Energy from Waste Procurement and Business Planning Workshop

Risk and Control – Public/Private Context



Energy from Waste Procurement and Business Planning Workshop

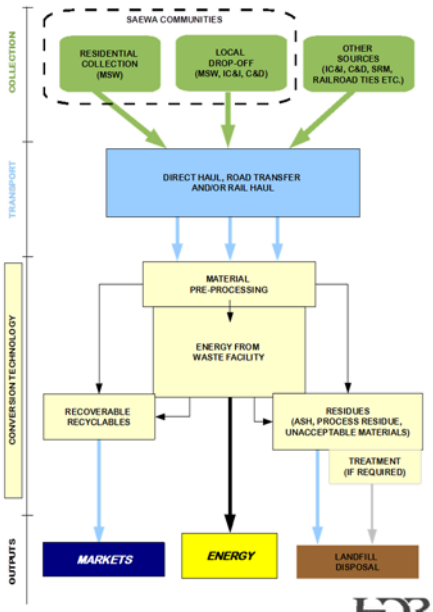
Break

Discussion Issue: Scope of Services

Energy from Waste Procurement and Business Planning Workshop

What will be included in the business?

- **Core Elements:**
  - Receiving and processing waste
  - Recovery of energy
  - Recovery of materials
  - Marketing and management of outputs
    - Energy, products, recovered recyclables, ash/residues
- **Other Potentially Related Elements:**
  - Collection of waste?
  - Transfer and transportation of waste?
  - Marketing of surplus or ***merchant*** processing capacity?
  - Development of new products from outputs?
  - Others?



Discussion Issue: Project Delivery

Energy from Waste Procurement and Business Planning Workshop

What is the preferred method of project delivery?

- **Models:**
  - Traditional Design-Bid-Build
  - Design Build
  - Design Build Operate
  - Design Build Operate and Maintain
  - Design Finance Build Own & Operate
  - Variations on above
- **Key Considerations:**
  - Allocation of risk and control
  - Capabilities to assume roles
  - Ability to fund
  - Preferences regarding price and schedule
  - Ownership preference

Discussion Issue: Ownership and Partnering

Energy from Waste Procurement and Business Planning Workshop

- **Ownership:**
  - *"The ultimate and exclusive right conferred by a lawful claim or title, and subject to certain restrictions to enjoy, occupy, possess, rent, sell, use, give away, or even destroy an item of property."*
  - Responsibilities and rights ⟷ risk and control
- **Who should own the:**
  - Site?
  - Facility?
  - Equipment?
  - Outputs?
- **Is there interest in partnering?**
- **Who could be potential partners:**
  - Private sector?
    - EFW project developers/technology vendors?
    - Others (e.g. waste services companies, venture funds)?
  - Public sector (e.g. non-SAEWA municipalities, Province, P3 Canada)?

Discussion Issue: Funding

Energy from Waste Procurement and Business Planning Workshop

Who will fund the project?

- SAEWA's membership?
  - Through capital contributions and tipping fees?
  - Through contributions from other public sector funding organizations (i.e. Provincial and/or Federal)?
- Private sector:
  - Through capital payments and/or tipping fees?
- Other options?
- The basis for all funding options will include:
  - Secured waste supply tip fees
  - Confidence in other revenue streams including:
    - Energy purchase and sale
    - Greenhouse gas emission offsets
    - Marketing of recyclables

Discussion Issue: Waste Supply

Energy from Waste Procurement and Business Planning Workshop

SAEWA's waste supply is the cornerstone of the project

- **How will the waste supply be secured?**
  - Agreements between SAEWA and its member communities?
  - Tip fee contracts on a put or pay basis?
  - Risk of short-term fluctuations?
  - Long-term stability of waste supply agreements?
  - Any allowances for surplus or merchant capacity to be sold as an alternative revenue generation?

Discussion Issue: Competition in Procurement

Energy from Waste Procurement and Business Planning Workshop

Competition in Procurement

- Procurement is the process of acquiring goods and services needed to complete a task or project
- Can be competitive (typical) or sole-sourced (not generally allowed for public expenditures)
- Competitive procurement:
  - Requires a competitive market-place
  - Can be time consuming
  - Creates certain mutual legal obligations (i.e. fairness and transparency)
  - Might achieve lowest pricing, but may not achieve best value
    - Heavily dependent on the bid terms and conditions and the bidders qualifications
  - Can motivate innovation
  - Establishes a level playing field
  - Generates the most reliable information regarding performance and commitments

Discussion Issue: Competition in Procurement

Energy from Waste Procurement and Business Planning Workshop

Competition in Procurement (cont'd)

- Typical elements of competitive procurement:
  1. Prequalification
     - Experience, expertise, track record, demonstrated capabilities through reference projects
     - Develop a short-list of prequalified proponents
  2. Request for Proposals
     - Technical specifications, performance requirements, contractual terms and conditions
  3. Negotiations
     - Establishment of final details of agreement
- **It is strongly recommended that SAEWA use competitive procurement be as a tool to select the preferred EFW technology from among those recommended for further consideration**
  - Technologies are rapidly changing
  - Maximize the potential for SAEWA to achieve best value
  - Provides opportunity for qualified vendors to participate
  - Keeps vendors "inside the tent"
  - A common industry practice

Discussion Issue: Due Diligence in Procurement

Energy from Waste Procurement and Business Planning Workshop

Due Diligence

- **The stakes are high**
- Important to be able to differentiate claims, interpretations and embellishments from accurate information
- Due diligence checks need to happen early in each procurement step
- **It is recommended that the competitive procurement approach incorporate due diligence measures including:**
  - Careful and detailed specification of required prequalification criteria
  - Affidavits and clear and substantive contractual consequences for false or misleading information (disqualification, loss of bid deposit)
  - Interviews of various types of reference contacts (clients, host community representatives, regulators)
  - Inspection visits to reference facilities identified by short-listed proponents
  - Financial condition investigation of short-listed proponents
  - Detailed assessment and evaluation of claims, statements, offers, terms and conditions presented by proponents

Discussion Issue: Fairness in Procurement

Energy from Waste Procurement and Business Planning Workshop

Fairness

- **The stakes are high**
- Project developers and technology vendors will seek to gain advantages in the selection process
- Procurement processes in Canada create mutual legally binding obligations on Owner and Proponents
- Fairness in procurement means: un-biased, non-discriminatory, no preferential treatment, transparent, mechanism for challenge and resolution of disputes
- **It is recommended that the competitive procurement process incorporate:**
  - Fairness principles in the selection processes for prequalification and request for proposals
  - The services of a third party fairness monitor to independently observe, provide feedback and report on the fairness of the procurement process
  - Experienced legal advisory services from a procurement specialist
  - Pre-defined channels of communication
  - Legally binding and enforced anti-lobbying restrictions applied to all potential proponents, all SAEWA decision-makers and all project team members
    - Anti-lobbying clause should be imposed concurrent with SAEWA's decision to proceed with procurement

Discussion Issue: Other Issues

Energy from Waste Procurement and Business Planning Workshop

Other Important Issues?

APPENDIX B
ENERGY FROM WASTE OPERATION PROCESS SCHEMATICS

Refuse Derived Fuel (RDF) Combustion

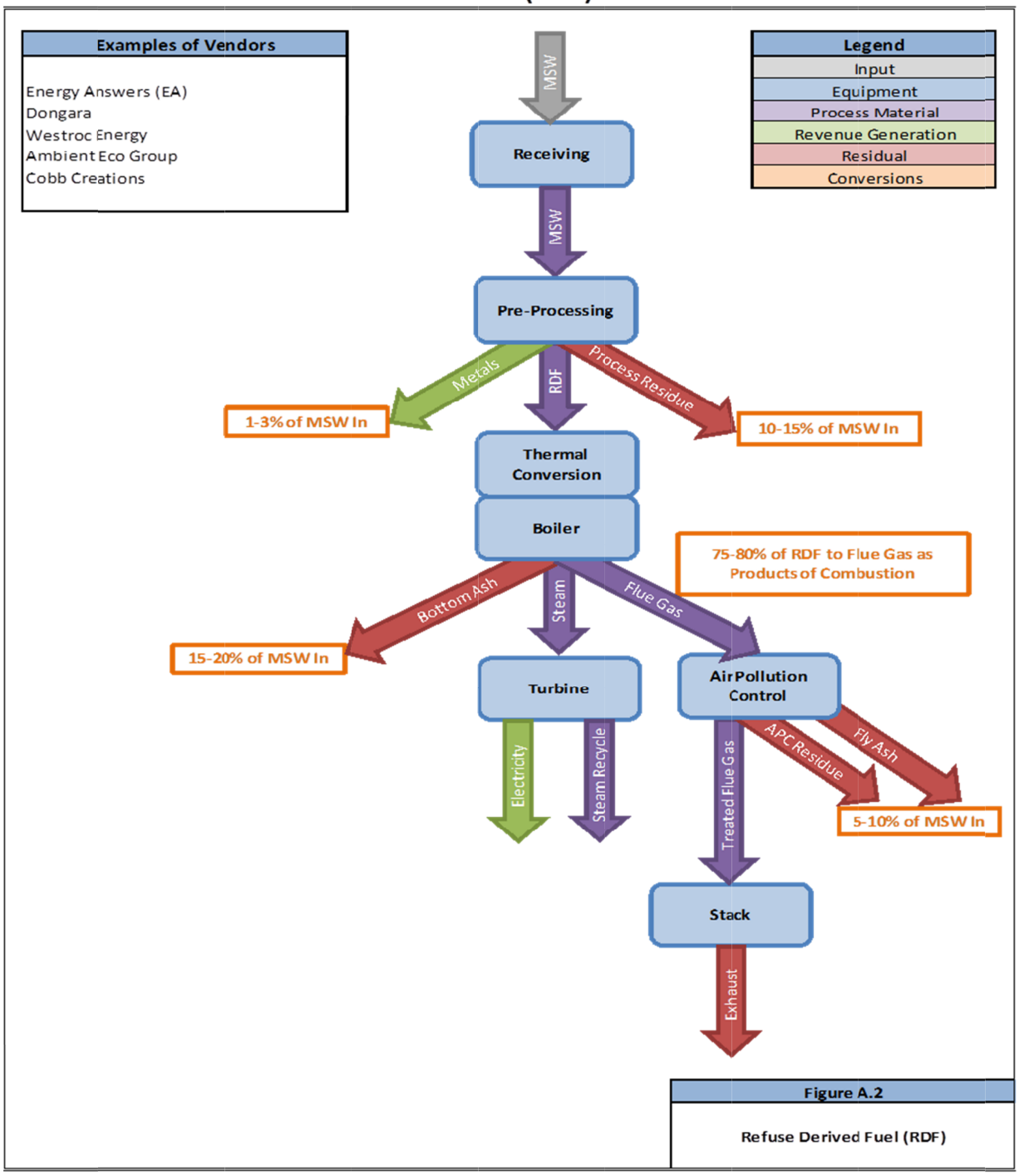


Figure A.2

Refuse Derived Fuel (RDF)

Description:

This technology prepares MSW by shredding, screening, and removing non-combustible materials prior to additional processing. The goal of this technology is to derive a better, more homogenous, Refuse Derived Fuel (or RDF) that can be used in a more conventional solid-fuel boiler as compared to a mass-burn combustion waterwall boiler. The RDF process typically results in a fuel yield in the 80% to 90% range (i.e., 80 to 90 percent of the incoming MSW is converted to RDF). The remaining 10% to 20% of the incoming waste that is not converted to RDF is composed of either recovered ferrous metals (1-5%) which can be sold to market, or process residue (15% to 19%) that must be disposed of in a landfill. In most cases, the fuel is used at the same facility where it is processed, although this does not have to be the case. The RDF is blown or fed into a boiler for semi-suspension firing. Combustion is completed on a traveling grate. Thermal recovery occurs in an integral boiler. The APC equipment arrangement for an RDF facility would be similar to that of a mass-burn combustion system.

Traditional Mass Burn Combustion

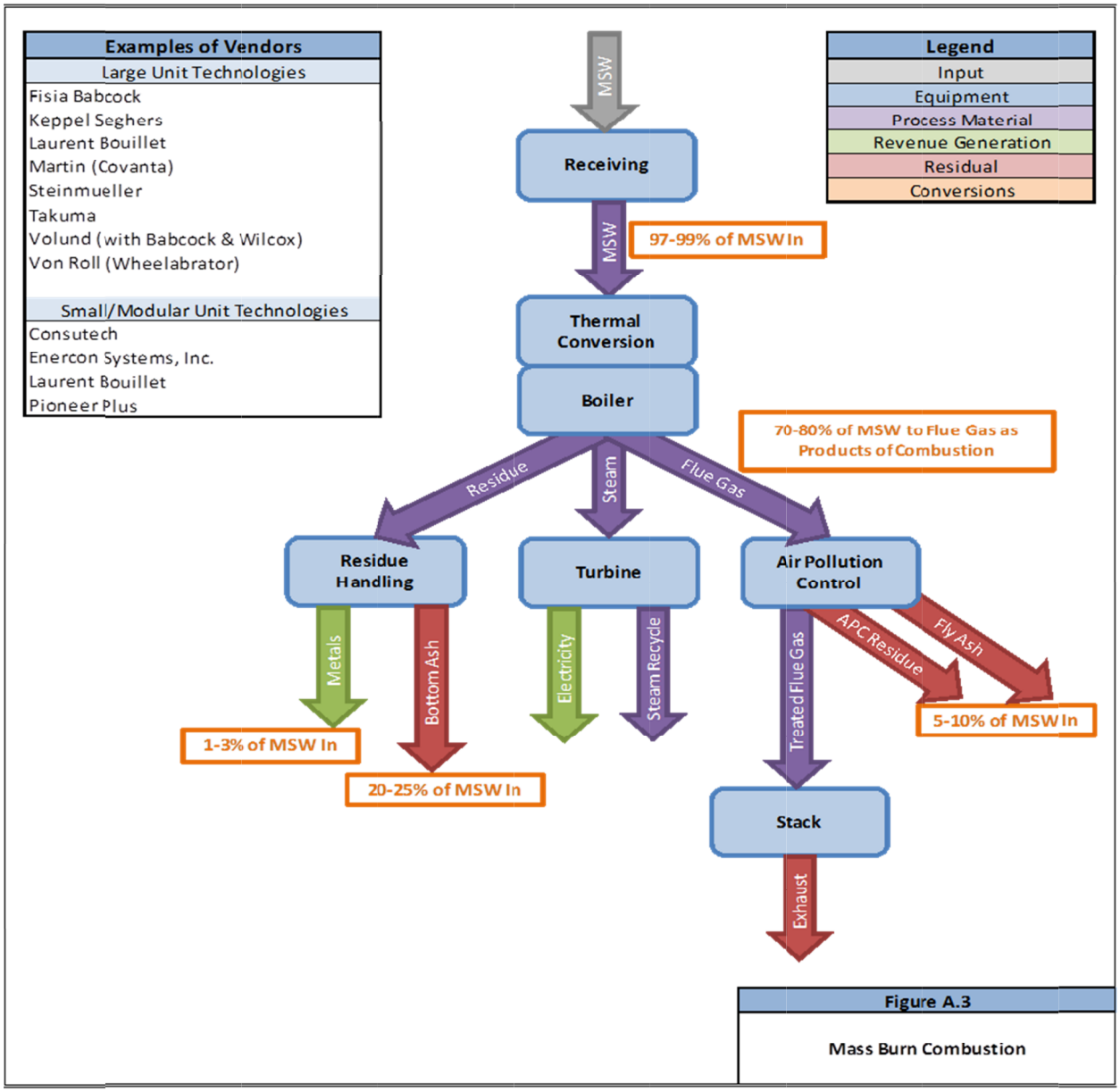


Figure A.3

Mass Burn Combustion

Description:

Mass Burn combustion technology can be divided into two main types: (a) grate based, waterwall boiler installations; and (b) modular, shop erected combustion units with shop fabricated waste heat recovery boilers. The modular units are typically limited to less than 200 tonnes per day and are historically used in facilities where the total throughput is under 500 tpd. In Mass Burn combustors, MSW is fed directly into a boiler system with no preprocessing other than the removal of large bulky items such as furniture and white goods. In the larger Mass Burn Combustion units, the MSW is typically pushed onto a grate by a ram connected to hydraulic cylinders. Air is admitted under the grates, into the bed of material, and additional air is supplied above the grates. The resulting flue gases pass through the boiler and the sensible heat energy is recovered in the boiler tubes to generate steam. In the smaller modular mass burn systems, MSW is fed into a refractory lined combustor where the waste is combusted on refractory lined hearths, or within a refractory lined oscillating combustor. The flue gases exit the combustors and enter a heat recovery steam generator, or waste heat boiler, where steam is generated by the sensible heat in the flue gas. In Mass Burn Combustion, four main streams are generated; steam, flue gas, bottom ash and fly ash. The steam is either sent to a steam turbine to generate electricity or it can be piped directly to an end user as process or district heating steam, or a combination of these uses. Mass burn technologies utilize an extensive set of air pollution control (APC) devices for flue gas clean-up. The typical APC equipment used include: either selective catalytic reduction (SCR) or non-catalytic reduction (SNCR) for NOx emissions reduction; spray dryer absorbers (SDA) or scrubbers for acid gas reduction; activated carbon injection (CI) for mercury and dioxins reduction; and a fabric filter baghouse (FF) for particulate and heavy metals removal.

Gasification

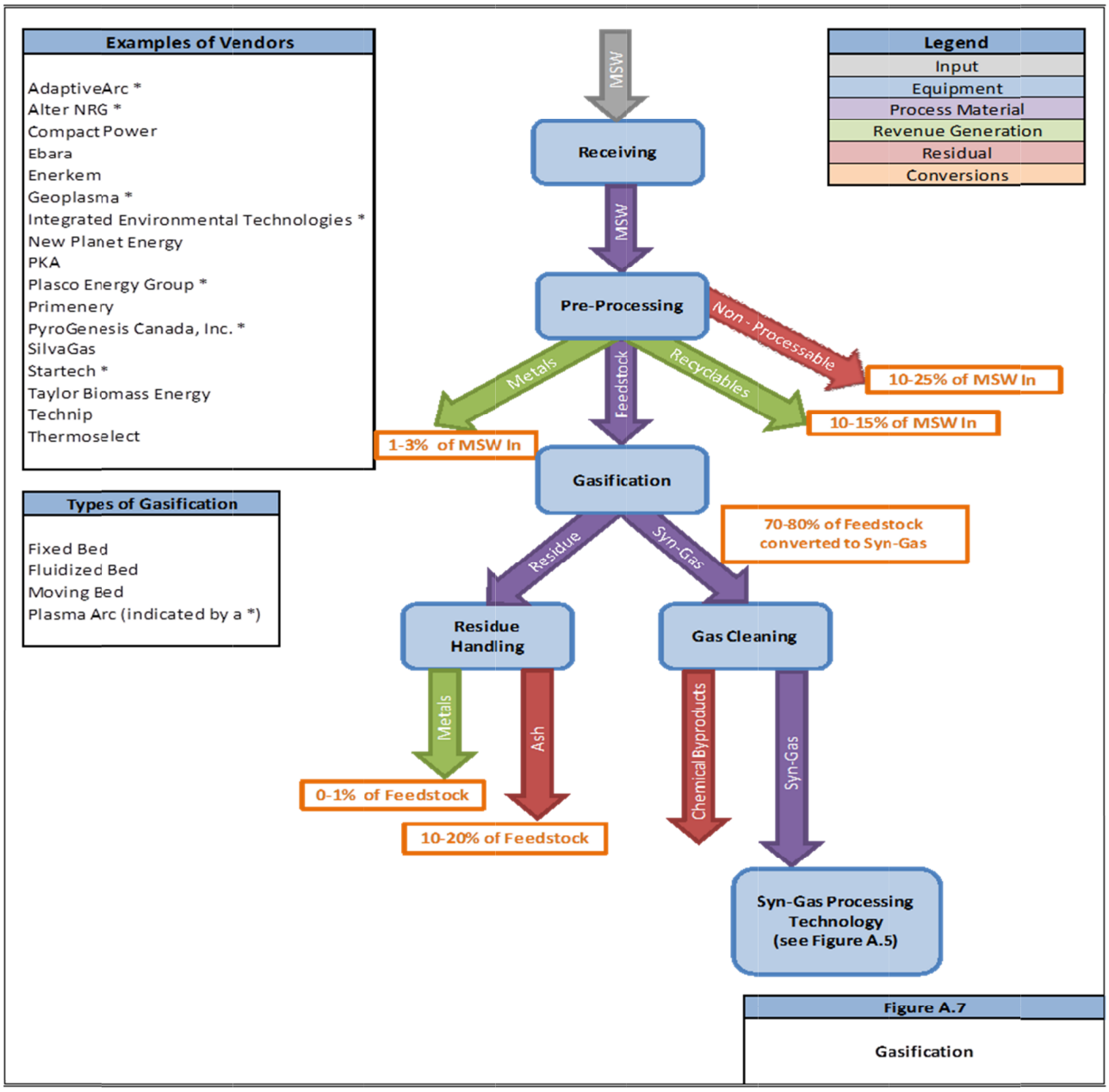


Figure A.7

Gasification

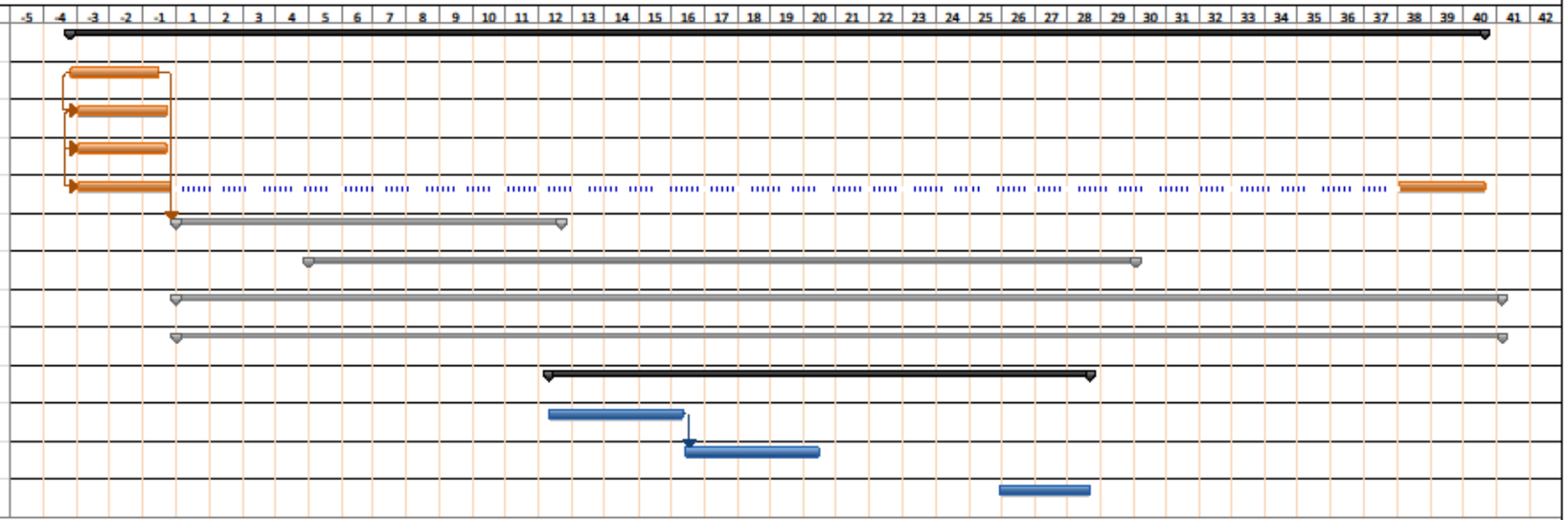
Description:

Gasification converts carbonaceous material into a synthesis gas or "syngas" composed primarily of carbon monoxide and hydrogen. Following a cleaning process to remove contaminants this syngas can be used as a fuel to generate electricity directly in a combustion turbine or engine, or the gas can be fired in a boiler to generate steam that can be used to generate electricity, for process uses or district heating, or a combination of both. The syngas generated can also be used as a chemical building block in the synthesis of gasoline or diesel fuel. The feedstock for most gasification technologies must be prepared into RDF developed from the incoming MSW, or the technology may only process a specific subset of waste materials such as wood waste, tires, carpet, scrap plastic, or other waste streams. Similar to Fluidized Bed Combustion, these processes typically require more front end separation and size reduction, and result in lower fuel yields (less fuel per tonne of MSW input). The feedstock reacts in the gasifier with steam and sometimes air or oxygen at high temperatures and pressures in a reducing (oxygen-starved) environment. The low- to mid-Megajoule syngas can be combusted in a boiler, or following a cleanup process a gas turbine, or engine or used in chemical refining. Of these alternatives, boiler combustion is the most common, but the cycle efficiency can be improved if the gas can be processed in an engine or gas turbine, particularly if the waste heat is then used to generate steam and additional electricity in a combined cycle facility. Industry experts generally expect that the flue gas will be lower in acid gases, combustion gases, organics, and metals, but APC equipment and syngas cleaning systems will still be required. The remaining ash and char produced by the syngas process may be marketed as a construction base, or disposed of in a landfill if a market does not exist.

APPENDIX C
PRELIMINARY PROJECT DEVELOPMENT SCHEDULE

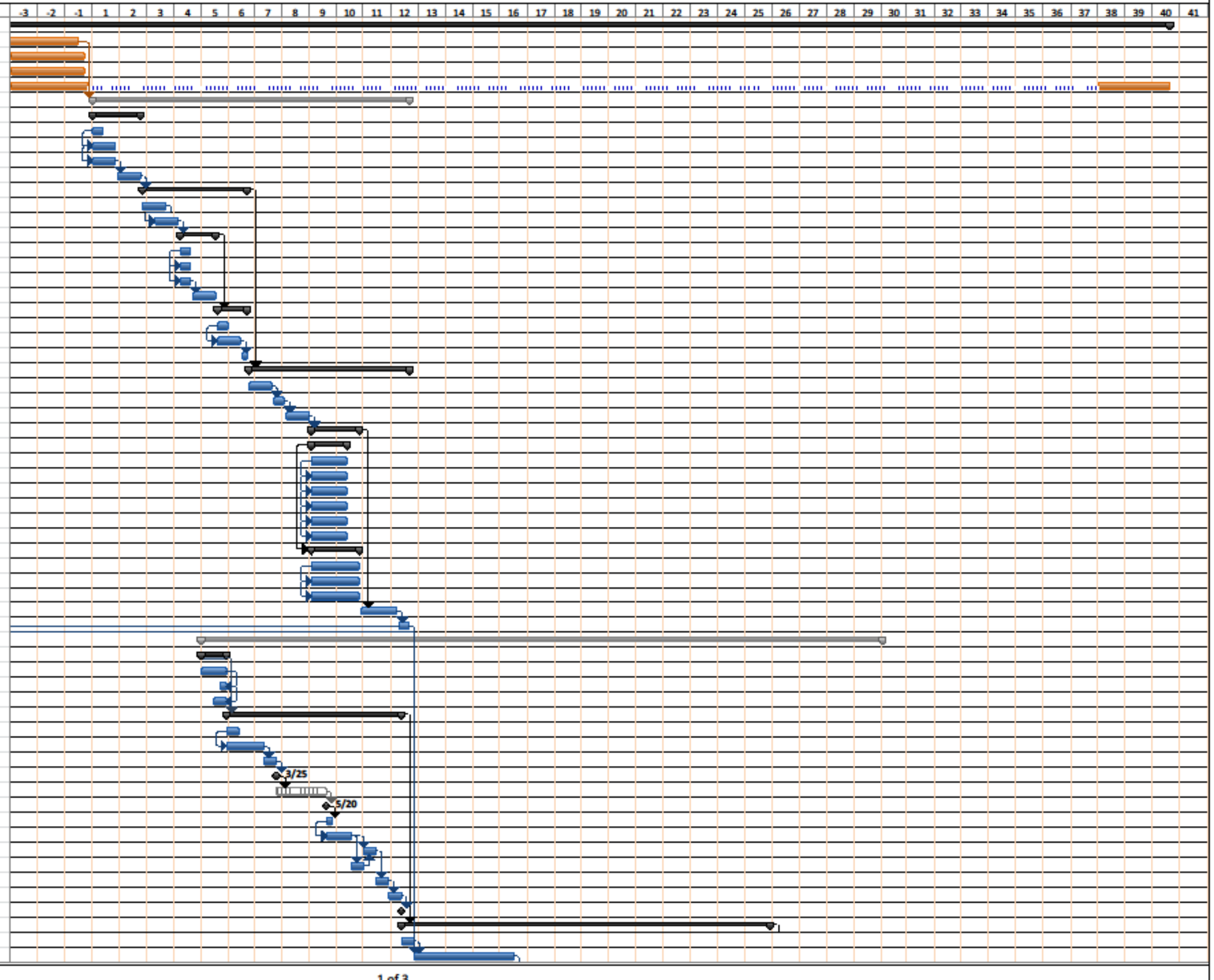
SAEWA Project Development Plan
DRAFT PRELIMINARY SCHEDULE - BUSINESS PLANNING

ID	Task Name
1	**Pre-Development Organizational Tasks**
2	Governance Structure
3	Secure Waste Supply and Conduct Waste Stream Analysis
4	Establish Funding for Early Project Development Activities
5	Establish Mechanisms for Financing Facility Capital and Operating Costs
6	**Siting**
7	**Procurement**
8	**Regulatory**
9	**Communications**
10	**Business Planning**
12	Waste Transportation Business Review and Analysis
13	Detailed Business Plan
15	Final Business Case Analysis



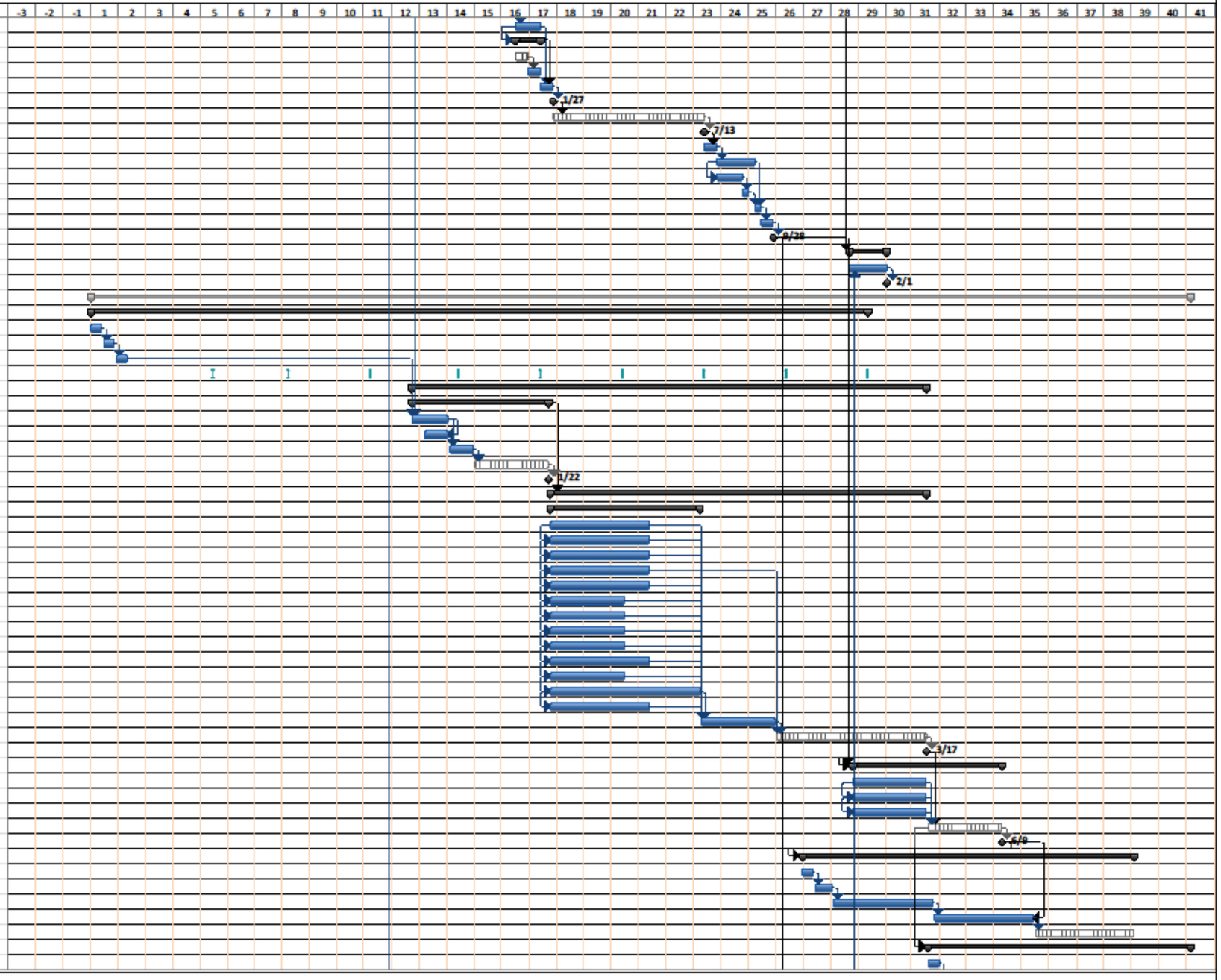
SAEWA Project Development Plan
DRAFT PRELIMINARY SCHEDULE - MASTER

ID	Task Name
1	**Pre-Development Organizational Tasks**
2	Governance Structure
3	Secure Waste Supply and Conduct Waste Stream Analysis
4	Establish Funding for Early Project Development Activities
5	Establish Mechanisms for Financing Facility Capital and Operating Costs
6	**Siting**
1	**Initiate Siting Process**
2	Update Siting Process Plan
3	Develop High-Level Site Specifications
4	Develop Elegibility and Exlusionary Criteria
5	Receive Stakeholder Input (Communications Plan)
6	**Identify and Evaluate Long-list Candidate Sites**
7	Develop Evaluation Criteria
8	Prepare Site Solicitation Documents
9	**Solicit Formal Nomination of Candidate Sites**
10	Meet with 2012 REOI Willing Host Communities
11	Mail Site Solitication Documents to Landholding Public Agencies
12	Advertise Request for Nomination of Private Sector Candidate Sites
13	Receive Nominations of Candidate Sites
14	**Evaluate Long-list Candidate Sites**
15	Due Diligence Compliance Checks
16	Review and Rank Compliant Candidate Sites
17	Identify Top Ranked Sites (Short-list)
18	**Evaluate Short-list Candidate Sites**
19	Review and Finalize Evaluation Criteria and Weighting
20	Receive Stakeholder Input (Communications Plan)
21	Identify Data Needs and Scope for Technical Reviews
22	**Conduct Technical Reviews of Short-list Candidate Sites**
23	**Desktop Reviews**
24	Preliminary Traffic Review
25	Local Air Quality Review
26	Land Use Review
27	Servicing Review
28	Topographic Review
29	Economic Review
30	**Field-Based Reviews**
31	Water Quality, Terrestrial, Aquatic and Ecological Review
32	Preliminary Geotechnical Screening
33	Archaeological Review
34	Analyze Technical Reviews, Compare and Evaluate Short-list Candidate Sites
35	Identify the Preferred Site
7	**Procurement**
1	**Initiate Procurement**
2	Prepare Procurement Manual
3	Conduct Procurement Training
4	Advance Notification of Pending Procurement Process
5	**Request for Prequalification**
6	Develop Prequalification Criteria and Selection Methodology
7	Prepare Draft Request for Prequalification (RFPQ)
8	Review Draft RFPQ
9	Issue RFPQ
10	RFPQ Submission Period
11	RFPQ Close
12	Initial Compliance Check of Prequalification Submissions
13	Review Prequalification Submissions
14	Conduct Due Diligence Reviews of Prequalification Submissions
15	Optional - Conduct Vendor Interviews
16	Final Review and Consensus Confirmation of Evaluation Results
17	Prepare Vendor Prequalification Report
18	Identification of Prequalified Vendors
19	**Request for Proposals (RFP)**
20	Develop Proposal Evaluation Methodology and Criteria
22	Prepare Draft RFP



SAEWA Project Development Plan
DRAFT PRELIMINARY SCHEDULE - MASTER

ID	Task Name
23	Review Draft RFP
24	**Optional - Confidential Review of Draft RFP**
25	Prequalified Proponents Review Confidential Draft RFP
26	Commcercially Confidential Meetings
27	Finalize RFP
28	Issue RFP
29	RFP submission period
30	RFP close
31	Initial compliance check of proposals
32	Review proposals
33	Conduct proposal due diligence, if required
34	Clarification queries to proponents
35	Conduct proponent interviews
36	Consensus evaluation and scoring of proposals
37	Identification of the preferred vendor
40	**Establish Contract**
41	Conduct negotiations with the preferred vendor
42	Execute the Contract
8	**Regulatory**
1	**Regulator Communications**
2	Prepare for Meeting with Regulators
3	Regulatory Project Initiation Meeting(s)
4	Update Regulatory Requirements Plan
5	**Regulatory Update Meetings**
15	**Environmental Impact Assessment (EIA)**
16	**EIA Terms of Reference (TOR)**
18	Prepare Proposed EIA TOR
19	Prepare First Nations Consultation Plan (if required)
20	TOR Notification Period
21	EA Director Review
22	Final TOR Issued
23	**EIA Report**
24	**Technical Assessment Studies**
25	Air Quality Assessment
26	Water Quality, Terrestrial, Aquatic and Ecological Assessments
27	Surface Water and Groundwater Assessment
28	Facility Energy and Life Cycle Assessment
29	Geotechnical Investigation
30	Acoustic Assessment
31	Natural Environment Assessment
32	Social/Cultural Assessment
33	Archaeological and Built Heritage Assessment
34	Transportation Logistics and Traffic Assessment
35	Economic Assessment
36	Site Specific Human Health and Ecological Risk Assessment
37	Additional Technical Studies Identified in the Final TOR
38	Prepare and Submit EIA Report
39	EIA Review Period
40	Decision in the Public Interest
42	**Integrated Environmental Protection and Enhancement Act (EPEA) Application**
43	EPEA Schedule 1 waste facility application
44	AUC Rule 007 power generation facility application
45	Additional integrated EPEA application submissions required
46	Integrated application review period
47	Facility approval
48	**AESO Connection Process**
49	Stage 0: Identify Project
50	Stage 1: Connection Study Scope
51	Stage 2: Connection Proposal
52	Stage 3: NID & Facility Application
53	Stage 4: Application Filings &AUC Approval
54	**Municipal Regulatory Requirements**
55	Identify Applicable Municipal Regulations



SAEWA Project Development Plan
DRAFT PRELIMINARY SCHEDULE - MASTER

ID	Task Name
56	Development Permits
57	Water License
58	Building, Electrical, Plumbing, Sewage, Gas Permits
59	Additional Municipal Permits
9	**Communications**
1	**Initiate Communications Plan**
2	Communications Guide
3	Project Branding
4	Key Messages
5	FAQs
6	Issues Database
7	Stakeholder Database
8	**Communications Support Tools**
9	Project Website
10	**Social Media**
21	Online Open-house
22	Customer Contact Centre
23	Surveys
24	Facility Tour
25	Communications Records
26	Communications Effectiveness Monitoring
27	**Stakeholder Engagement**
28	**SAEWA Membership**
29	Briefing Packages
44	Update Meetings
51	**Aboriginal peoples**
52	Aboriginal peoples communications plan
53	Consultations as required
54	Grassroots Organizations and Local Interest Groups
55	Non-governmental Organizations
56	Media
57	Notifications
58	Public Information Consultations
59	Local Community Events
60	Resident/Property Owner Meetings
10	**Business Planning**
12	Waste Transportation Business Review and Analysis
13	Detailed Business Plan
15	Final Business Case Analysis

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