Cleveland's Energy Future

Municipal Solid Waste To Energy Project Overview

June 23, 2010

Department of Public Service
Division of Waste Collection

CITY OF CLEVELAND
Mayor Frank G. Jackson

Cleveland PublicPower
Count on it

Agenda

Introduction

A New Way To Think About Municipal Solid Waste (MSW)

- Think of Cleveland's MSW as a valuable renewable resource that must be mined, processed, recycled and sold.
- To obtain this renewable resource it will take careful planning and investment; but it will result in new jobs, tax revenues, an environmentally friendly alternative energy source, and increased control of ***Cleveland's energy future!***

3

Introduction

- Cleveland's Municipal Solid Waste to Energy facility will be the first of its kind to maximize recycling, minimize the use of landfills, be a reliable renewable energy source and create jobs.

Cleveland Will Become An Advanced Energy Leader!

4

Where does the process begin?

- The process would start in the homes of Cleveland residents, as they are required to take the necessary steps to sort the waste into recyclable and non-recyclable materials for curbside pickup.

- Automated Waste Collection and Curbside Recycling
  - Societal and community-wide behavioral change
  - Rules that would define and identify recyclable and non-recyclable waste
  - Convenience and ease to recycling by offering residents with two carts one blue cart for comingled recyclable materials and one black or gray cart for non-recyclable waste

5

MSW to Electric Power

The Concept and Technology is Not New

- The first commercially successful incineration plant in the U.S. was built in Saugus, Massachusetts in 1975.
- Incineration of waste is popular in countries such as Japan, China and Asia due to population density and land scarcity.
- Japan has over 30 years of experience with Waste to Energy facilities that process municipal, industrial, hazardous and medical waste.

6

MSW to Electric Power Cont.

- In the United States, there are presently 87 waste-to-energy facilities processing around 100,000 tons per day of municipal solid waste.
- At the same time, these facilities generate as much as 2,500 megawatts of power, enough electricity to meet the needs of more than two million homes.

Spittelau waste to energy plant provides district heating in Vienna

7

What Option is Best for Cleveland?

- Cleveland's MSW to Energy Facility will use thermal gasification rather than incineration.
- Incineration vs. Thermal Gasification
  - Incineration of MSW involves the combustion of unprocessed refuse in an oxygen rich environment that produces complex hazardous oxides in the process.
  - Thermal gasification of MSW is through a high temperature chemical conversion of organic materials into synthetic gas (composed primarily of H_2 and CO) in a controlled oxygen and heat environment.
  - Thermal gasification breaks down hazardous organic substances such as dioxins and furans
  - The outcome of the gasification process is a product called syngas or producer gas. The producer gas is combustible and can be burned as a fuel much like natural gas.

8

Why This Option for Cleveland?

- Traditional fuel types available in other parts of the State or Country are not available in a "non-attainment" area like Cleveland.
  - "Non-attainment" refers to a geographic areas that have failed to meet the National Ambient Air Quality Standards. In which the level of certain air pollutants is higher than national air quality standards.
- Cleveland is not alone in the challenges it faces and other municipalities will want to duplicate our efforts.
- Cleveland must find green, renewable, advanced energy options in order to generate power locally

9

Why this Option for Cleveland? Continued

Unlike other municipalities, Cleveland is unique in that it:

- ***Owns the MSW***
- ***Has a high volume and variety of MSW***
- ***Owns the Transfer Station***
- ***Rail is proximate to Transfer Station***
- ***Has its own electric system with direct access to the electric grid***
- ***Manages its own Water System***

10

Cleveland's Advanced Energy Portfolio Standards

Cleveland Public Power will produce and/or purchase power generation from Advanced Energy Sources to meet the following goals and timelines:

AEP	Target Year
15%	2015
20%	2020
25%	2025

11

CPP's Fuel Diversity and Advanced Energy Sources

Renewable resources

- Waste to energy generation
- Biomass (fuel pellets)
- Low-impact hydro
- Wind power
- Landfill gas
- Solar PV
- Solar thermal

- Co-generation
- Distributed generation

12

Cleveland's System Expectations

- True Sustainable System
- Interface with MSW Curbside Recycling to meet recycling goals
- Minimize waste sent to landfill
- Electric Power generation to minimize market dependence
- Electric Generation that helps meet Advanced Energy Portfolio Standards (AEPS) goals
- Environmentally friendly generation fuel source
- Maximize all system outputs
  - Bricks from ash
  - Fuel pellets from organics

13

Princeton Environmental Group, Inc.

Princeton Environmental Group, Inc.
Marketing and Engineering Arm of Kinsei Sangyo Co. Ltd

- Kinsei Sangyo Company Was Founded In Japan In 1964
- Kinsei Has 25 Years Of Dedicated Research And Development In Bio-mass Gasification
- Kinsei Invented The World's First Solid Waste Gasification System, Known As The Quad Stage Solid Waste Gasification System In 1997
- There Are Over 300 Operating Gasification Facilities In Japan, China And In Asia.
- U.S. Marketing Office Was Established In 2005.
- All Systems Are Guaranteed To Conform To U.S., EU, Japan And China Emission Requirements.
- Over 30 Patents Awarded Worldwide
- Experts In Solid Waste Processing Engineering.

Princeton Environmental Group

14

PEG's MSWE Technology

Princeton Environmental Group's MSWE technology will meet the following requirements:

- Treat and recycle MSW in a patented process that presents near zero toxic emissions
- Produce electric power from a process called Gasification
- Produce high value refuse derived fuel pellets that can be used to generate power and/or be sold commercially as an alternative to coal or other generation fuels.

Princeton Environmental Group

15

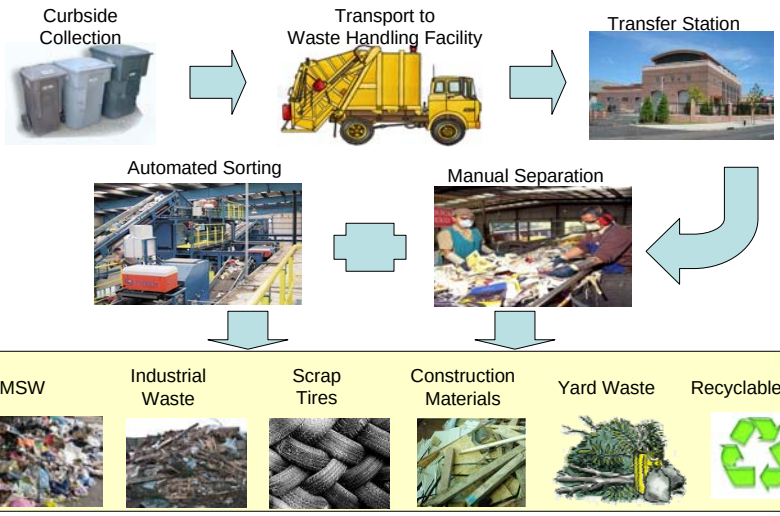
Princeton/Kinsei Facilities in Japan

A City of Cleveland delegation traveled to Japan and China to see first hand facilities using Kinsei's gasification technology.

They visited Maratuku and BML.

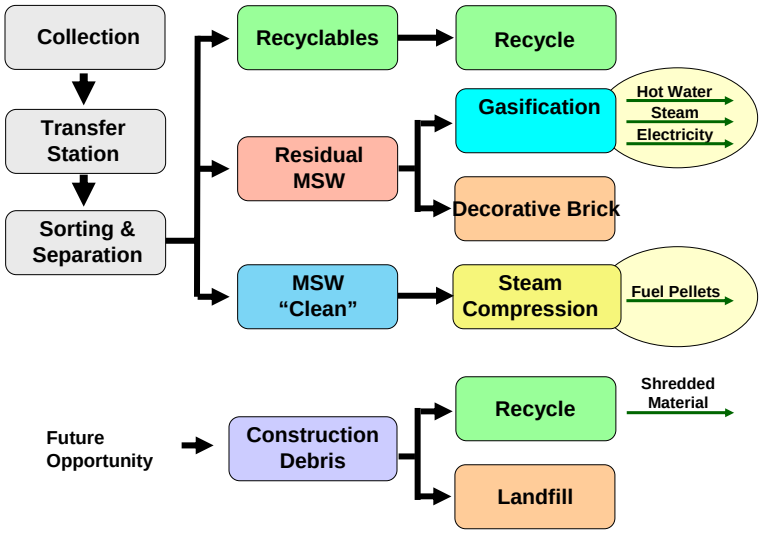
16

MSWE Operation Overview



17

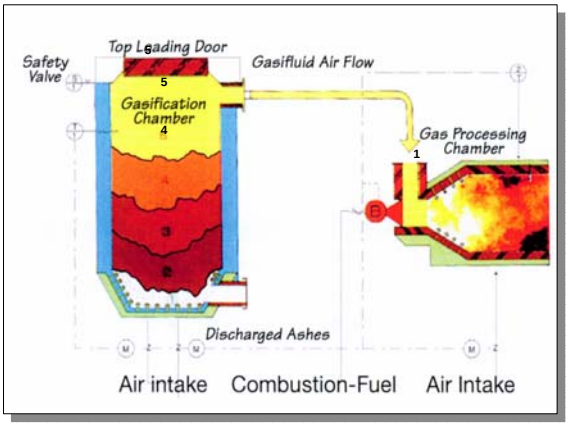
Cleveland's Approach and Facility Design



18

Gasification Process

- Gasification Process: System will be ignited at 80º Fahrenheit and rapidly increased to 800º Fahrenheit. Through precision temperature and air flow control, system restrains formation of toxins. 6-8 hr process.
- After gasification, ash remains are reduced to 5% of initial input volume. Furnace can reduce ash to 1-2%.
- Ash discharges are reported at 99% non-organic and non-toxic.



19

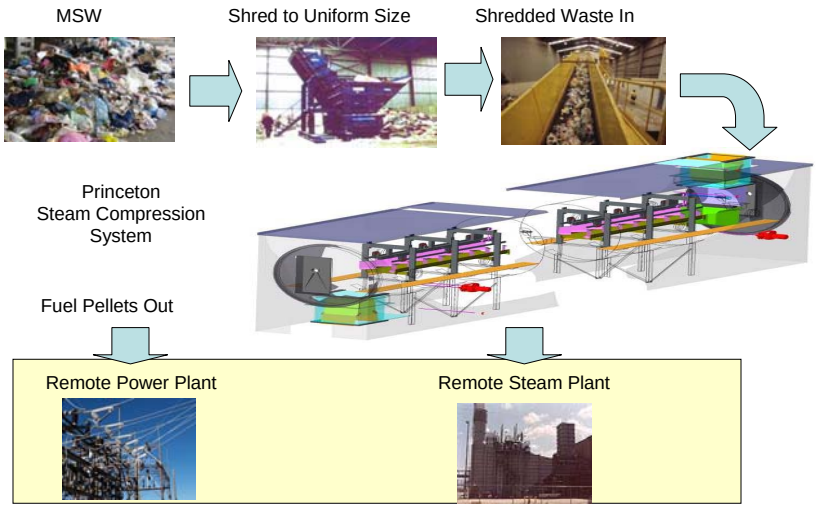
Gasification Process Continued

Princeton's Technology

- PEG Gasification- Processes MSW with high temperatures in separate stages and restrains the formation of toxic substances (Dioxin, CO, NOx, SOx).
- Removes more than 97% of airborne odor
- Primarily water vapor emissions (no black/gray smoke)
- No increased or high volume noise effects
- Technology is used abroad near residential areas

20

Steam Compression Process



21

Refuse Derived Fuel Pellets (RDF)

Fuel pellets

- Derived from MSW through Steam Compression
- Every 1,000 tons of MSW produces fuel cells for 20MW of power
- Dried fiber has a gross heat value greater than 10,000 BTU per pound (Coal has 12,000 BTU/lbs)
- This biomass contains minimal sulfur and is much cleaner when burned than fossil fuel
- This is approximately 10% of the sulfur content of coal
- Fuel pellets can be sold to local electric generators to enable them to produce more power under their existing EPA Air permits.

22

Decorative Bricks

- Decorative and landscape bricks made from the gasification ash will be environmentally friendly and a commercially viable product.

23

CPP Avoided Cost

- Local generation of up to 20MW would reduce MISO transmission dependence
- Reduce transmission cost $3.00/MWh

  This yields monthly savings of $41,000.00

  Annual Transmission savings $500,000.00
- Generation savings at $65/MW is $9.69 Million annually

24

Waste Collection and Recycling

Cleveland's Municipal Solid Waste will be the primary feedstock for the MSWE facility

- 300,000 tons of MSW annually
- 900 to 1,500 tons daily
- Potential for revenue from recyclables and tipping fees

25

Waste Management Program Components

Waste collection: fully implement *Cleveland's Waste Collection Recycling Pilot Program*

Waste sorting & separation: prepare waste for processing and/or recycling

Recyclables: includes ferrous and non-ferrous metal collection and separation, waste paper collection and bundling, plastic bottles and containers, construction debris recycling, etc.

Collection method: convert the current manual collection operation to a *Fully- automated system* for solid waste and a *Semi-automated system* for recycling utilizing carts.

26

Waste Collection Cost

Tipping fees

- 300,000 tons of MSW annually
- Tipping fee $31.44 /ton
- Tipping fees expected to increase in the near future
- Other communities in our Region are also looking for ways to reduce this cost.

27

Regional Opportunities

Reduced Tipping Fees for Participating Municipalities

- Participating communities that enter a long term contract could see reduced tipping fees of 15% or more. This would mean savings of $500,000 to $1 million dollars annually.

28

Summary of Facility Cost

Estimated Facility Cost:

City-Wide Recycling (equipment & vehicles)	$29 million
MSW Receiving Station	$21 million
Recycling Station	$12 million
Gasification Equipment	$21 million
Power Plant (20 MW)	$15 million
Steam Compression Equipment	$45 million
Construction	$21 million
Civil Engineering*	$ 8 million
Decorative Brick Equipment	$ 8 million

Total Estimated Cost	$180 million

- *Cost of Detailed Facility design: $1.5 million

29

Economic Development

Cleveland's MSWE facility will be in operation year round.

Full-time staffing needs

Waste Sorting:	24-36
Waste Processing:	12-18
Gasification Operation:	18-24
Steam Compression:	18-24
Power Plant Operation:	18-24

Total New Jobs: 90-126

30

Summary of Cleveland's MSWE Facility

Cleveland MSWE facility

- Will utilize Kinsei's patented gasification and steam compression technology
- Facility will process MSW to generate electricity
- Facility will also produce additional marketable by-products such as recyclables, refuse derived fuel *(RDF)* pellets, steam and bricks
- Facility would process MSW in a 7 step process identified as:

1. **Collection**
2. **MSW handling and processing**
3. **Material Recovery and Recycling;**
4. **Sorting and shredding**
5. **Steam compression**
6. **Gasification and electricity**
7. **Decorative bricks**

31

Questions?

32