Anchorage WtE Combined Heat and Power Project

A facility that generates usable heat and electricity from solid waste

Prepared for the Mayor's Energy Task Force
Why WtE in Anchorage?

- High tipping fees
- Relatively high—and rising—electric power rate
- Strong community desire for use of renewable energy
- Stable supply of a relatively dry waste stream
- Anchorage is located far from recycling markets
Anchorage WtE Heat and Power Project Partners

JL PROPERTIES, INC.

Alaska Waste

ECO

EnvioEnergi

Redefining waste management

Renewable Energy Systems
• Founded in 1990 by its two current principals, Jonathan Rubini and Leonard Hyde

• Largest and most active real estate firm in Alaska

• Has been involved in over $1 billion in building construction in the past 10 years

• Presently owns over 1.5 million square feet of Anchorage office space
ASRC Headquarters
JL Tower
Centerpoint Financial
Centerpoint West
National Park Service Building
Elmendorf AFB Housing
• An affiliate of JL Properties

• Full service waste management company

• Currently hauls 47% of the volume that goes to Anchorage Municipal Landfill

• Environmental initiatives include curbside recycling service, large-scale composting and biodiesel processing
Alaska Waste Services

Residential Trash
- Tipper Service
- Approx. 49,000 Anchorage Households
- Bear Resistant Options

Residential Recycling
- Single Stream Processing
- Approx. 6,600 Anchorage Households

Commercial Front Load
- Trash and Recycle Services
- Approx. 3,600 Anchorage Businesses
- On-Demand or Routed
- Security Options

Commercial Roll Off
- Variety of Sizes
- Great for Construction Material
## Anchorage and Mat-Su Solid Waste Data

### Annual disposal by site (tons)

<table>
<thead>
<tr>
<th>Site</th>
<th>Tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anchorage Landfill</td>
<td>374,500</td>
</tr>
<tr>
<td>Anchorage Central Transfer Station</td>
<td>287,500</td>
</tr>
<tr>
<td>Mat-Su Borough</td>
<td>70,000</td>
</tr>
</tbody>
</table>

(77% of volume)
Alaska Waste Specific MSW Volume Data

• Alaska Waste hauled 174,371 tons of MOA solid waste in 2009 (47% of total MOA volume)

• Unique ability to control waste stream quality
  • Diversion of green waste
  • Automation
Recycling Initiatives at Alaska Waste/AK Green Energy Solutions

- Bio-Diesel Operation
- Compost Processing
- Expanding Recycle Services
Curbside Recycling

Alaska Waste’s recycle program diverts **10,600 tons** of paper, cans and plastic bottles annually.
• Alaska Green Waste Solutions- started in January of 2010
• Spearheading renewable energy projects for Alaska Waste, currently separated into two areas, compost and biodiesel
• Compost pilot project- began in October 2009
• Biodiesel plant- beginning early June 2010
• Ongoing research in other renewable projects, such as WtE combined heat and power
Alaska Waste owns and operates a rotary in-vessel composting machine that combines organic waste materials to produce a rich, earthy compost for ground cover, gardens, and landscaping. Waste produce and horse manure are collected from local grocers and stable owners.
Biodiesel Plant Highlights

Alaska Waste collects used cooking oil from Anchorage and Eagle River restaurants and grocers for processing into biodiesel at its Anchorage facility—the first commercial biodiesel plant in Alaska.

- 200,000 gallons/per year
- Primary usage is to operate fleet
  - reduce carbon emissions
  - keep used cooking oil out of landfill
  - reuse an energy source
  - reduce diesel costs
  - support our green initiatives
Biodiesel Collection
Biodiesel Processing
Envio Energi is the exclusive licensee in North America of EcoEnergy AB of Stockholm, Sweden, a technology leader within the Waste-to-Energy (WtE) Combined Heat & Power (CHP) and Power markets in Scandinavia.

Envio Energi designs, engineers, manufactures and constructs WtE systems for customers throughout North America.

All services are located in and preformed through our US based operations with offices located in the Northwest and Southeast United States.

- Project Development
- Engineering & Design
- Manufacturing
- Project Execution
- Construction
- Commissioning, Training & Start-up
- Maintenance, Parts & Service
Envio Energi / EcoEnergy Team

- Sweden has more than 50 years experience in environmentally acceptable WtE projects
- Sweden has higher per capita use of WtE than any other country in world
- EcoEnergy AB has been involved in the construction of most of the large scale WtE plants in Sweden during the past decade
- Have more than 11 facilities in operation meeting or exceeding the EU standards for WtE incineration
- Our modular design is based on current experience for a Rapid Deployment Project Scenario (RDPS) reducing time and cost while enhancing a proven concept
Envio Energi Project Execution Partners

GKL Growth Capital AB
Principal owner of KMW Energi AB and EcoEnergy AB.

EcoEnergy
Waste-to-Energy (WtE) technology provider. Process design and engineering of all proprietary WtE components.

AMERICAN PROCESS
Project and process engineering including procurement, project management and construction management.

EnergyLaunch
Project development services focusing on BtE and WtE projects.

SEH
Site development and civil engineering. Project development services.

VAL-FAB, Inc.
Manufacture of proprietary technology components.

JAMES CONSTRUCTION GROUP
General contractor. Civil and industrial construction and construction management.

AGH
CPA, project accounting, financial and tax advisor.

WACHOVIA
Banking, insurance & bonding.
What is a WtE Combined Heat & Power Plant?

Waste-to-Energy = The process of creating energy in the form of electricity or heat from the incineration of waste source.

CHP = Combined Heat and Power. Generating electrical power and thermal energy from a single fuel source.

$WtE \text{ CH}P$
In Alaska:

WtE = Renewable Energy
General Plant Description
Process Description

- Intermediate Fuel Storage
  - Two to five days of storage
  - Fuel bunker under negative pressure for odor control
- Furnace & Boiler – Modular Design
  - 40 to 60 MW thermal per incineration line
  - Furnace - Grate Design @ 1200°C (2200°F)
  - Water Tube Boiler - 40 bar (580 psi) and 400°C (750°F)
- Back Up Burner
  - Maintains a minimum temperature of 850°C (1560°F) for two seconds
- SNCR System For NOx Control
- Flue Gas Temperature - > 150°C (300°F) after Economizer
- Emissions Controls
  - Lime And Active Coal Reactor
  - Baghouse - Barrier Filter
  - Wet Flue Gas Scrubber
- Water Treatment Systems
- Bottom and Fly Ash Storage
- Turbine/Generator - Back Pressure or Extraction/Condensing Options
General Plant Description
Process Design
Plant Configuration & Energy Generation

Fuel Input

- MSW: 200,000 Tons/Year
- Methane: 1,350 Cubic Feet/Minute

Boiler Energy Generated

- MSW: 72.0 MW
- Methane: 10.3 MW
- Total Plant Size: 82.3 MW
- Steam Flow: 236,000 Pounds/Hour

Planned Energy Usage

- District Heating: 60 + Million BTUs
- Electric Power: 20-24 MW/Hour
General Plant Description
Fuel Feed System

- Trucks are unloaded into a waste bunker in an enclosed waste receiving building.
- The fuel bunker is designed for two to five days of waste storage per site requirements.
- Fuels is fed from fuel bunker into the incinerator via an automated fuel crane and fuel feed system.
- Fuel bunker and receiving hall are under negative pressure for odor and site emissions control and thus provide make-up air to the incinerator.
General Plant Description
Incineration Process

- The waste moved through the incineration zone on a movable, reciprocal grate
- Incineration occurs at temperature of greater than 1,200°C
- Hot gases are transferred to a high pressure steam boiler to produce superheated steam for turbine and thermal energy district heating
- The incineration gases are kept at a temperature of minimum 850°C during two seconds in accordance with local requirements
- The steam superheaters are designed to withstand acid gases formed at the incineration
- Ash System – Fly ash and bottom ash streams are separated for disposal options
General Plant Description

Emissions

- Emissions treatments are designed for most stringent US and EU requirements

- Standard emissions treatments:
  - SNCR – Ammonia injection upstream of economizer
  - Lime And Active Coal Reactor
  - Baghouse - Barrier Filter
  - Wet or Dry Flue Gas Scrubber

- Standard emissions treatments can be enhanced per local requirements

- Optimum emission control is achieved through feed forward control scheme and real time analysis and is then recorded as historical data for reporting and trouble shooting
Technology Benefits

- Industry Leading, State-of-the-Art WtE Incineration Technology
- Utility Grade Design – > 90% Operational Up-Time
- Utility Grade Automation
  - Designed for Unmanned Remote Operation (Pending Local Regulation)
  - Reduced Operating Staffing Requirements
  - Enhanced System Flexibility
  - Advanced Process Monitoring and Corrections
- Efficient and Controlled Incineration System to Optimizes Efficiency and Pollutants Concentration
- Flexible Turn Down Ratio
- Customized Boiler Design to Meet Specific Fuel Characteristics
- Proven Performance & Design
  - Proprietary Systems – Fuel Feed, Incineration, Boiler, Ash Handling, Integrated Process Controls
- State-of -the-Art Emissions Controls – Designed per Local Conditions
- Modular Design
  - Multiple, independent incineration lines with a common turbine and emissions treatments system
  - Allows fuel flexibility per incineration line
  - Allows shutdown of individual incineration line for schedule maintained while maintaining operation and emissions
Benefits of WtE CHP

CHP optimizes the energy supply to all types of consumers, providing benefits to both customers and the greater community:

• Increased Efficiency
  • CHP is the most effective and efficient form of power generation
  • Power Plant Only - Approximately 35% energy recovery
  • CHP Plant – Up to 85% energy recovery

• Local Generation
  • Decentralized energy generation
  • Each plant designed to meet local needs
  • High efficiency
  • Less transmission losses
  • Increased flexibility in system use

• Security of Supply
  • Flexibility to meet high & low demands
  • Less risk of outages
  • Reduced fuel need
  • Less import dependency
Benefits of WtE CHP

- Utilize Municipal Solid Waste (MSW) as principal fuel source to recover energy
- MSW = Renewable Fuel = Renewable Energy
  - USA utilizes only 15% of MSW versus 50% in Europe
- WtE results in reduced CO2 emissions
  - MSW > 70% biomass
  - Biomass consumes CO2 during growth
  - WtE projects can be minimal or “net zero” CO2 sources
- WtE reduces methane and fossil fuel emissions
  - Reduces amount of waste to landfills by 75% to 85%
  - Recover landfill methane for use as fuel
    - Primary emission from landfills is methane
    - Methane is 21 times more reactive than CO2 from a greenhouse gas standpoint
- Offset energy production for fossil fuel based facilities
- WtE CHP district heating systems offset traditional fossil fuel heating systems
Optimizes Landfill Gas Use

• Landfill gas could act as an enabling resource that better unlocks Anchorage’s waste stream energy potential

• Quantity and quality of the landfill gas available at Anchorage Landfill is an excellent technological fit for the type and size of an Anchorage WtE facility

• Using landfill gas as an energy source for burners or fire tube heaters would allow for the greatest utilization of this resource and may increase the economic viability of such a WtE project

• Boiler combustion and environmental controls at a WtE facility would ensure greater air quality compliance of the landfill gas
Assumes 20,000,000 ton landfill capacity

A 200,000 ton-per-year WTE facility at the Anchorage Municipal Landfill would extend the life of the landfill 26 years.

**Assumes 20,000,000 ton landfill capacity**
Creates Jobs

• A 200,000 TPY facility would create 50-60 full-time operation jobs
• Waste-to-energy projects employ modern state-of-the-art emission control technology that virtually eliminate hazardous pollutants that otherwise create significant levels of air toxins when the material is land filled.

• One ton of MSW, combusted rather than landfilled, reduces greenhouse gas emissions by one ton of carbon dioxide.

• Envio Energi’s technology package is designed to meet the most stringent U.S. and European emissions standards, such as those established by the Kyoto Protocol.
Preliminary Economic Viability

• All in facility cost: $100 - 150 million

• Annual operating cost: $9 - 10 million

• Capitalization rate: 6 - 12%

• Revenue
  Net power output: 18,000-22,000 Kw $9,000,000
  Avoided tipping fee: 65.00/ton $13,000,000
  Steam heat: 400,000 Mlbs $500,000
  Total: $22,500,000
Summary

• WtE is a proven technology, employed throughout Europe

• WtE conserves fossil fuels by generating electricity and heat from a renewable green source

• Today’s WtE plants exceed U.S. and Kyoto Protocol air standards

• WtE would extend MOA landfill life 26 years

• WtE creates 50-60 jobs

• WtE reduces greenhouse gas emissions
Request

1. Consider implications of existing landfill gas RFP

2. Provide policy recommendations to MOA

3. Undertake an assessment of the benefits of extending the life of the Anchorage Landfill and make recommendations to MOA