



Technical Session #2 - Alternative Disposal Technologies

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SWALCO
SOLID WASTE AGENCY OF LAKE COUNTY, IL

SWALCO MUNICIPAL MEMBERS

Approximately 653,000 population > 95% of the County

Antioch

Beach Park

Deer Park

Deerfield

Fox Lake

Grayslake

Gurnee

Hainesville

Hawthorn Woods

Highland Park

Highwood

Island Lake

Kildeer

Lake Barrington

Lake Bluff

Lake County

Lake Forest

Lake Villa

Lake Zurich

Libertyville

Lincolnshire

Lindenhurst

Long Grove

Mundelein

North Barrington

North Chicago

Park City

Port Barrington

Riverwoods

Round Lake

Round Lake Beach

Round Lake Heights

Round Lake Park

Third Lake

Tower Lakes

Vernon Hills

Wadsworth

Wauconda

Waukegan

Winthrop Harbor

Zion

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SWALCO's MISSION

- **Plan for and implement an efficient, reliable and environmentally sound waste/material management system**
- **Advise and assist SWALCO members regarding solid waste management issues**
- **Educate the public regarding the implications of solid waste management options**
- **Provide programs and facilities to reduce the amount and toxicity of the municipal waste stream**

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OVERVIEW OF PRESENTATION

- **Brief description of alternative technologies**
- **Why is there interest in alternative technologies**
- **Potential issues/concerns with alternative technologies**
- **Final thoughts on the role of alternative technologies in Illinois**

OVERVIEW OF ALTERNATIVE TECHNOLOGIES

- **Alternative technologies = Conversion technologies**
- **Conversion technologies use advanced thermal, biological or chemical processes to convert the carbon-based portion of MW into useful products, including electricity, fuels and/or chemicals**
- **Conversion technologies are being widely implemented in Europe and Japan to manage waste streams**
 - **Per U.S. Dept. of Energy, 144 existing major plants worldwide employing 427 gasifiers. 50 projects in various stages of planning and preliminary engineering in the U.S.**
 - **8 existing in U.S. using primarily non-MW feedstocks (corn fiber, rice hulls, wood and carpet residues)**

OVERVIEW OF ALTERNATIVE TECHNOLOGIES

- **Thermal conversion technologies (produce syngas, which can be converted to steam, electricity or ethanol using anaerobic bacteria)**
 - **Pyrolysis**
 - Heat without oxygen
 - Endothermic – absorbs heat supplied by outside fuel
 - Tendency to be lower temperatures than other thermal technologies (750-1,650 degrees F)
 - **Gasification**
 - Heat using little oxygen
 - Exothermic – generates its own heat
 - Higher temperatures (1,400 to 2,500 degrees F)
 - **Plasma gasification**
 - Heat supplied by electric arc
 - Highest temperatures (up to 5,500 degrees F)

OVERVIEW OF ALTERNATIVE TECHNOLOGIES

- **Biological conversion technologies (produce biogas)**
 - **Anaerobic digestion**
 - **Converts biodegradables in the absence of oxygen, via bacteria groups, into methane and carbon dioxide (biogas that can be converted to useable energy)**
 - **Similar process occurs in landfills**
 - **Proven technology, numerous facilities in U.S used to treat sewage biosolids (many are now co-digesting food scraps and other organic materials)**
 - **Produces a compostable byproduct, called digestate**

OVERVIEW OF ALTERNATIVE TECHNOLOGIES

- **Chemical conversion technologies (produce ethanol)**
 - **Uses fermentation processes to convert sugar and starch to ethanol**
 - **Primary example is corn ethanol production**
 - **Ideal feedstock is paper, wood, yard waste**
 - **Barriers still exist to cost effective chemical conversion of wood and other fibrous vegetable matter**

SHAW/SIEMENS GASIFICATION PLANT, GEORGIA



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Gasification



Gasification Plant – Tokyo, Japan

HDX

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Pyrolysis Unit (Germany)



Advanced
Energy Strategies, Inc.

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Anaerobic Digestion of MSW



Anaerobic Digestion of MSW – Tel Aviv, Israel

Arrow-Bio

HDR

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WHY THE INTEREST IN ALTERNATIVE TECHNOLOGIES

- **A higher and better use than landfilling**
 - Illinois' waste management hierarchy lists landfilling as least preferred option
 - Recent life cycle analysis studies have shown that thermal conversion technologies are less polluting than landfills
 - U.S. annually landfills biogenic (renewable) materials with an energy potential of 8.72 million megawatt-hours, equal to avoiding the burning of 35 million tons of coal if more efficiently recovered by a conversion technology
- **Urban areas are running out of space for landfills**
 - Sustainable solutions imply local disposal solutions vs. transfer station/long haul/landfilling model

WHY THE INTEREST IN ALTERNATIVE TECHNOLOGIES

- **A source of renewable energy (over 30 states have renewable energy portfolio standards, Illinois' is 25% by 2025)**
 - **Approximately 60% of the waste stream is biogenic (i.e., renewable)**
 - **Federal government and 25 states consider waste from energy as a renewable energy source**
 - **Illinois counts landfill gas as a renewable energy but not municipal waste if it is incinerated (it is assumed gasification would not be included, but statute is not clear regarding this or anaerobic digestion)**
 - **Landfill gas to energy much less efficient than municipal waste that is gasified or incinerated (LF gas approximately 50 kW h/ton vs. gasification at approximately 500 kW h/ton)**
 - **Recent studies indicate that power from municipal solid waste (primarily incinerators) is significantly less polluting than power from coal or oil for carbon dioxide, sulfur dioxide and nitrogen oxides**

POTENTIAL ISSUES WITH ALTERNATIVE TECHNOLOGIES

- **Lack of a track record in U.S. with municipal waste**
 - Examples do exist (Siemens' carpet plant gasifier) with other waste streams
 - Los Angeles County moving forward with three projects (anaerobic digestion, pyrolysis, and gasifier)
 - Dozens of projects in planning or engineering phases
 - WMI strategic alliance with Enerkem (gasification technology)
- **Cost vs. landfilling option**
 - Landfill tipping fees in Illinois range from \$20 to \$50 per ton, depending on location and volume deals
 - Alternative technologies, \$70 per ton and greater

POTENTIAL ISSUES WITH ALTERNATIVE TECHNOLOGIES

- **Environmental concerns**
 - “Incinerators in disguise”, this is not accurate for several reasons
 - Alternative technologies use no or lower amounts of oxygen
 - Syngas can be treated and cleaned up prior to combustion
 - The volume of output gases is much smaller, therefore less emissions to treat
 - Syngas can be converted to multiple energy uses (steam, electricity and fuels)
 - Any air emission is bad, landfills are preferred
 - Neglects GHG problems with landfills (studies have documented that LFs are bigger GHG sources than ATs)
 - Neglects fact that LF gas must be combusted (just like syngas) and often with no pollution control (if flared)
 - Anti-recycling
 - Studies indicate that nations in Europe that rely extensively on waste to energy facilities do not recycle less than those nations relying on landfilling
 - Zero waste is the answer

FINAL THOUGHTS

- **Illinois needs pilot projects like Packer Engineering's Naperville project to gain knowledge and confidence with alternative technologies**
- **Technology enhancements must (and will) continue, great promise shown in converting syngas to ethanol**
- **Anaerobic digestion is ideal for managing food scraps and other organic materials in urbanized areas**
 - **13% of landfilled material in Illinois is food scrap, over 2 million tons per year (in comparison, we compost about 500,000 tpy of landscape waste)**
- **Life cycle assessment must continue to be used to make policy decisions**
 - **Lake County SWM Plan requires use of LCA to demonstrate that proposed disposal options are environmentally superior to current system (i.e., landfilling)**



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