

Recycling Council of BC
June 2008



Waste as a Resource

- Urban societies create solid waste.
- Affluent urban societies create $\frac{3}{4}$ of a tonne per person per year.
- Jurisdictions have established policies to maximize recycling, maximize value recovery and minimize disposal.
- To implement this policy, four imperatives will be key:
 - ❖ Reduce material consumption
 - ❖ Maximize recycling to the limits of feasibility
 - ❖ Eliminate environmental impact on land, water and air
 - ❖ Maximize net economic value from residual waste

Recovery vs. Disposal

- **California** legislation recognizes conversion of waste to useful products **without air emissions** and **without contamination of water or land** as a concept that implements the “waste as a resource” policy
- **European Union** (Jan 2008) considers Plasco Conversion System as Recovery not Disposal



Excellent Performance Against the Toughest Regulations

Parameter	Units	Ontario	British Columbia	California	EU	PlascoEnergy
Total Dust	mg/m ³	12	20	17	9	3
Organic Matter	mg/m ³	50	40	-	9	9
Hydrogen Chloride (HCl)	mg/m ³	20	70	27	9	2
Hydrogen Fluoride (HF)	mg/m ³	-	3	-	1	0.02
Sulphur dioxide (SO ₂)	mg/m ³	37	250	57	47	10
NOx expressed as NO ₂	mg/m ³	211	350	205	186	9
Carbon monoxide (CO)	mg/m ³	-	55	42	47	34
Mercury (Hg)	mg/m ³	0.020	0.200	0.057	0.05	0.0005
Cadmium (Cd)	mg/m ³	0.014	0.100	0.014	0.05	0.0009
Lead	mg/m ³	0.14	0.050	0.14	-	0.012
Class III Metals	mg/m ³	-	-	-	0.5	0.05
Dioxins and furans	ng/m ³	0.041	0.5	9	1	0

Notes:

1. All values are expressed at 11%O₂ and standard conditions (101.3 kPa, 20°C)
2. EU regulations combine Thallium with Cadmium and Lead with Class III Metals

Ottawa Facility: Commercial Module

Ground breaking: Sept 2006

Construction: 9 months

Power sales: 13 months

MSW receipt: 16 months

Power from MSW:
17 months



Maximum Value

What Becomes of the Waste?

Per Tonne (Based on 16,500 MJ @ 30% moisture)	Type
2600 Nm ³ *	Syngas @ LHV = 4.85 MJ/Nm ³ (dry basis)
150 kg	Vitrified Slag
5 kg	Sulphur
5 - 10 kg	Salt
300 L	Water (potable water standards)
1.3 kg	Heavy metals and particulate**

* Normal conditions are °C and 101.3 kPa.

** These heavy metals are due to improper disposal of hazardous waste, such as batteries, by the public and not due to Plasco Conversion.

99.8% of waste is converted to clean fuel and valuable products

Plasco Conversion is Not Incineration



Plasco Trail Road

- Value Recovery
- NO Stack
- NO Emissions from Conversion
- Tallest piece of equipment is 16 m (H₂S Absorber)

Burnaby Incinerator

- Waste Disposal
- Emissions from MSW Combustion
- 60 m stack height



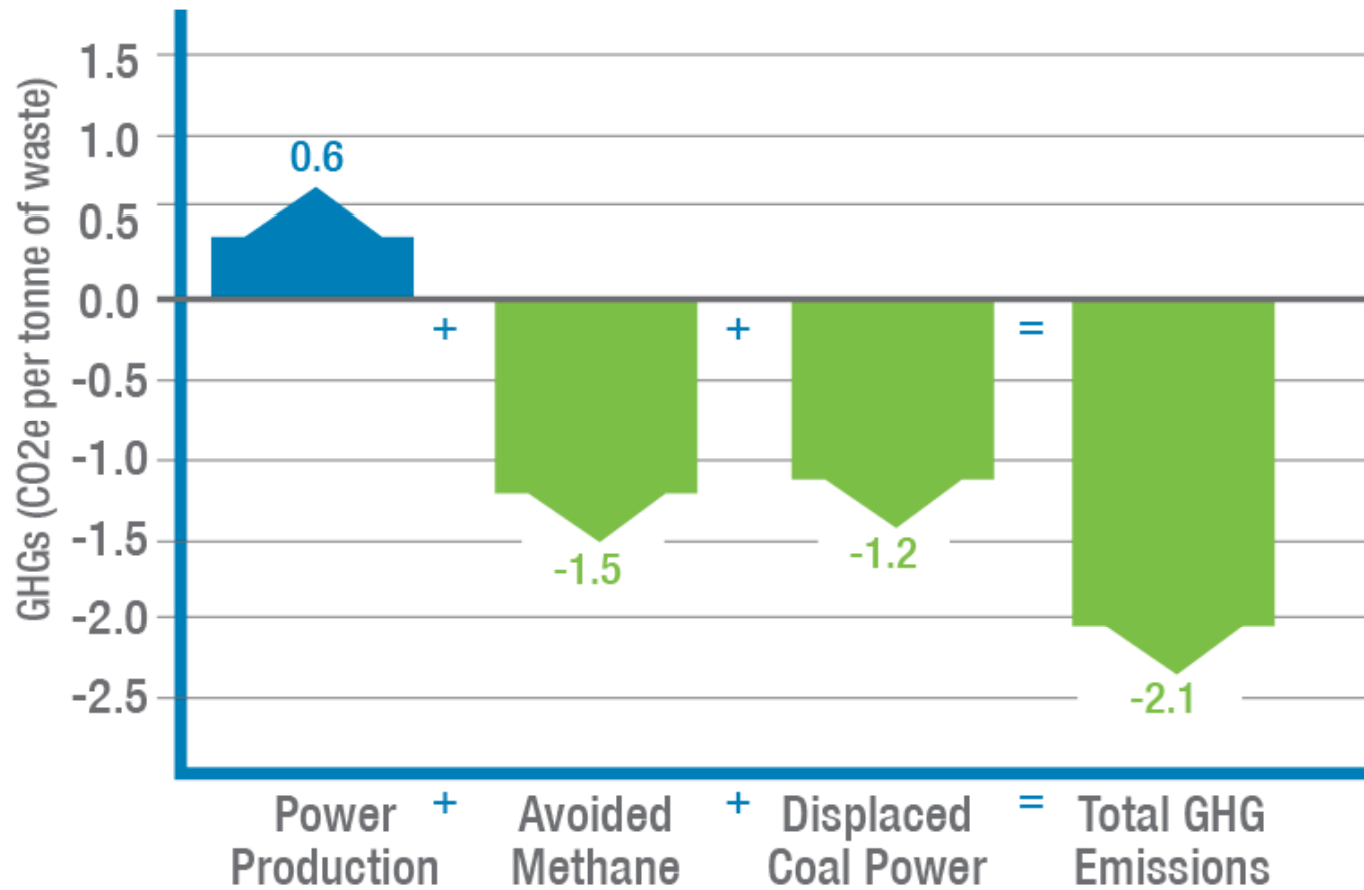
PlascoEnergy – A Partner in the Solution

	PLASCO CONVERSION	WIND	SOLAR
Methane Avoidance from Landfills			
Elimination of Long-distance Trucking of Waste			
Displacement of GHG-intensive Power (e.g. Coal)			
Reduction in Transmission Losses			

Processing waste through Plasco Conversion reduces greenhouse gas (GHG) emissions.

Maximum Environmental Protection GHG Reductions

Greenhouse Gas Reductions per Tonne of Waste



Comparing the Alternatives

WHAT HAPPENS TO 1 TONNE OF WASTE?

Maximum Value

Comparator	Plasco Conversion	Incineration	Landfill with Landfill Gas Capture
Power Generation	<p>Primary Internal Combustion Engine</p> <p>Secondary Heat Recovery - Steam Turbine</p>	Heat Recovery-Steam Turbine	Internal Combustion Engine
Power per Ton	1.1-1.2 MWh	0.6 MWh	0.15 MWh
Diversion	99.8%	75-80%	0%

Comparing the Alternatives

WHAT HAPPENS TO 1 TONNE OF WASTE?

Maximum Environmental Protection

Comparator	Plasco Conversion	Incineration	Landfill with Landfill Gas Capture
GHG's avoided (tonnes of CO ₂ e)	2.1	1.5	1.2
CACs (per MWh)			
NO _x (g)	80	1660 ^b	570 ^e
Sulfur (g)	40	95 ^b	50 ^a
Particulate Matter (g)	13	37 ^b	8 ^e
CO (g)	168	190 ^b	2950 ^e
Mercury (mg)	2	60 ^d	2 ^a
Dioxins and Furans (ng)	0	60 ^d	0

a Parameters based on US EPA AP-42 Emission Factors for IC engines and methane produced per tonne of waste.

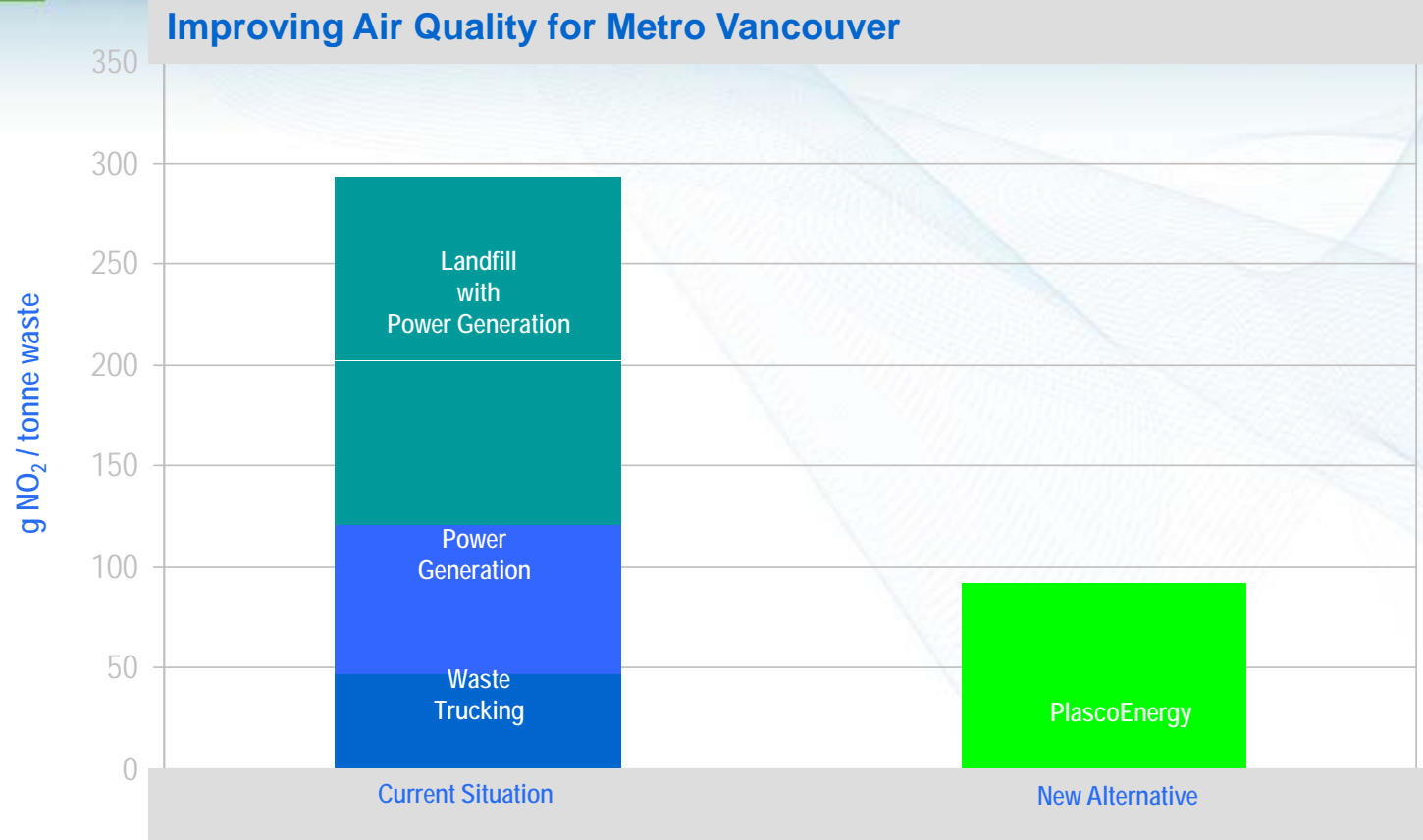
b Based on Montenay's response to Request for Expressions of Interest, GVRD, 2006.

c Assumes 90-100 ppm H₂S in gas.

d Based on "Life Cycle Assessment of Two Waste Management Scenarios for Metro Vancouver".

e Based on 2006 National Pollutant Release Inventory (NPRI) data for Vancouver Landfill and electrical capacity of 7.4 MW.

Smog Causing NOx Emissions



Sources:

1. Landfill with Power Generation: NPRI data for Vancouver Landfill, 2006
2. Power Generation: BC Hydro data for Burrard Thermal
3. Waste Trucking: Fleet Average Emission Factors for Garbage/Recycling Truck Fleet, *Emission Reduction Options for Heavy Duty Diesel Fleet Vehicles in the Lower Fraser Valley*, 2005

Typical Municipal Waste – 1000 kg

Other Waste	kg	HHV (Dry)	Moisture	HHV (Wet)
Plastics	114	42,100	3.5%	40,600
Metals	27	0	0%	0
Glass	17	0	0%	0
Inorganic	8	0	0%	0
Hazardous Waste	7	32,700	5.6%	30,800
Rubber/Textiles	109	20,600	23.5%	15,800
Other	49	17,500	9.3%	15,900
Total	331	24,800	10.4%	22,200

297 kg dry
= 7350 MJ

34 kg H₂O
= 0 MJ

14,300 MJ

Organic Waste	kg	HHV (Dry)	Moisture	HHV (Wet)
Paper and paperboard	225	17,100	22.5%	13,300
Food Waste	253	19,000	60.0%	7,600
Yard Waste	121	17,800	36.9%	11,200
Household Hygiene	70	22,500	56.4%	9,800
Total	669	18,200	42.8%	10,400

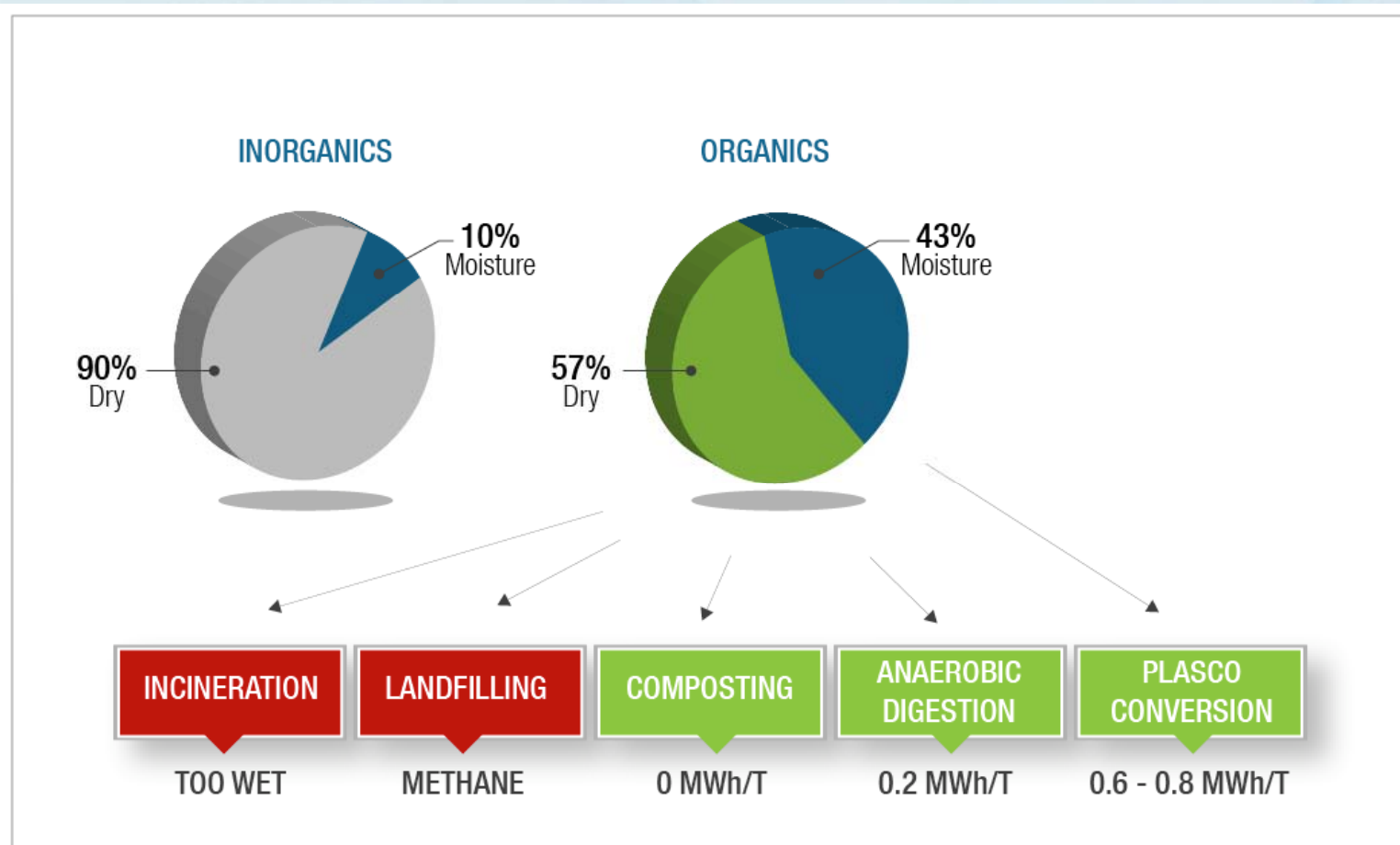
383 kg dry
= 6950 MJ

286 kg H₂O
= 0 MJ

Ref: Technology Resource Institute. *Waste Composition Study for GVRD*. January 15, 2005.

Water (H₂O) that has no energetic value is used effectively in the Plasco Conversion process for generating hydrogen fuel gas (H₂) and carbon monoxide (CO), with residual clean water.

Being Wise About Waste



Innovative Technology Offers Another Option

The Public Advisory Committee

- **Comprised of 10 Ottawa residents that range from involved citizens and members of community associations to professional engineers and environmentalists**

The Committee will:

- ❖ Be Chaired by a City councilor
- ❖ Review, discuss and form opinions on emissions data
- ❖ Independently report to the public and City council on PlascoEnergy's emissions test results
- ❖ Publish statements to zerowasteottawa.com
- ❖ Meet as often as its members feel necessary, but no less than four times a year

Public Disclosure



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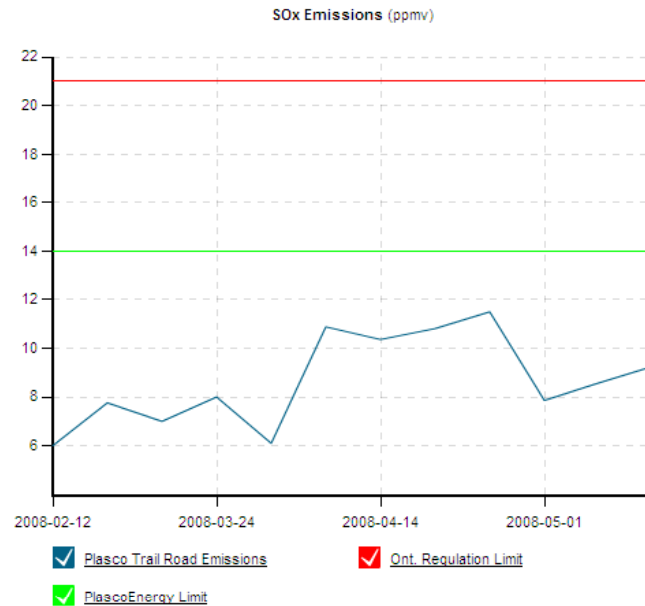
A PARTNERSHIP FOR A ZERO-WASTE OTTAWA



ENVIRONMENTAL PERFORMANCE:

SOx:

chart by amCharts.com



LAST REPORTING DATE:

May 26, 2008

NOx:	60.55	ppmv
HCl:	0.34	ppmv
SO ₂ :	9.26	ppmv
Organic Matter:	6.93	ppmv

WEEKLY NOTES:

This is the data submitted to the Ministry of Environment of Ontario for the weeks of May 12th through to May 25th.

NOTE:

A series of operational changes primarily to the materials handling facilities, within that time frame, has affected Plasco Trail Road's ability to ramp up production rates. A sustained run of 24 hours at the maximum rate would permit triplicate source testing required by our Certificate of Approval for Air. Substantial progress is occurring in increasing throughput rates and Plasco Trail Road expects to have the facility available for testing during the first week in June. A modified pre-test plan is being submitted to the MOE to reflect our revised plans and schedule.

www.zerowasteottawa.com



Zero Risk Business Model

- **PlascoEnergy builds, owns and operates its patented conversion system**
 - no capital required from customers,
 - no operation risk
 - In operation 12 months after permitting
- **Environmental performance is guaranteed**
- **Long-term budgetary certainty – competitive tipping fees are fixed for 20 years**

Municipality assumes no risk for:

Capital cost

Operating performance and costs over 20 years

Environmental performance

Los Angeles 200 tpd Plant



Zero Risk to Community

Social Acceptability

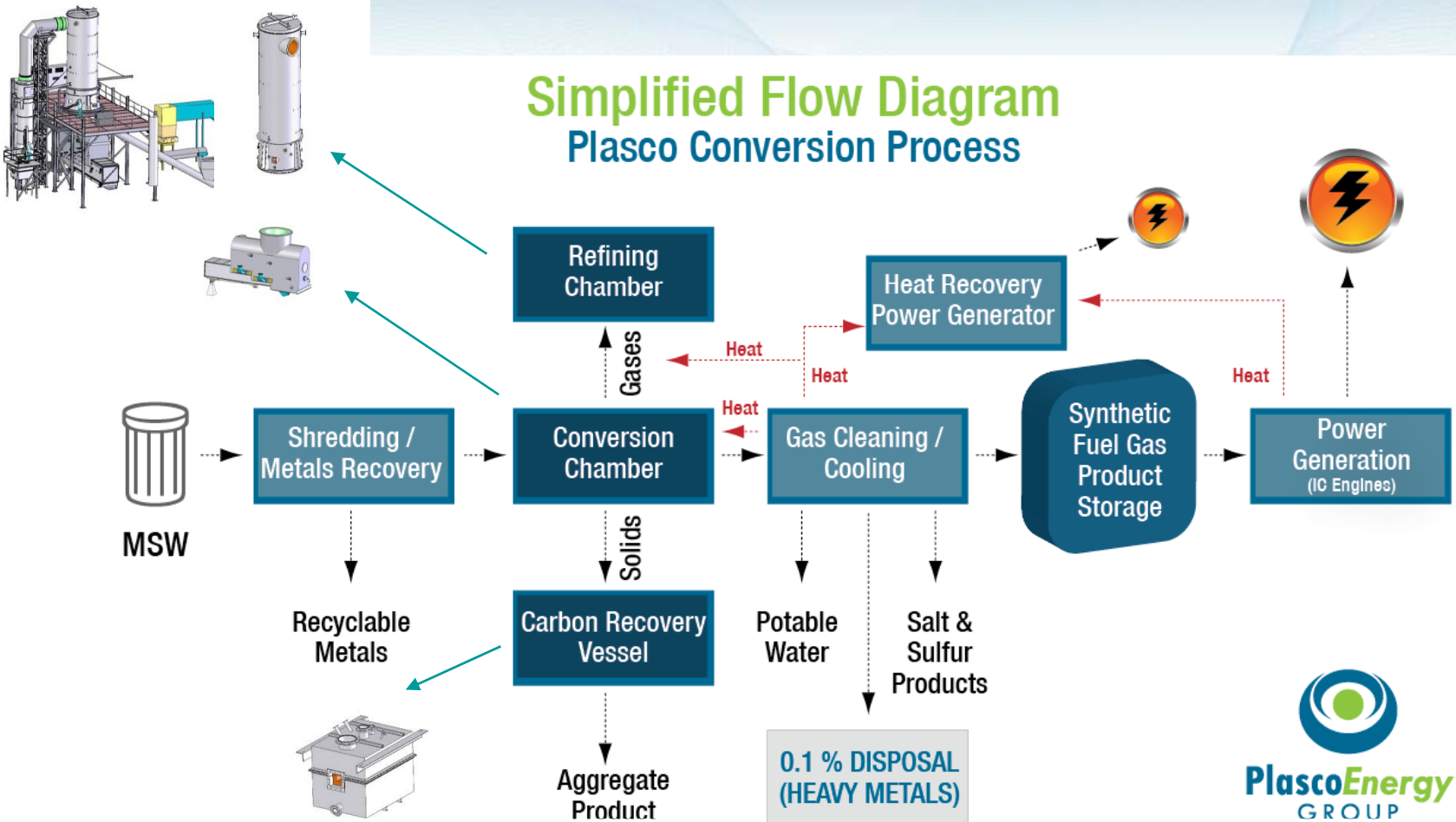
**Maximum
Value from Waste**

**Maximum
Environmental Protection**

200 tpd = 4 acres
+ 100 tpd = + 1 acre

Simplified Flow Diagram

Simplified Flow Diagram Plasco Conversion Process



Maximum Technical Advantage

Recycling Council of BC
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