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Waste to Energy Treatment Alternatives In Southwest and South-Central Alberta

Economic Development LETHBRIDGE

SW ALBERTA SOUTHWEST

SouthGrow Regional Initiative

Industry Sponsor:

BFuel CANADA CORP. www.bfuelcanada.com

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Southern Alberta Alternative Energy Partnership (SAAEP)

- SouthGrow Regional Initiative
- Economic Development Lethbridge
- Alberta SouthWest Regional Alliance
  - 37 municipalities in Southwest and South-Central Alberta
  - Facilitate development of alternate energy systems and attract related businesses to the region
  - Initiated study to investigate energy recovery from waste

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Objectives of the Study

- Determine current situation with respect to waste management
- Investigate identified energy recovery processes
- Review siting and operational considerations

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Study Methodology

- Retain Trimark Engineering, Lethbridge to conduct study
- Primary and secondary research
  - Mail, telephone and in-person surveys / interview
  - Municipal, Provincial and Federal statistics
  - Technology providers
- Analyze data
- Prepare conclusions and recommendations

Waste Management Background

- Waste is an environmental, health, social and economic issue
- Generation and disposal of waste is a waste of energy and resources
- Costs of waste management will increase
- Majority of material landfilled has not been fully used
- Technologies to recover energy from waste are emerging

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Waste Management Background

- Landfill is the favoured waste disposal option in Canada
  - The potential environmental, social and human health costs of producing, treating and disposing of wastes are not necessarily reflected in waste disposal fees
  - Innovative, cost-effective waste reduction options tend to be developed only when waste disposal options become more limited

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SAAEP Region Current Situation

- Region waste management system includes the following elements:
  - Waste generation
  - Waste handling, separation and storage at source
  - Collection, transfer and transport
  - Separation and processing
  - Final disposal

SAAEP Region Current Situation

- Most region solid wastes landfilled as final disposal
- Agricultural production and secondary processing produce high volumes of organic residuals - most of these are land applied
- Quantity of solid waste entering the waste management system is increasing
- Municipal costs related to wastes will increase

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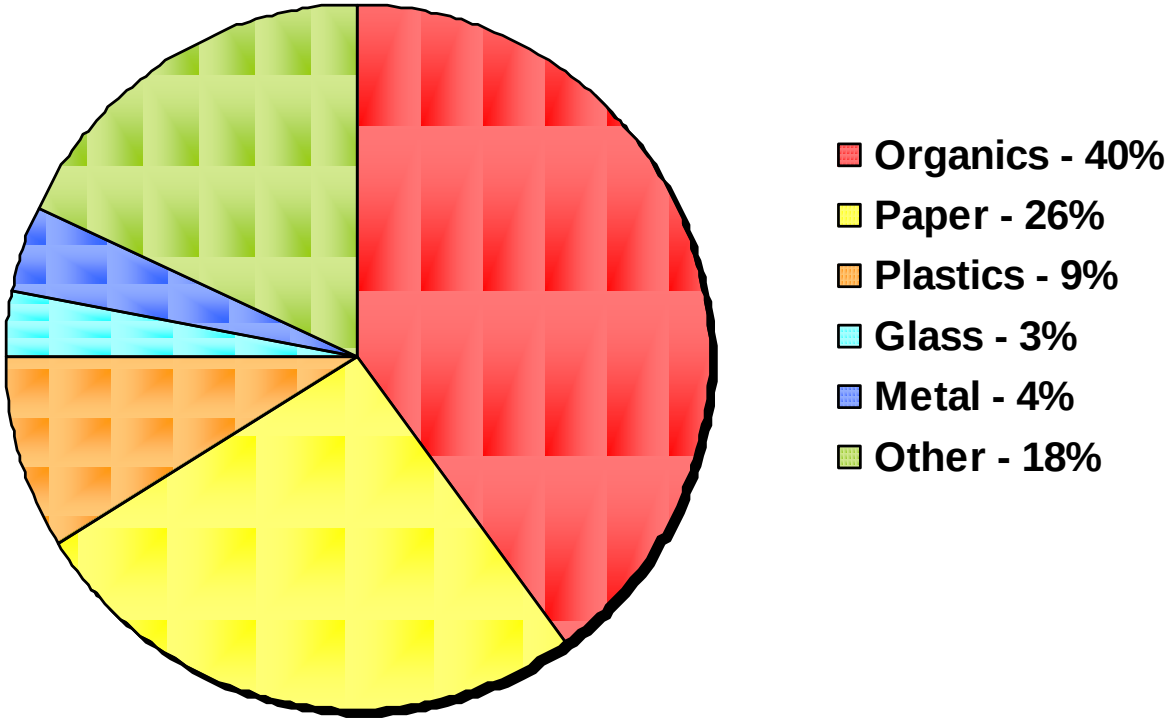
SAAEP Region Current Situation

- Agricultural residues include materials that may be used as feedstock for energy recovery
- Landfilled wastes include materials that may be recovered, reused, composted or used as feedstock for energy recovery

SAAEP Region Current Situation



Composition of mixed solid waste by weight

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SAAEP Region Current Situation

Waste Quantities Generated in the Region and Transported to Landfills in the Region - 2006

Waste Authority	Waste to Landfill (tonnes)	Percentage
City of Lethbridge	99,000	47.6
Chief Mountain	10,000	4.8
Crowsnest-Pincher Creek	41,500	20.0
Lethbridge Regional	11,000	5.3
Taber and District	22,000	10.6
Vulcan District	3,000	1.4
Willow Creek Regional	6,500	3.1
Unclassified	15,000	7.2
SAAEP Region Total	**208,000**	**100.0**
Diverted to Recycle or Reuse from Landfill site	(16,500)	
Landfill	**191,500**	

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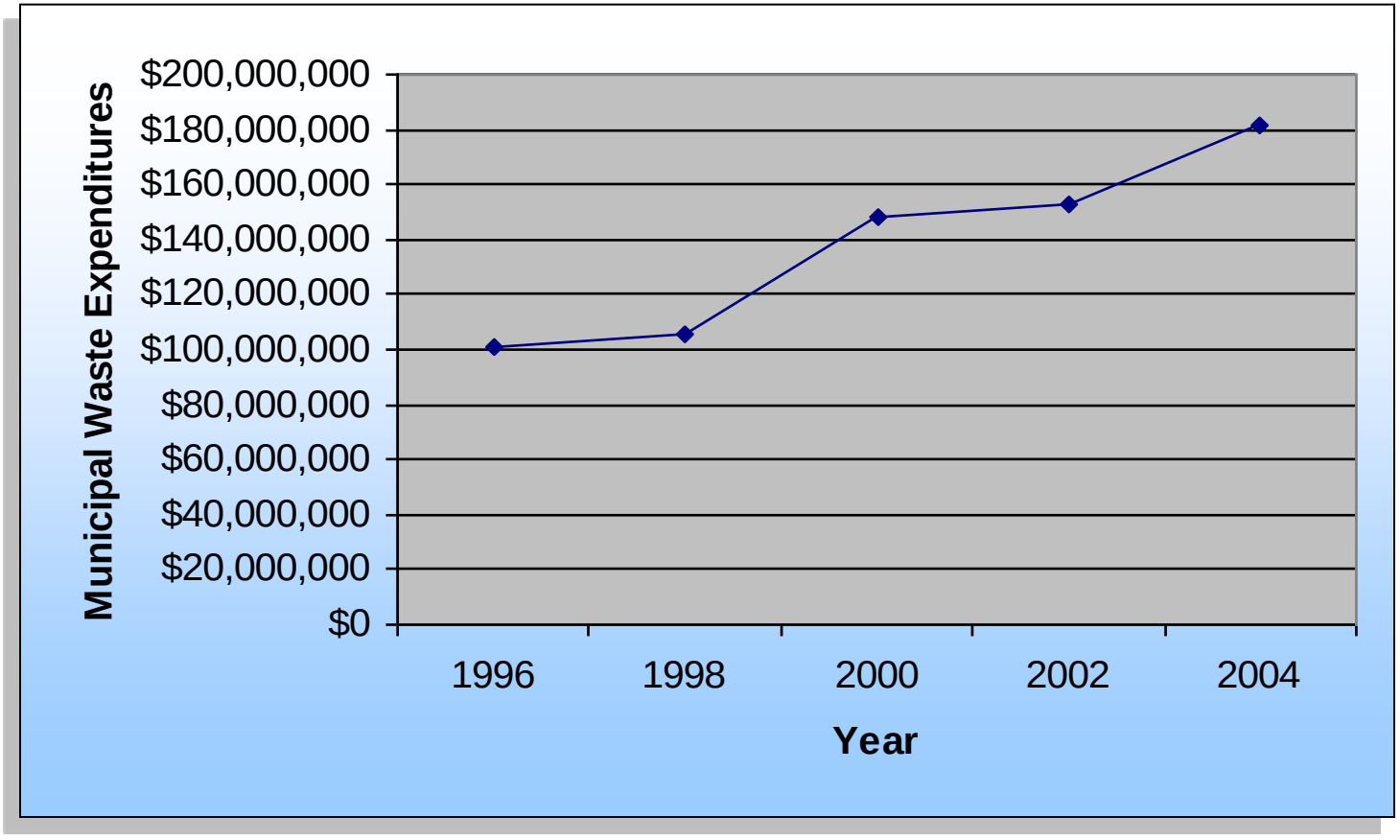
SAAEP Region Current Situation

- Region Landfill Sites
  - Chief Mountain Landfill
  - Crowsnest – Pincher Creek Landfill
  - Lethbridge Regional Landfill
  - Willow Creek Regional Landfill

SAAEP Region Current Situation

- Alberta Municipal Waste Treatment Costs



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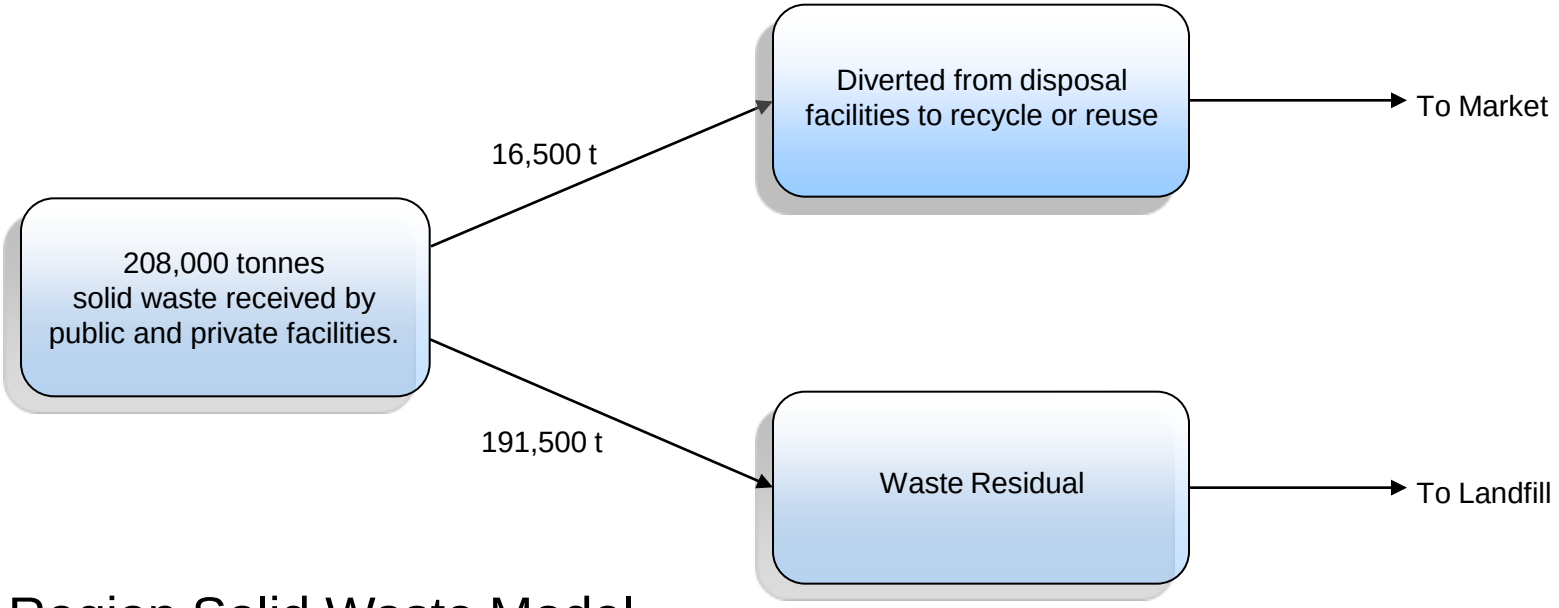
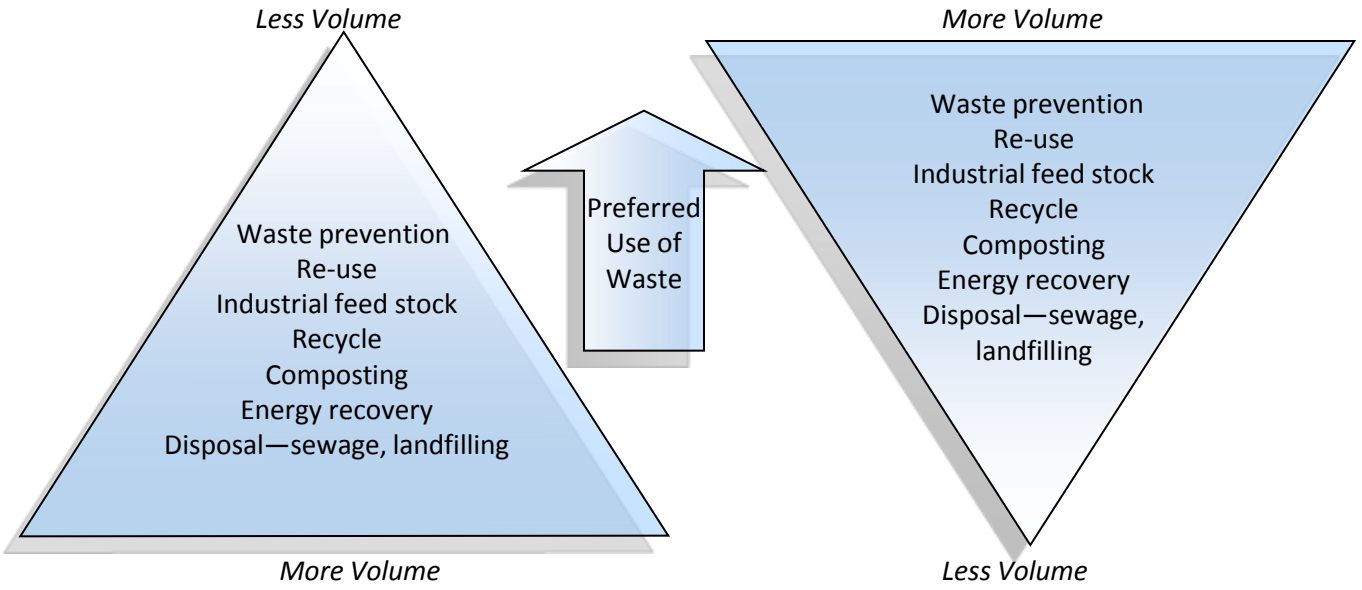
SAAEP Region Current Situation



Region Solid Waste Model

SAAEP Region Current Situation

Preferred: Move waste up the Use Hierarchy



Energy Recovery Technologies

- Traditional technologies
- Advanced energy recovery technologies
  - Fluid Bed Gasification
  - Pyrolysis / Thermal Gasification
  - Plasma Arc Gasification
  - Bioreactor Landfill

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Energy Recovery Technologies

- Common processing steps
  - Sorting - material recovery / composting
  - Pre-processing – mixing, shredding
  - Thermal treatment – heat, controlled conditions
  - Energy recovery
  - Air pollution control
  - Residual management

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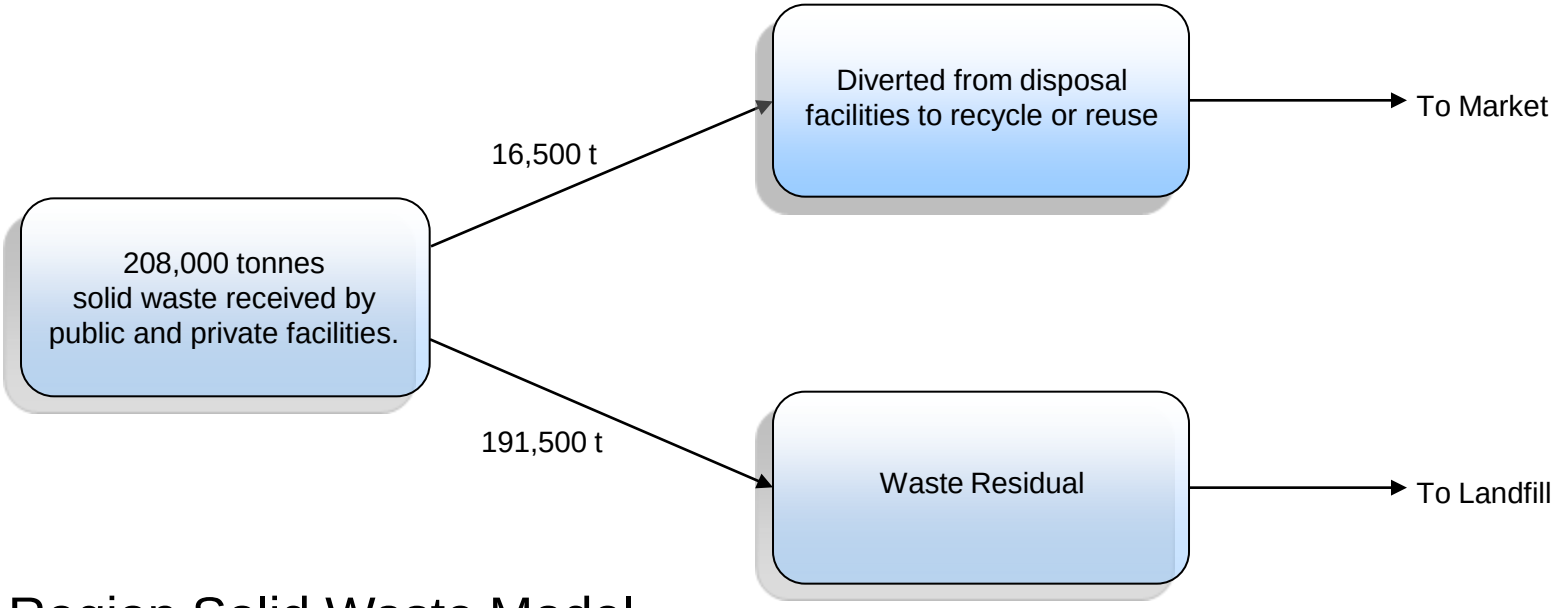
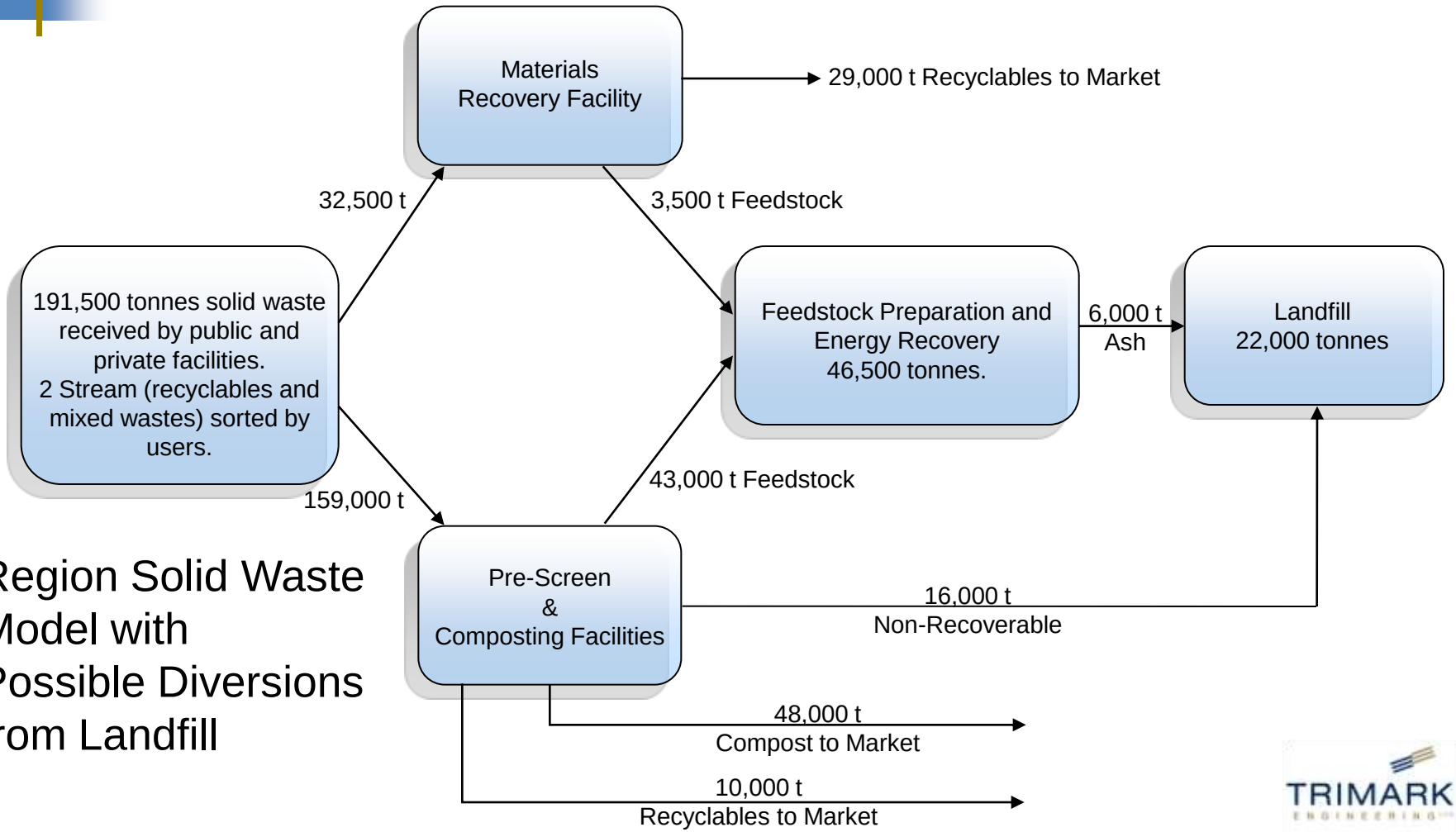
SAAEP Region Current Situation



Region Solid Waste Model

Energy Recovery Technologies



Region Solid Waste Model with Possible Diversions from Landfill

Energy Recovery Technologies

- Energy recovery output
  - 450 to 500 kWh of electricity / tonne
  - 24 tonnes of waste = annual electrical requirements of a Canadian home
  - Efficiency

    Conventional energy recovery technologies: 30%

    Advanced energy recovery technologies: 60%

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Advanced Energy Recovery Technologies

- Fluid Bed Gasification
  - Critical pre-processing requirements
  - Feedstock gasified in a reactor
  - No full scale facilities in Canada, proposed facility in Edmonton
  - Capacities available up to 350 tonne per day
  - Simple designs, low capital cost, long service life and low maintenance costs

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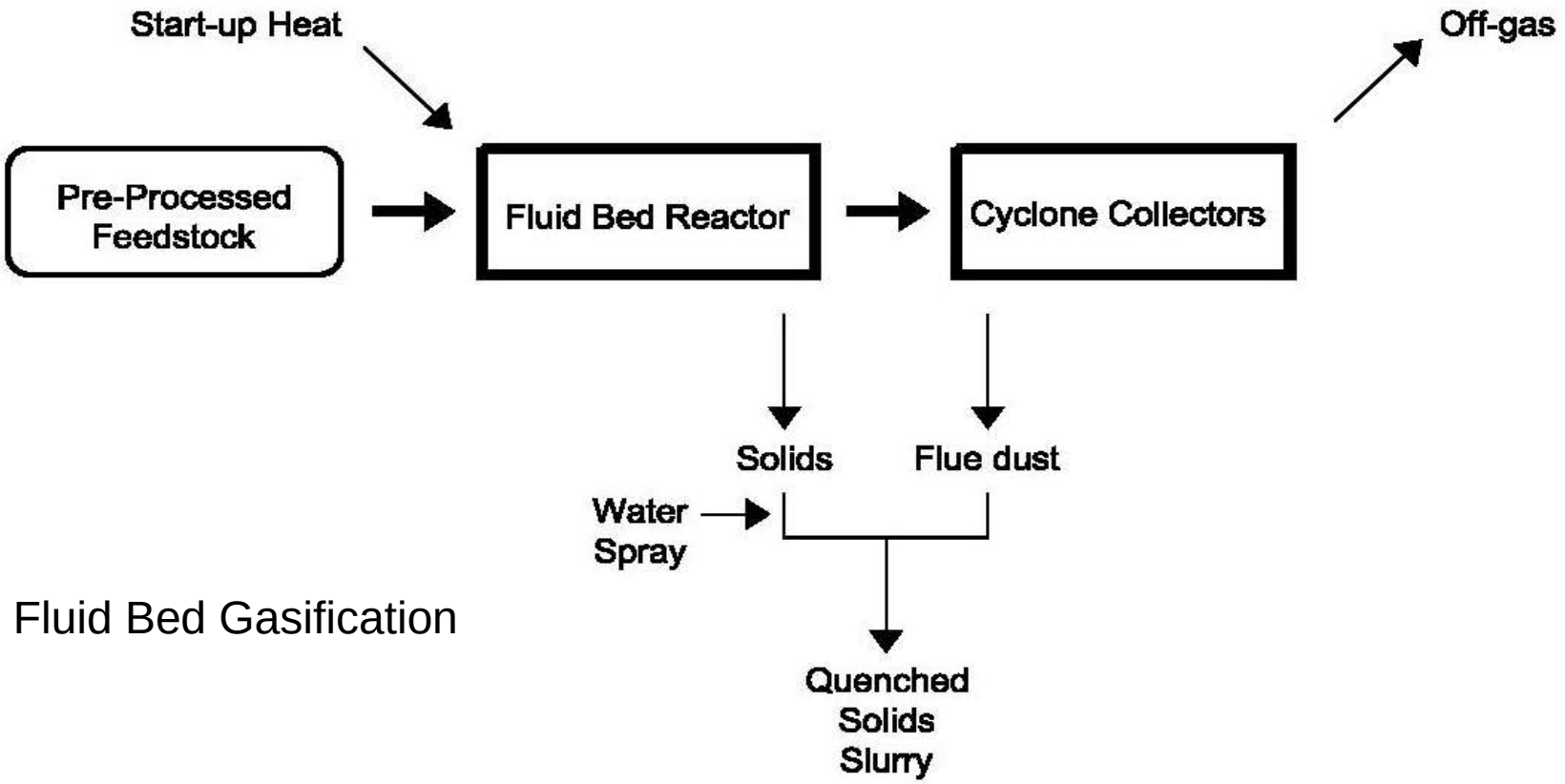
Advanced Energy Recovery Technologies



Fluid Bed Gasification

Advanced Energy Recovery Technologies

- Pyrolysis / Thermal Gasification
  - Two related technologies
  - Feedstock is combusted in oxygen controlled environment
  - Pyrolysis technology - oxygen-starved combustion
  - Thermal technology - oxygen-limited combustion
  - Modular design – units as small as 25 tonnes per day
  - Low air pollution emissions

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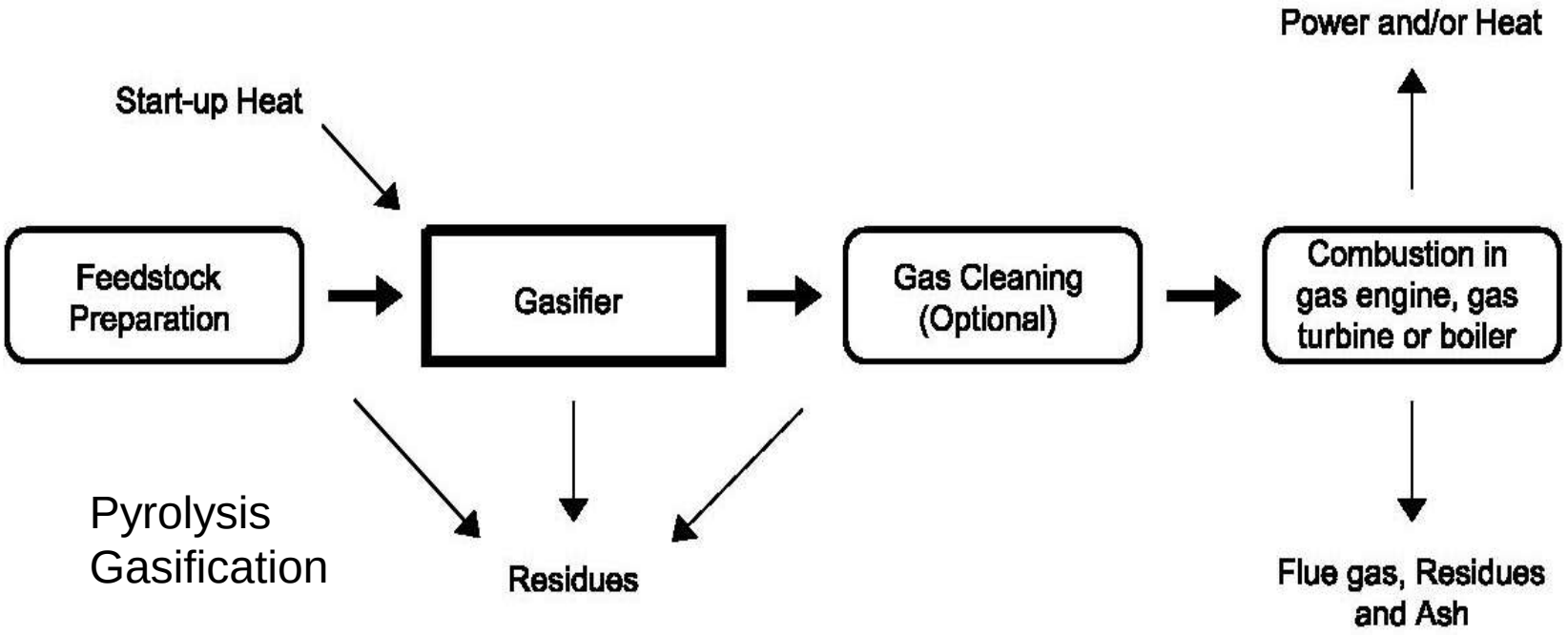
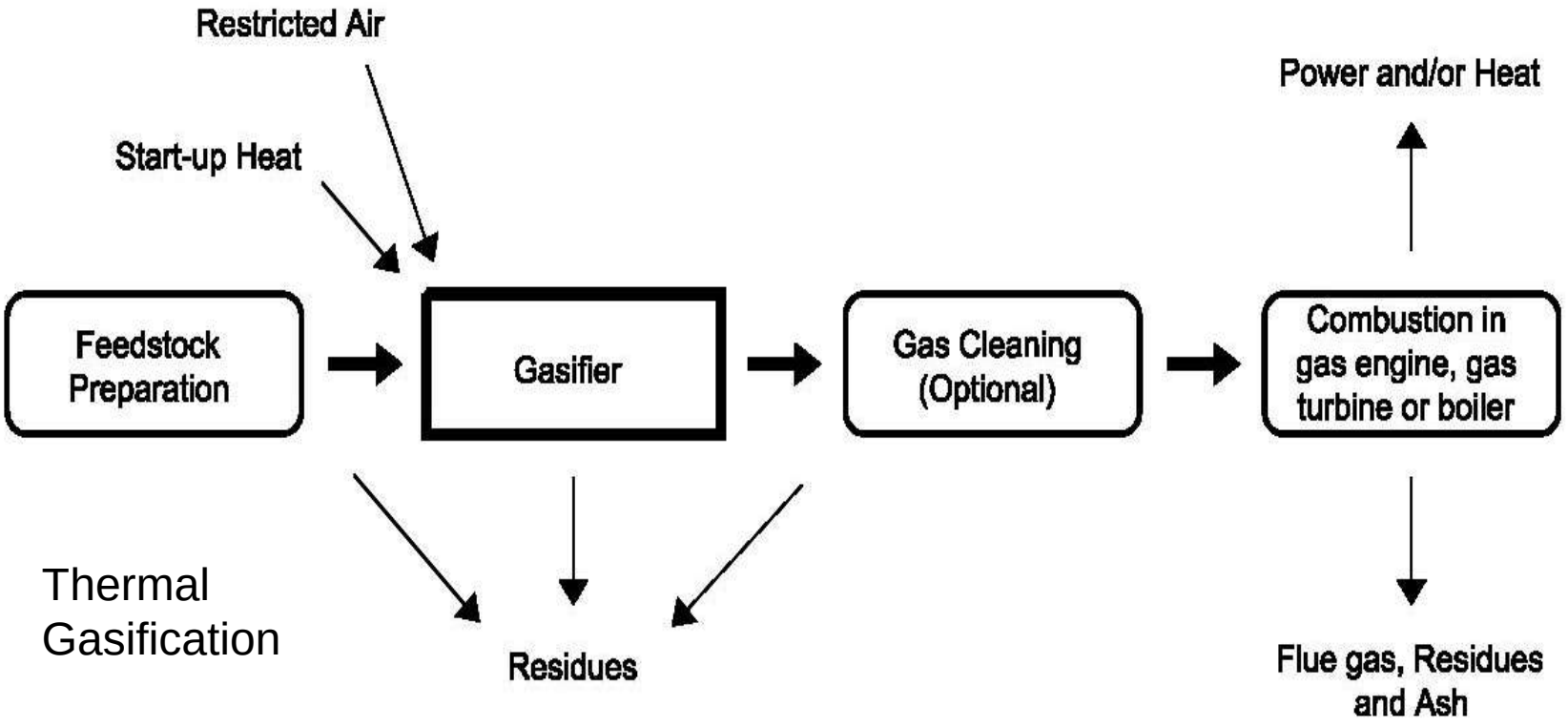
Advanced Energy Recovery Technologies



Advanced Energy Recovery Technologies



Thermal Gasification

Advanced Energy Recovery Technologies

- Plasma Arc Gasification
  - Industrial use well established - electric arc furnaces, welding
  - Feedstock is gasified and passed through an electric arc
  - Feedstock processed at extremely high temperatures, destroys hazardous materials
  - Process outputs - synthetic gas, potable water, slag, metals, salt and sulphur fertilizer
  - No air emissions

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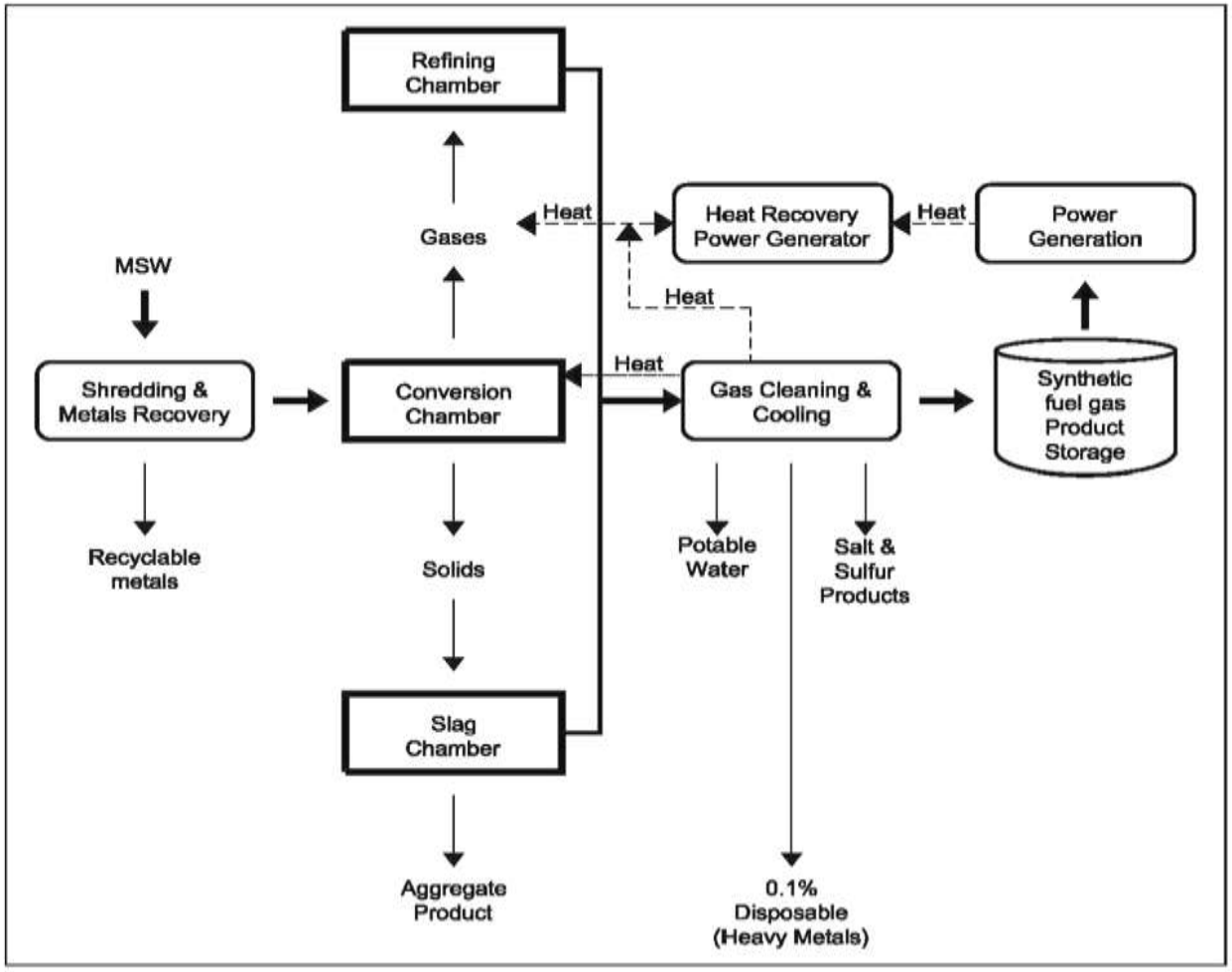
Advanced Energy Recovery Technologies



Plasma Arc Gasification

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Siting and Operational Considerations

- Modular energy recovery units are available
- "Nuisance" generation from advanced energy recovery facilities is low risk
- Capital and operating costs per tonne of small facilities is higher than costs per tonne for large facilities

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Siting and Operational Considerations

- Opportunity to learn from current Alberta projects
  - Central Waste Management Commission – plasma arc project in Central Alberta
  - Edmonton Waste Management Centre – gasification project

Conclusions

- From an ecosystem perspective, waste material constitutes a waste of energy and resources
- Assessment of total cost of waste management should consider environmental, health and social costs
- Implementation of material recovery, composting and energy recovery has potential to reduce landfill requirements by 80 to 90%
- Energy recovery may recover up to 500 kWh of electricity per tonne of waste processed - process may generate an equivalent amount of recoverable heat energy

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Conclusions

- Advanced energy recovery technologies are available
- Available technologies include modular designs adaptable for small and large capacities
- Technology vendors and government offer project financing

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Recommendations

- Provide leadership to support and investigate energy recovery alternatives
- Determine total cost of waste management alternatives
- Investigate and verify technologies
- Gain / promote support with the community and with municipal, provincial and federal governments
- Draw from experience of current energy recovery projects

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