

SOUTHERN ALBERTA ENERGY FROM WASTE ASSOCIATION

Friday, August 26, 2016



POTENTIAL FEEDSTOCK VOLUMES

Southern Alberta Waste Streams	Annual Waste Volume (Tonnes)
SAEWA Members	185,000
Non-SAEWA Members	285,000
Lethbridge	95,000
Medicine Hat	63,000
Other County/Municipal Districts	126,000
Total Southern Alberta Municipal Waste	470,000
Other Non-Municipal Waste Streams	30,000
Railway Ties	20,300
Specified Risk Materials (MBM)	9,700

Population Based Estimate for Municipal Waste based on Statistics Canada survey data

SAEWA MEMBER SURVEY / INTERVIEW DATA

SAEWA Member Waste Association / Municipality	Volume (tpy)
Bow Valley Waste Management Commission (Francis Cooke Landfill)	13,000
Drumheller and District Solid Waste Management Commission	20,000
Newell Regional Solid Waste Management Authority	21,000
Vulcan and District Waste Commission	3,400
North Forty Mile Regional Waste Management Services Commission	5,396
South Forty Waste Services Commission	493
Chief Mountain Regional Solid Waste Authority	3,892
Big Country Waste Management Commission	12,600
Lethbridge Regional Waste Management Services Commission	2,400
Mountain View Regional Waste Management Commission	19,685
Town of Coaldale Utilities and Services	2,246
Town of Coalhurst Waste Management Commission	571
Bow Valley Waste Management Commission (Town of Banff)	2,839
Bow Valley Waste Management Commission (Town of Canmore)	3,150
Town of Lake Louise	1,016
Municipal District of Bighorn	475
Total	112,163

Generally supports population based estimate – excludes recyclables

Change in SAEWA membership accounts for some 60,000 tonne reduction.

Foothills	36,900
Crowsnest/Pincher Creek	16,300
Willow Creek Regional	6,600

OPENING YEAR WASTE VOLUMES

Waste Streams (tonnes)	Available	Taken
SAEWA member waste quantity	119,795	119,795
Waste from non-SAEWA members	310,824	149,691
Agricultural plastics	13,222	0
Railway ties	20,817	20,817
Biosolids	1,344	0
Combustible oilfield Waste	2,813	0
Specified risk materials (MBM)	9,696	9,696
Total	478,511	300,000

- Volumes shown are opening year (2021) grown by 1.5% per year based on a blended average of municipality population growth

FACILITY CAPITAL AND OPERATING COSTS

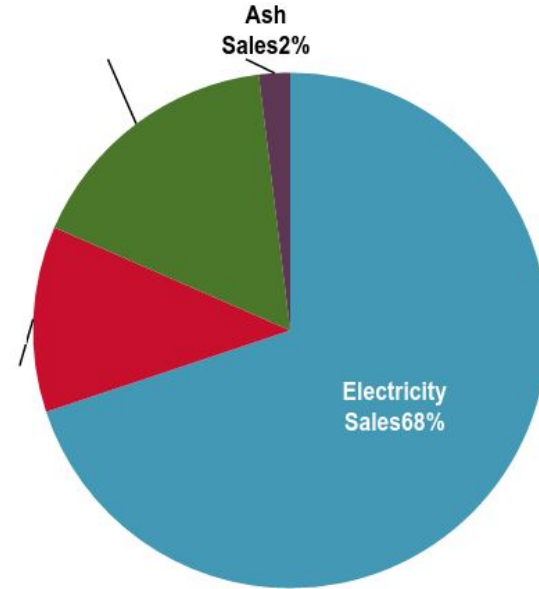
Cost (2015\$)	300,000 tpy	200,000 tpy	vs. 300	150,000 tpy	vs. 300
Direct construction cost	\$372,040,000	\$289,640,000		\$251,640,000	
Indirect construction cost	\$12,986,000	\$11,586,000		\$11,000,000	
GST	\$19,251,300	\$15,061,300		\$13,132,000	
Total construction cost	\$404,277,300	\$316,287,300		\$275,772,000	
Contingency at 10%	\$40,427,730	\$31,628,730		\$27,577,200	
Total capital cost	\$444,705,000	\$347,916,000	- 21.8%	\$303,349,000	- 31.8%
Capital cost per tonne	\$1,482	\$1,740	+ 17.4%	\$2,022	+ 36.4%
Facility operating cost	\$19,958,272	\$16,600,463	- 16.8%	\$15,620,000	- 21.7%
Operating cost per tonne	\$67	\$83	+ 23.9%	\$104	+ 55.2%

REVENUE-SUMMARY

Revenue Source	2021 Quantities	Units
Electricity production	205,304	MWh
Recovered metal	5,400	tonnes
Net GHG emissions avoided	115,732	tCO2e
Ash	75,000	tonnes

Operating Revenue	2021 (\$M)	NPV (\$M)
Electricity sales	\$14.70	\$290.25
Recovered metal sales	\$2.45	\$75.68
Carbon offset credit sales	\$3.47	\$32.10
Ash sales	\$0.41	\$6.94
Total	\$21.52	\$404.96

2021 Operating Revenues



SUMMARY OF FINANCIALS – BASE CASE

Cost (\$M)	NPV	2021	2050
Principal repayment	(\$260.15)	(\$10.12)	(\$25.48)
Interest payments	(\$178.62)	(\$15.98)	(\$0.62)
O&M costs	(\$487.79)	(\$22.48)	(\$39.91)
Total facility costs	(\$926.56)	(\$48.57)	(\$66.01)

Operating Revenue (\$M)	NPV	2021	2050
Electricity sales	\$290.24	\$14.70	\$21.18
Recovered metal sales	\$75.68	\$2.45	\$7.83
Carbon offset credit sales	\$32.10	\$3.47	\$0.00
Bottom ash sales	\$6.94	\$0.41	\$0.41
Total operating revenue	\$404.96	\$21.04	\$29.42

Net Cost per Tonne	Levelized (NPV)	2021	2050
Total cost per tonne	(\$183.69)	(\$161.91)	(\$220.03)
Total revenue per tonne	\$80.28	\$70.13	\$98.06
Net cost per tonne	(\$103.41)	(\$91.78)	(\$121.98)

Variable	Units	Values
Debt financing ratio	%	100%
Interest rate	%	3.21%
Term (years)	years	30
Annual debt service	\$M	\$26.10
Bond issuance year	year	2020

Tipping fee of **\$91.78** (2021) required to subsidize facility operating costs

SUMMARY OF FINANCIALS – GRANT / UTILITY MODEL

Cost (\$M)	NPV	2021	2050
Principal repayment	\$0.00	\$0.00	\$0.00
Interest payments	\$0.00	\$0.00	\$0.00
O&M costs	(\$487.79)	(\$22.48)	(\$39.91)
Total facility costs	(\$487.79)	(\$22.48)	(\$39.91)

Operating Revenue (\$M)	NPV	2021	2050
Electricity sales	\$290.24	\$14.70	\$21.18
Recovered metal sales	\$75.68	\$2.45	\$7.83
Carbon offset credit sales	\$32.10	\$3.47	\$0.00
Bottom ash sales	\$6.94	\$0.41	\$0.41
Total operating revenue	\$404.96	\$21.04	\$29.42

Net Cost per Tonne	Levelized (NPV)	2021	2050
Total cost per tonne	(\$96.70)	(\$74.92)	(\$133.05)
Total revenue per tonne	\$80.28	\$70.13	\$98.06
Net cost per tonne	(\$16.42)	(\$4.79)	(\$34.99)

Variable	Units	Values
Debt financing ratio	%	n/a
Interest rate	%	n/a
Term (years)	years	n/a
Annual debt service	\$M	n/a
Bond issuance year	year	n/a

Tipping fee of **\$4.79** (2021) required to subsidize facility operating costs

SUMMARY OF FINANCIALS – INTEREST-FREE LOAN

Cost (\$M)	NPV	2021	2050
Principal repayment	(\$476.53)	(\$15.88)	(\$15.88)
Interest payments	\$0.00	\$0.00	\$0.00
O&M costs	(\$911.82)	(\$22.48)	(\$39.91)
Total facility costs	(\$1,388.35)	(\$38.36)	(\$55.80)

Operating Revenue (\$M)	NPV	2021	2050
Electricity sales	\$533.42	\$14.70	\$21.18
Recovered metal sales	\$147.15	\$2.45	\$7.83
Carbon offset credit sales	\$45.13	\$3.47	\$0.00
Bottom ash sales	\$12.38	\$0.41	\$0.41
Total operating revenue	\$738.07	\$21.04	\$29.42

Net Cost per Tonne	Levelized (NPV)	2021	2050
Total cost per tonne	(\$154.26)	(\$127.87)	(\$186.00)
Total revenue per tonne	\$82.01	\$70.13	\$98.06
Net cost per tonne	(\$72.25)	(\$57.74)	(\$87.94)

Variable	Units	Values
Debt financing ratio	%	100%
Interest rate	%	0%
Term (years)	years	30
Annual debt service	\$M	\$15.88
Bond issuance year	year	2020

Tipping fee of **\$57.74** (2021) required to subsidize facility operating costs

SUMMARY OF FINANCIALS – OPEN MARKET FINANCING

Cost (\$M)	NPV	2021	2050
Principal repayment	(\$61.91)	(\$3.22)	(\$54.47)
Interest payments	(\$315.35)	(\$55.38)	(\$4.12)
O&M costs	(\$171.97)	(\$22.48)	(\$39.91)
Total facility costs	(\$549.23)	(\$81.07)	(\$98.51)

Operating Revenue (\$M)	NPV	2021	2050
Electricity sales	\$105.50	\$14.70	\$21.18
Recovered metal sales	\$24.65	\$2.45	\$7.83
Carbon offset credit sales	\$16.88	\$3.48	\$0.00
Bottom ash sales	\$2.66	\$0.41	\$0.41
Total operating revenue	\$149.69	\$21.05	\$29.42

Net Cost per Tonne	Levelized (NPV)	2021	2050
Total cost per tonne	(\$284.34)	(\$270.23)	(\$328.35)
Total revenue per tonne	\$77.49	\$70.16	\$98.06
Net cost per tonne	(\$206.84)	(\$200.07)	(\$230.30)

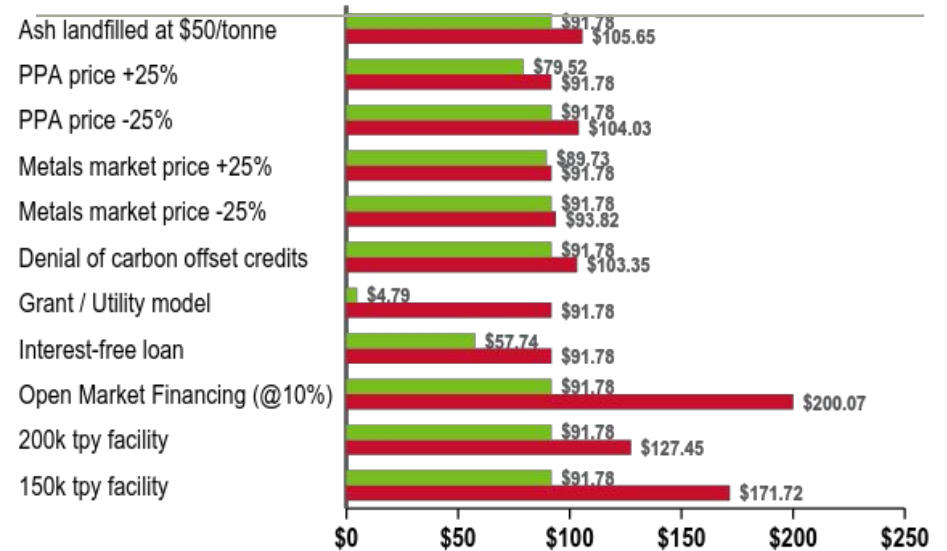
Variable	Units	Values
Debt financing ratio	%	100%
Interest rate	%	10%
Term (years)	years	30
Annual debt service	\$M	\$58.59
Bond issuance year	year	2020

Tipping fee of **\$200.07** (2021) required to subsidize facility operating costs

RISK AND OPPORTUNITY

EfW Tipping Fees	2021	2050	Levelized (NPV)
Base case	\$91.78	\$121.98	\$103.41
Revenue Streams			
Ash landfilled at \$50/tonne	\$105.65	\$135.85	\$117.28
PPA price +25%	\$79.52	\$104.33	\$89.02
PPA price -25%	\$104.03	\$139.62	\$117.79
Metals market price +25%	\$89.73	\$115.45	\$99.66
Metals market price -25%	\$93.82	\$128.50	\$107.16
Denial of carbon offset credits	\$103.35	\$121.98	\$109.77
Financing			
Grant / Utility model (100% of capital)	\$4.79	\$34.99	\$16.42
Interest-free loan	\$57.74	\$87.94	\$72.25
Open Market Financing (Debt @10%)	\$200.07	\$230.30	\$206.84
Sizing			
200k tpy facility	\$127.45	\$172.49	\$144.63
150k tpy facility	\$171.72	\$233.68	\$195.09

Sensitivity Analysis
EfW Tipping Fee vs. Base Case (\$91.78/t)



OPERATING COST ANALYSIS

- Purpose of Analysis:
 - To compare SAEWA member disposal cost to that of a proposed EfW facility
 - To obtain other data on transportation, municipal collection and transfer station cost
- Important Notes:
 - There are differences in the operating and funding models of waste commissions across Southern Alberta
 - Operating cost may be funded through any combination of tipping fees, municipal requisitions, general property tax.
 - Landfills may accept waste from outside region contributing to recovery of operating cost.
 - Fees (requisition/tipping/other) are set to cover full lifecycle cost of landfill – waste commissions are not-for-profit
 - Any comparison to tipping fees of EfW should exclude landfill closure and monitoring cost

DRUMHELLER AND DISTRICT SOLID WASTE MANAGEMENT COMMISSION

- Provides service to over 28,000 people
- Waste is collected at 19 transfer stations and transported to the Drumheller Regional landfill

Revenue sources:

- Municipal requisitions directed toward the transportation and disposal cost for MSW
- Tipping fees for non-member waste including certain contracts from outside region

Contact: Tammi Nygaard

	Operating Cost (2015\$)	Operating Cost per Tonne (2015\$)
Landfill	\$719,174	\$36
Transport to Landfill	\$307,518	\$15
Transfer Stations	\$50,000	\$3
Total Landfilled Waste¹	\$1,076,692	\$54
Recycling	\$355,191	
Total	\$1,431,883	
Reserve	\$182,311	
Population	28,648	
Feedstock	20,000 tonnes	

¹ includes all transfer station costs including any costs associated with recyclable materials

NEWELL REGIONAL SOLID WASTE MANAGEMENT AUTHORITY

- Provides service to over 23,500 residents
- Waste is direct hauled and collected at 5 transfer stations and transported to the landfill near Brooks

Revenue sources:

- Industrial waste disposal fees
- MSW levies
- MSW fees

Contact: Ray Juska

	Operating Cost (2014\$)	Operating Cost per Tonne (2014\$)
Landfill	\$1,179,565	\$43
Transport to Landfill	\$183,675	\$9
Transfer Stations	\$173,421	\$8
Total Landfilled Waste¹	\$1,536,661	\$60
Recycling	\$322,886	\$51
Total	\$1,859,547	\$68
Reserve	\$783,099	
Population	23,500	
Feedstock	21,000 tonnes	

¹ includes all transfer station costs including any costs associated with recyclable materials

BOW VALLEY WASTE MANAGEMENT COMMISSION

(MD OF BIGHORN)

- Provides waste collection at various transfer facilities located throughout its service territory
- Waste is collected and direct hauled to Spyhill landfill facility in Calgary

Revenue sources:

- Costs are recovered through the tax base

	Operating Cost (2015\$)	Operating Cost per Tonne (2015\$)
Landfill	\$55,000	\$116
Transport to Landfill	\$88,000	\$185
Total	\$143,000	\$301
Population	1,341	
Feedstock	475 tonnes	

Contact: Al Hogarth

BOW VALLEY WASTE MANAGEMENT COMMISSION

(TOWN OF CANMORE)

- Provides garbage and recycling bins for resident drop off, consolidation and disposal
- Current disposal location is at Dried Meat landfill near Camrose

Revenue sources:

- Costs are recovered through property tax

Contact: Simon Robins

	Operating Cost (2015\$)	Operating Cost per Tonne (2015\$)
Landfill	\$110,250	\$35
Transport to Landfill	\$450,840	\$143
Municipal Collection	\$509,967	\$162
Total Landfilled Waste¹	\$1,071,057	\$340
Recycling	\$316,566	
Total	\$1,387,623	
Population	13,077	
Feedstock	3,150 tonnes	

¹ includes all transfer station costs including any costs associated with recyclable materials

SUMMARY OF OPERATING COSTS

Waste Commissions/Municipalities	Operating Cost per Tonne (\$/tonne)				
	Landfill	Transport to Landfill	Transfer Stations	Collection	Total
Drumheller and District Solid Waste Management Commission	\$36	\$15	\$3	N/A	\$54
Newell Regional Solid Waste Management Authority	\$43	\$9	\$8	N/A	\$60
Bow Valley Waste Management Commission (MD of Bighorn)	\$116	N/A	N/A	\$185	\$301
Bow Valley Waste Management Commission (Town of Canmore)	\$35	\$143	N/A	\$162	\$340