

# RENEWABLE ENERGY IN THE U.S.

## WASTE-TO-ENERGY

Swedish Trade Council, USA  
January, 2008

Co-Sponsors and Collaborating Partners:





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## EXECUTIVE SUMMARY

### - Waste-to-energy

- Even if the last 15 years have been tough for the waste-to-energy industry in the U.S., there are now indications of an increased interest. The main reasons are:
  - Increased electricity prices makes waste-to-energy production more profitable. Higher fuel prices also increase costs for transportation of waste to landfills
  - There are important state and regional incentives and initiatives in place that are favorable to waste-to-energy production
- There are also factors that make the market challenging:
  - The number of waste-to-energy facilities has continuously declined in the last 15 years and there are currently no new facilities being built
  - There is still a degree of public and political resistance in the U.S. towards waste-to-energy
- U.S. companies and plant managers on a general level express great interest in European companies and solutions. Those with specific knowledge of the Swedish WTE industry all rate it very highly
- Areas Swedish companies should look into are flue gas cleaning and consulting

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## SAMMANFATTNING

### - Avfallshantering med energiutvinning

- Studien visar att även om de senaste 15 åren har varit tuffa för branschen som helhet, så finns det nu indikationer på ett ökat intresse för avfallsförbränning. Huvudorsakerna är:
  - Ökat pris för elektricitet gör energiutvinning från avfallsförbränning mer lönsam. Högre bränslepriser gör det också dyrare att transportera avfall till deponier
  - Det finns flera viktiga incitament på delstatlig och regional nivå som gör avfallsförbränning med energiutvinning mer fördelaktigt
- Det finns också ett antal utmaningar för branschen:
  - Antalet anläggningar för avfallsförbränning har minskat kontinuerligt de senaste 15 åren och det byggs för tillfället inga nya anläggningar
  - Det finns fortfarande ett visst politiskt och allmänt motstånd i USA mot avfallsförbränning
- Det är även intressant att notera att många amerikanska företag och anläggningsansvariga är positivt inställda till europeiska företag. I de fall där man specifikt känner till vad Sverige gör inom området är man överlag mycket positivt inställd till svenska företag
- Områden med särskilt intresse för svenska företag är rökgasrening och konsulttjänster



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## BACKGROUND

- Sweden is internationally recognized as one of the leading countries when it comes to environmental regulation and a successful private-public partnership. Many Swedish companies decided early on to invest in the development of new technical solutions in order to reduce emissions to air and water. Combined with a strategic approach to environmental issues and many years of experience, Swedish companies have a strong position in a number of environmental sectors
- The U.S. environmental technology market is the world's largest. There is a growing interest in the U.S. for environmental technologies, particularly in the area of renewable energies, among investors, large corporations, policymakers and the public
- The Swedish Embassy in Washington D.C., the Consulates General of Sweden in New York and Los Angeles and the Swedish Energy Agency, have requested the assistance of the Swedish Trade Council (STC) to identify and assess Swedish business opportunities in the renewable energy sector in the U.S. The project should include a comprehensive and concrete analysis of business opportunities for Swedish companies within the areas of waste-to-energy (WTE), biogas, and ethanol
- The direction and outline of this project have been discussed with a number of Swedish organizations, including the Swedish Energy Agency, Swentec and IVL. The project team has taken advantage of this network and the competence and knowledge available in these organizations

## OBJECTIVE AND KEY ISSUES

The objective of the project is to evaluate Swedish business opportunities within the U.S. renewable energy sector with a focus on waste-to-energy (WTE), biogas and ethanol

In order to meet the objective the STC will address the following **key issues**:

- What does the U.S. market for WTE, biogas and ethanol look like in terms of market size and structure?
- What are the key trends in the U.S. market and what affects the development?
- What are the key regulations affecting the market?
- What types of promotional activities would be beneficial for Swedish companies?



## LIST OF ABBREVIATIONS

Abbreviation	Name/ explanation
DOE	Department of Energy
DSIRE	Database of State Incentives for Renewables and Efficiency
EPA	Environmental Protection Agency
IDEA	International District Energy Association
IWSA	International Solid Waste Association
MSW	Municipal Solid Waste
NSWMA	National Solid Wastes Management Association
RFS	Renewable Fuels Standard
RPS	Renewable Portfolio Standard
WTE	Waste-To-Energy



## TERMS AND TRANSLATIONS

Term	Translation
Combustible waste	Brännbart avfall - avfall som brinner utan energitillskott efter det att förbränningsprocessen startat
Energy recovery	Energiåtervinning
Landfill	Deponi - kontrollerat upplag för avfall som inte avses flyttas
Municipal solid waste (MSW)	Hushållsavfall
Waste-to-energy (WTE)	Avfallsförbränning med energiåtervinning
WTE plant	Avfallsförbränningsanläggning

## CONVERSION OF WEIGHTS AND MEASURES

U.S. weights and measures	European conversion
Gallon	1 American gallon = 3,785 liter
Miles	1 U.S. mile = 1.609 344 kilometer
Pounds (lbs)	1 kg = 2,2 pounds

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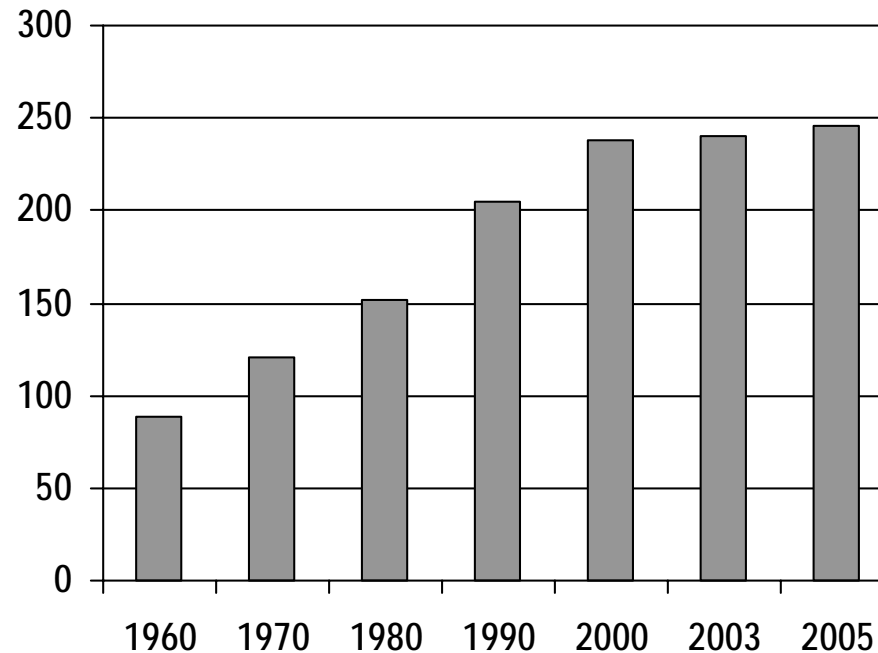
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## SOLID WASTE GENERATION HAS ALMOST TRIPPLED IN THE U.S. SINCE 1960

- A total of 245 million tons of solid waste was generated in the U.S. in 2005

U.S. municipal solid waste generation

Million of tons



In USA 4,5 lbs (2.04 kg) of solid waste is generated per person and day, compared to 2,8 lbs (1.27 kg) per person and day in Sweden

**The U.S. generates 60% more solid waste per person per year when compared to Sweden**

## MUNICIPAL SOLID WASTE HANDLING DIFFERS BETWEEN STATES

- There are a number of federal regulations and EPA programs states have to follow

- Traditionally, residents pay for waste collection and disposal through property taxes or a fixed fee
- Many communities use the Pay-As-You-Throw (PAYT) program, which means that residents are charged a fee for each bag or can of waste they throw away (the more you throw away, the more you pay)
- The Clean Air Act and the Resource Conservation and Recovery Act are the most important federal regulations for the waste-to-energy industry
- There are a total of 13 EPA programs and initiatives on municipal solid waste



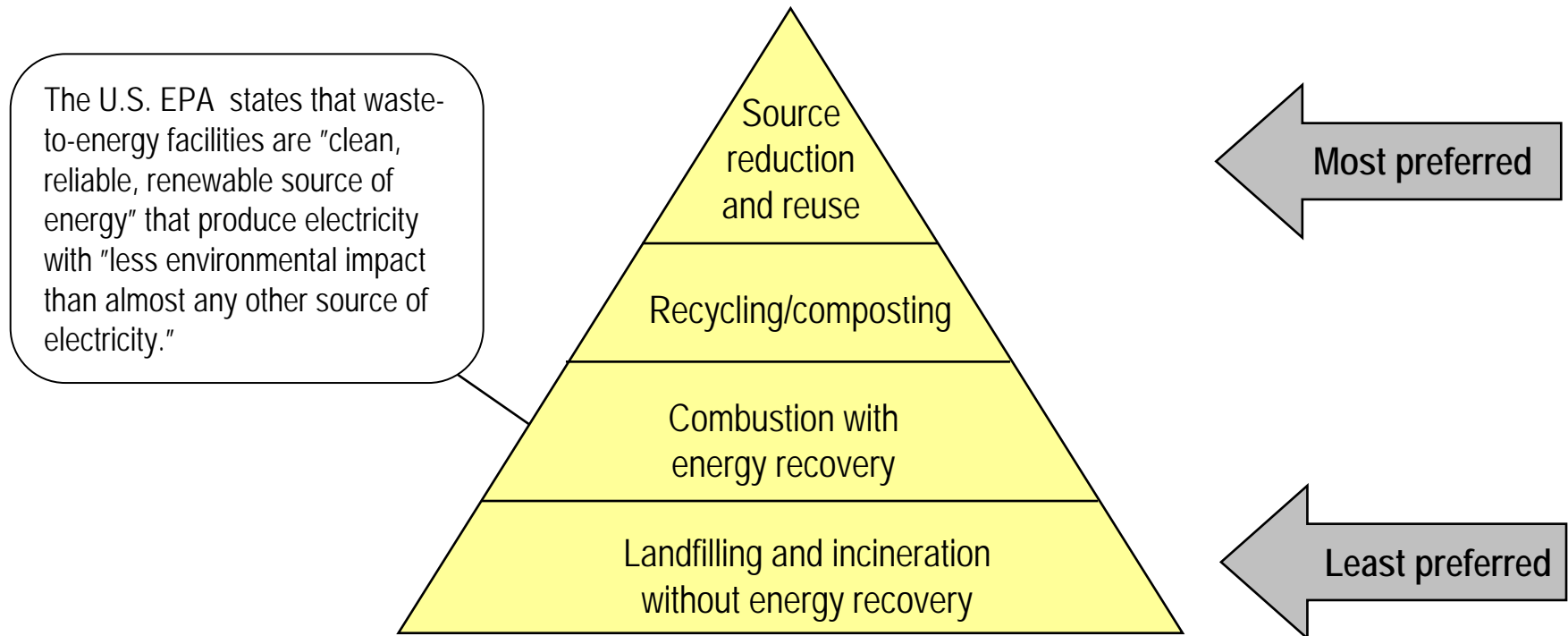
**Some states have stricter regulations than the ones set on a federal level**



## THE U.S. ENVIRONMENTAL PROTECTION AGENCY CONSIDERS WASTE-TO-ENERGY PREFERABLE TO LANDFILLING

- But source reduction/reuse and recycling/composting are preferred to combustion

Solid waste management hierarchy

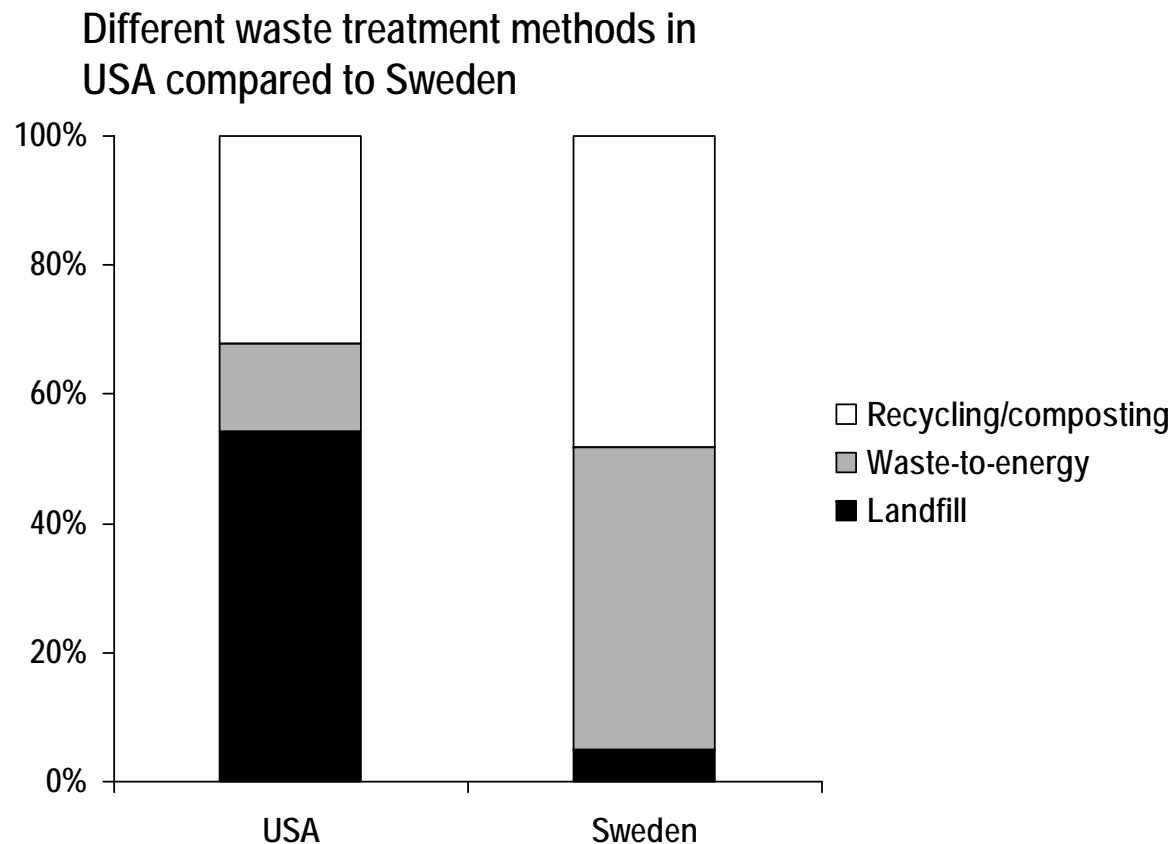


Waste-to-energy has a stronger position in Sweden, where it is considered equal to recycling



# LANDFILLING IS THE MOST COMMON WASTE MANAGEMENT IN THE U.S.

- Only 13.6% of the waste is used for energy production



The amount of waste used for energy production is low in the U.S. compared to Sweden

## WASTE-TO-ENERGY PLANTS ARE COMMONLY NOT USED FOR DISTRICT HEATING IN THE U.S.

- Most of them only generate electricity

*"There is no official statistic on how many waste-to-energy facilities in the U.S. are used for district heating production, but they are not many."*

Anders Rydåker,  
District Energy St. Paul

*"The use of heat recovered from municipal waste combustion for district heating is still small in the U.S."*

Priscilla Ulloa, Earth and  
Environmental Engineering

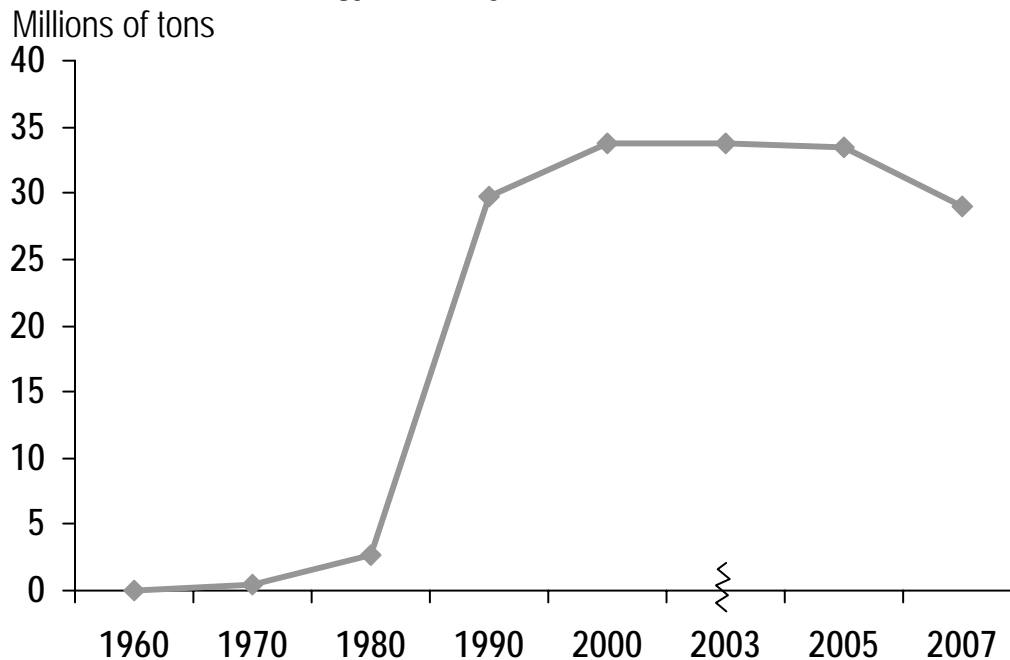
In Sweden, 15% of the district heating production originates from waste-to-energy production

**The amount of WTE used for district heating is low in the U.S. compared to Sweden**

## THE AMOUNT OF MUNICIPAL SOLID WASTE USED FOR ENERGY RECOVERY INCREASED DRAMATICALLY AFTER 1980

- However, the combustion of municipal solid waste with energy recovery has not increased since 1990

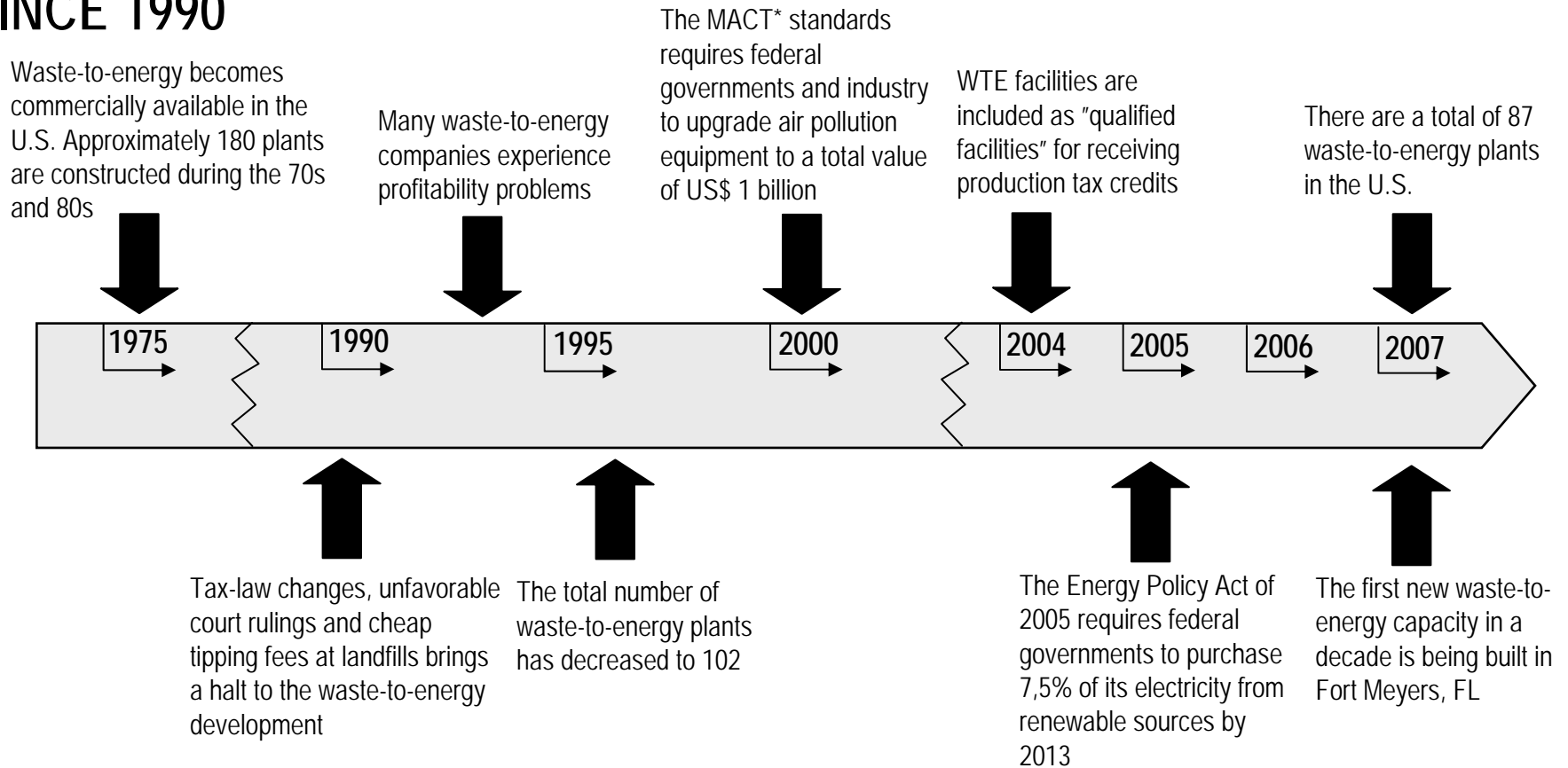
Combustion with energy recovery in the U.S. 1960-2007



The main reasons for the strong increase of energy recovery from municipal solid waste 1980-1990 were the need of finding environmentally sound alternatives to unregulated open dumps, and the need to develop alternative energy resources in order to decrease the oil dependence.

**An est. total of 28.7 million tons of trash will be processed in U.S. WTE plants during 2007**

# THE NUMBER OF WTE PLANTS HAVE DECREASED SUBSTANTIALLY SINCE 1990

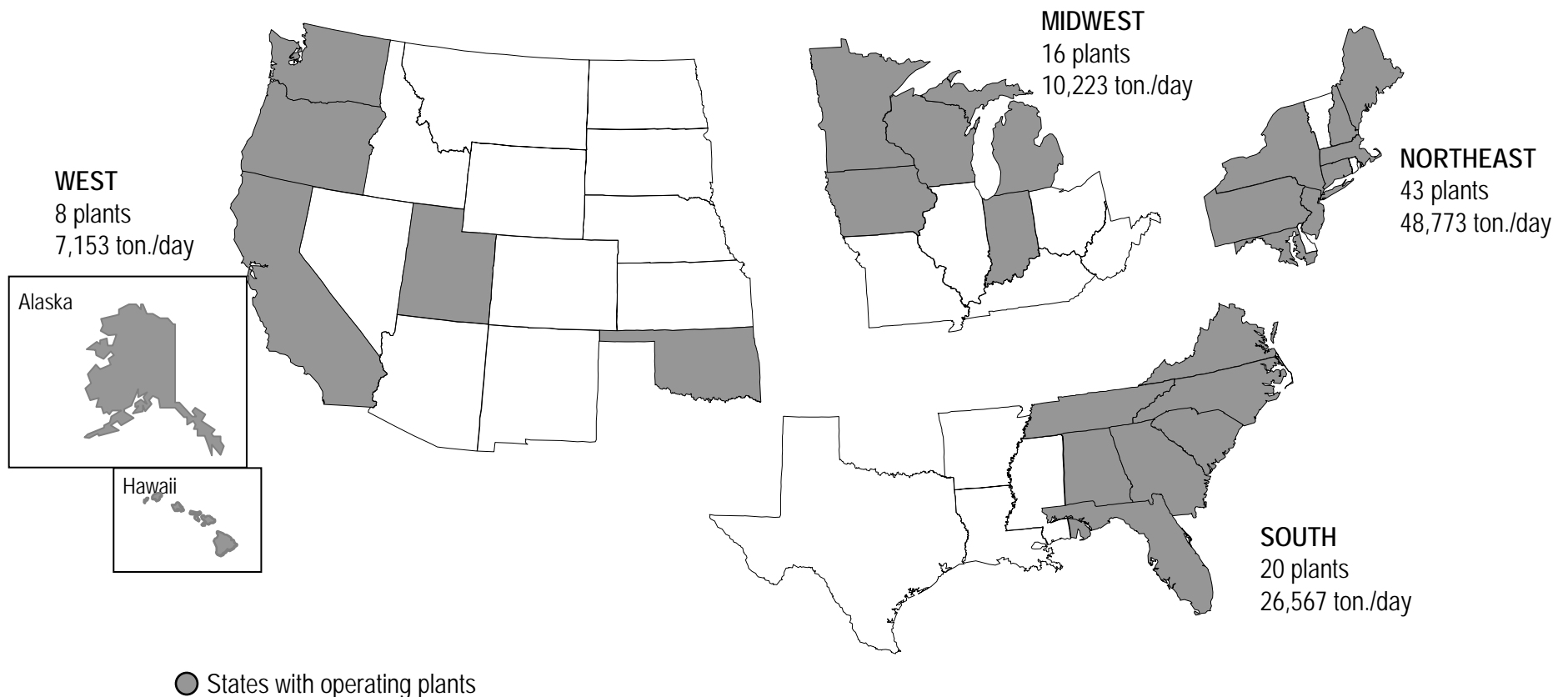


**Policy changes, construction of new large landfills and profitability problems for many WTE companies are the main reasons to the decreased number of facilities**

\*MACT – Maximum Achievable Control Technology – standards set by EPA for municipal waste combustors 20  
Source: IWSA, EPA, Eileen B. Berenyi and Marc J. Rogoff, MSW Management

# THERE ARE 87 WASTE-TO-ENERGY FACILITIES IN 26 U.S. STATES

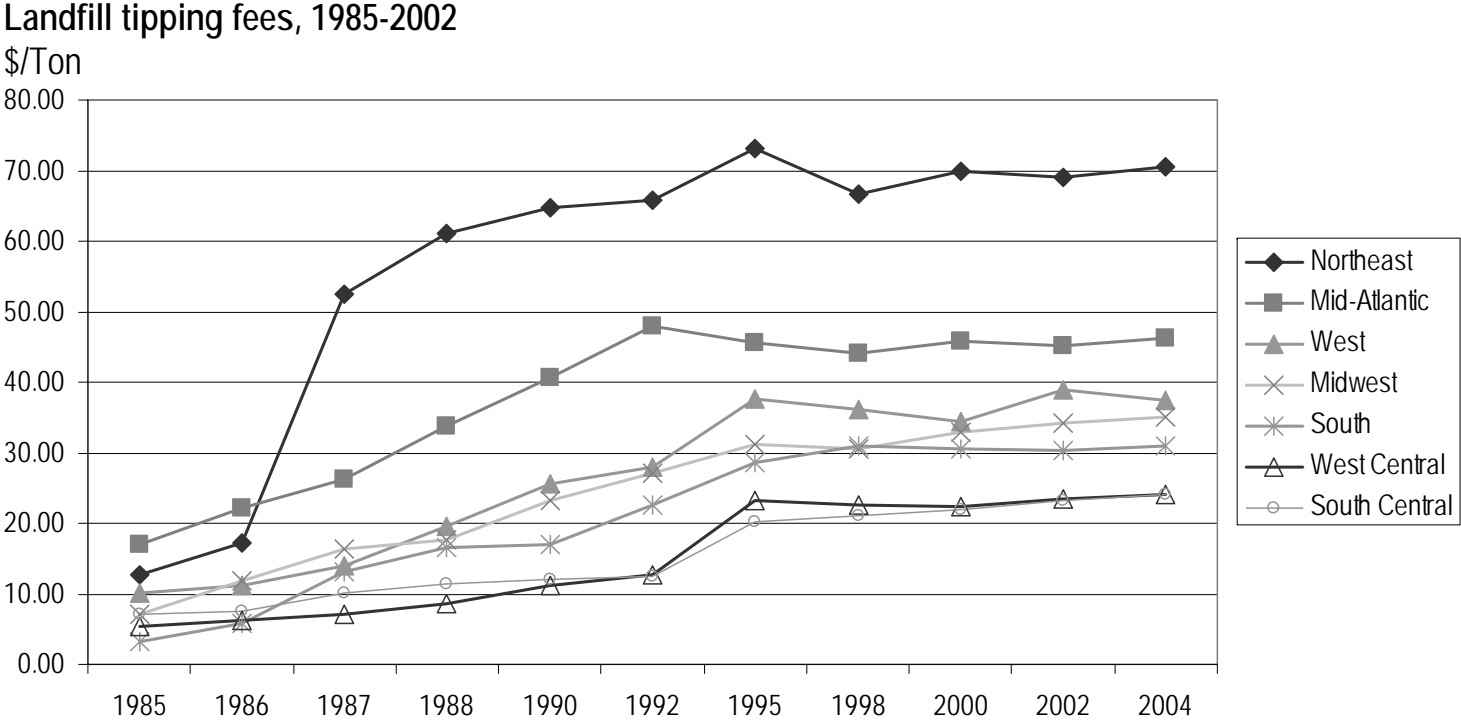
- Most of them are located in the Northeast



The total generated energy from WTE facilities in the U.S. is nearly 2,700 MW per year



# WASTE-TO-ENERGY IS MOST COMMON WHERE LANDFILL TIPPING FEES ARE HIGH



**In regions where land is less expensive and the tipping fees are low, recycling and waste-to-energy will continue to be at an economic disadvantage**

## THERE HAVE BEEN FEW NEW WASTE-TO-ENERGY PLANTS BUILT IN THE U.S. THE LAST 15 YEARS

- Low price of land disposal and low tipping fees have made landfills more profitable than waste-to-energy solutions
- The energy price has been low and there have been few incentives for waste-to-energy production
- Only a small number of the waste-to-energy facilities are used for district heating
- The public and political acceptance for waste-to-energy has been low
- Many waste-to-energy companies have had profitability problems

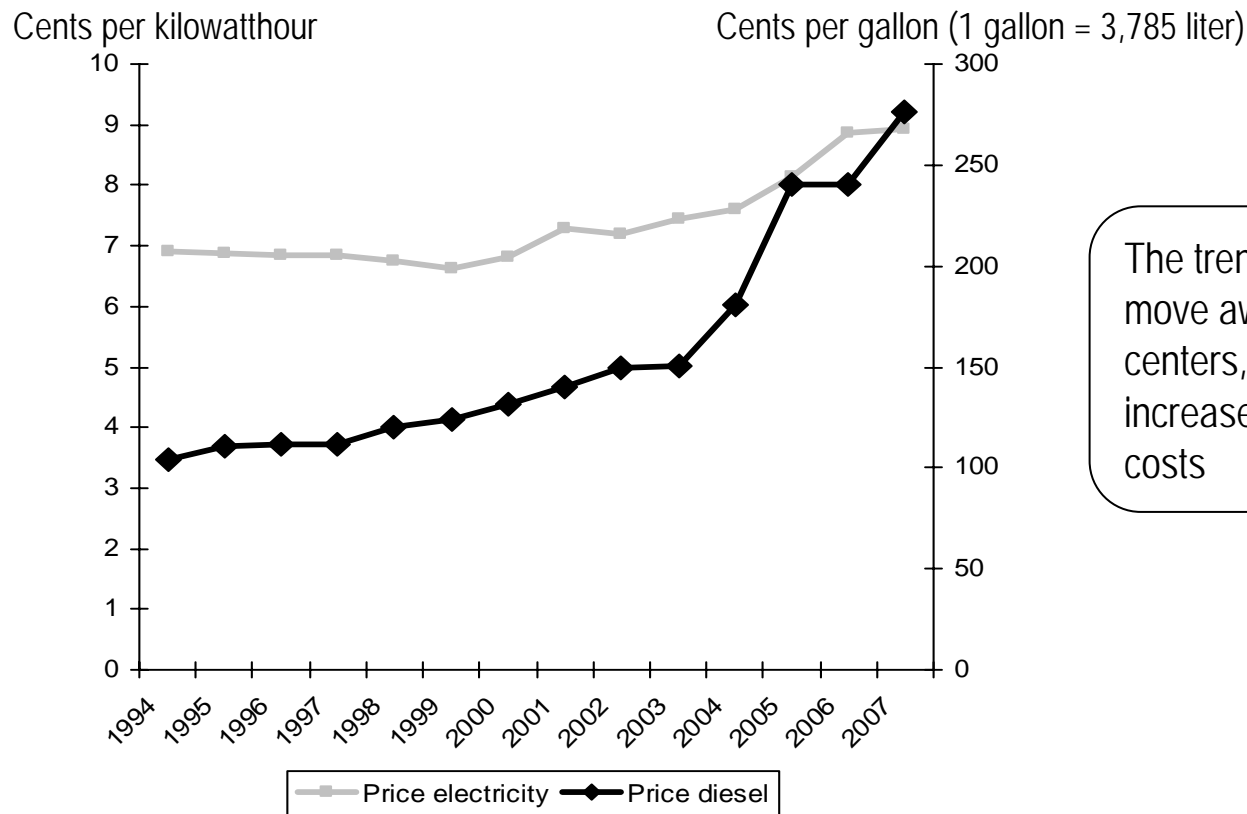
*"The profitability has not been there for waste-to-energy. It has been difficult to compete with landfills."*

Ted Michaels, Integrated Waste Services Association

## THE SITUATION FOR WTE HOWEVER IS STARTING TO CHANGE

- Increased electricity price makes waste-to-energy more profitable. Higher fuel prices also increase costs for transportation of waste to landfills

Electricity and diesel prices in the U.S. 2000-2007



The trend is that landfills move away from population centers, which also further increases transportation costs

## THE RENEWABLE ENERGY PRODUCTION TAX CREDIT COULD BE AN IMPORTANT INCENTIVE FOR THE WTE INDUSTRY

### The Renewable Energy Production Tax Credit

A per kilowatt-hour tax credit for electricity generated by "qualified energy resources" (of which waste-to-energy facilities are included). The tax credit is currently 1 cent/kWh for electricity produced for a period of 10 years.

*"Waste energy is a capital intensive industry. Financing is an important part of that. The economics of the facility are critical about whether it gets built. The one cent per kilowatt tax credit can make a key difference about whether it gets built. The tax credit has proven over time to be the most effective assistance you can provide to renewable industries."*

Ted Michaels, Integrated  
Waste Services Association

## THERE ARE A NUMBER OF STATE AND REGIONAL INITIATIVES AND PROGRAMS THAT ALSO COULD BE IMPORTANT INCENTIVES

### Regional initiatives

There are a number of regional initiatives to reduce carbon dioxide emissions and increase renewable energy generation, such as the Western Climate Initiative, Regional Greenhouse Gas Initiative (RGGI), Western Governors' Association (WGA): Clean and Diversified Energy Initiative, West Coast Governors' Global Warming Initiative, Powering the Plains, New England Governors: Climate Change Action Plan (NEG-ECP) and the Southwest Climate Change Initiative.

### Public Benefit Funds

Half of the U.S. states use funds to support energy efficiency and renewable energy projects. Twelve of the states coordinate their investments in renewable energy through the "Clean Energy States Alliance": California, Connecticut, Illinois, Massachusetts, Minnesota, New Jersey, New York, Ohio, Oregon, Pennsylvania, Rhode Island and Wisconsin.

## THERE ARE TWO IMPORTANT FEDERAL REGULATIONS THAT OPERATORS OF WTE FACILITIES HAVE TO ADAPT TO

### The Clean Air Act

Regulates operating conditions, monitoring, reporting, training and safety requirements. Municipal waste combustors must comply with the Maximum Achievable Control Technology (MACT) standards. The MACT standards are revised every five years (it was last updated on 10 May 2006).

### The Resource Conservation and Recovery Act

Requires testing of the plants' ash residue to determine the ash is non-hazardous and properly disposed or reused.

## SOME STATES HAVE POLICY AGREEMENTS AND STANDARDS THAT COULD BE IMPORTANT FOR THE WTE INDUSTRY

### The Renewables Portfolio Standard (RPS)

25 U.S. states have adapted the RPS standard, which is a policy that obligates each retail seller of electricity to supply its retail customers a certain amount of electricity from renewable energy sources. It can be done by either owning a renewable energy facility and producing its own power, or purchasing renewable electricity from someone else's facility.

### U.S. Mayors Climate Protection Agreement

600 mayors have signed an agreement for a 7% reduction in greenhouse gases from 1990 levels by 2012 (which is in line with the Kyoto protocol) and recognize waste-to-energy technologies as a means to achieve that goal.

## THERE ARE TWO MAIN EVENTS WHERE A LARGE SHARE OF THE INDUSTRY PARTICIPATES EVERY YEAR

### NAWTEC

- NAWTEC is recognized as the leading industry technical conference and trade show focusing on municipal waste-to-energy
- The exhibition is attended by many of the leading waste-to-energy professionals and decision makers, and offers networking opportunities as well as opportunities to showcase products and services
- It is arranged in Philadelphia, PA, May 19-21, 2008

### WASTECON

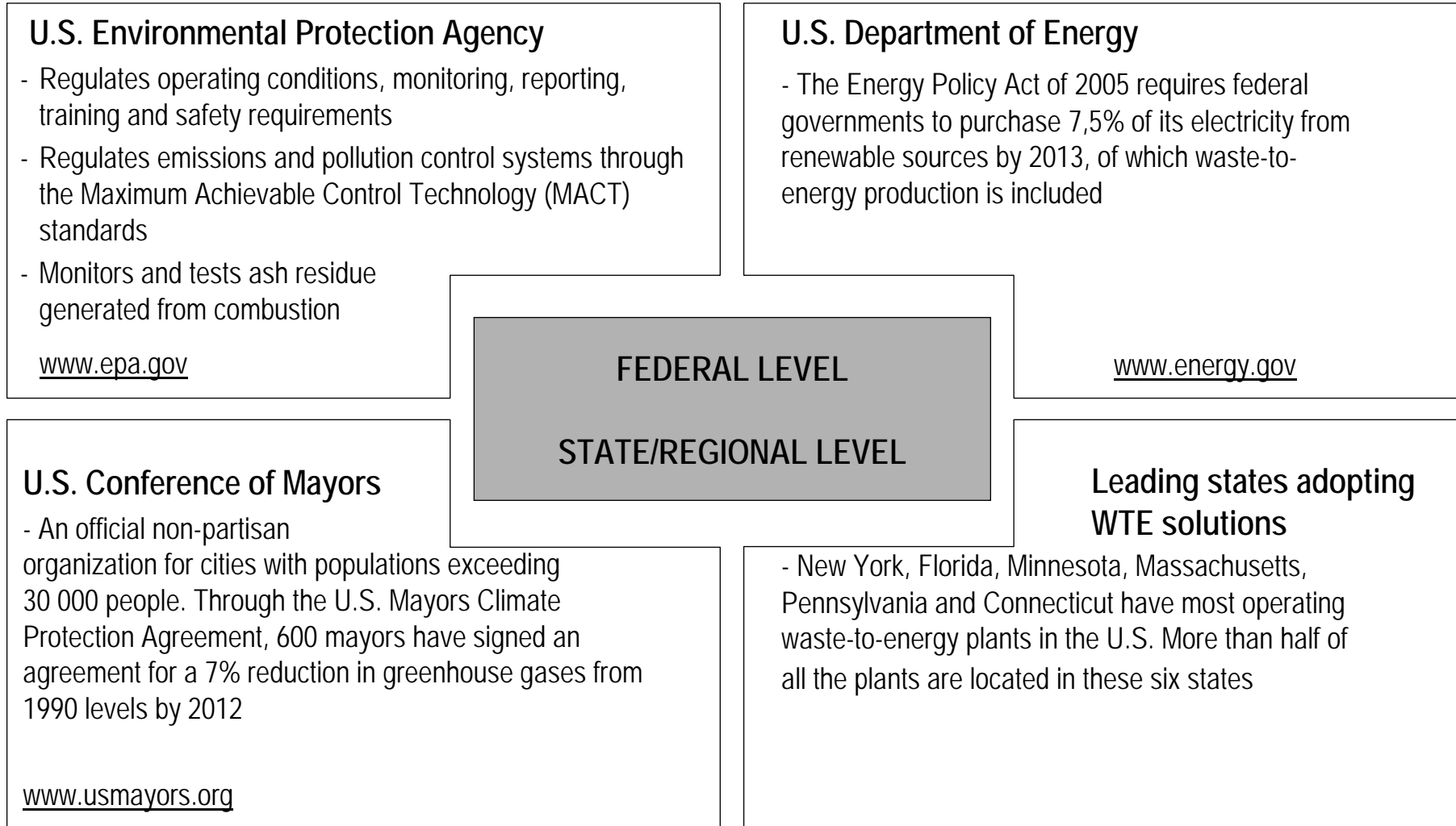
- The leading event for solid waste professionals
- The focus is on bringing solid waste companies and buyers together
- The 2008 event will be held October 21-23 in Tampa, FL and the 2009 event September 22-24 in Long Beach, California

**Tradeshows and workshops are important for making business connections within the U.S. waste-to-energy industry**

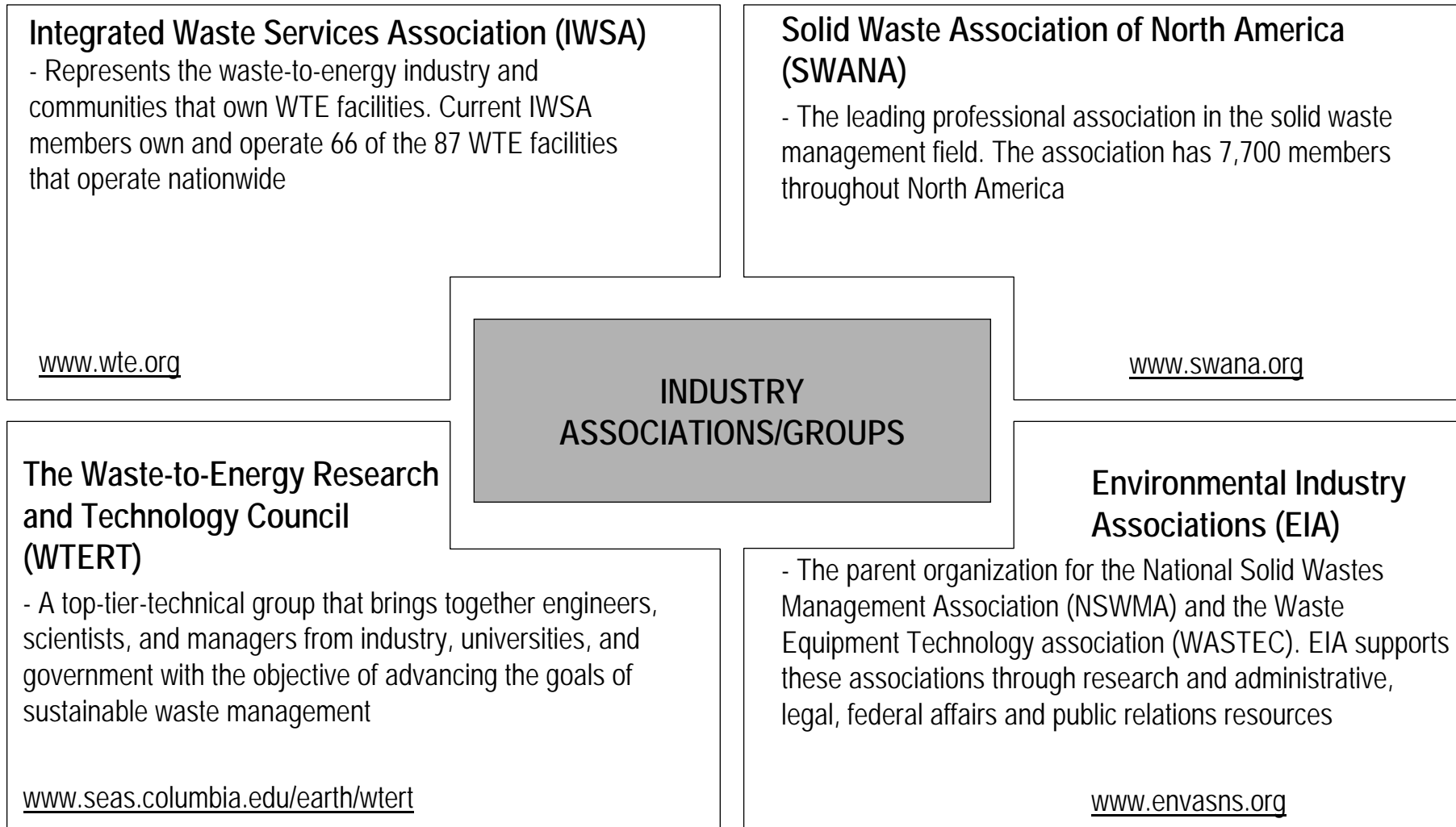
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# KEY PLAYERS INFLUENCING THE WASTE-TO-ENERGY INDUSTRY



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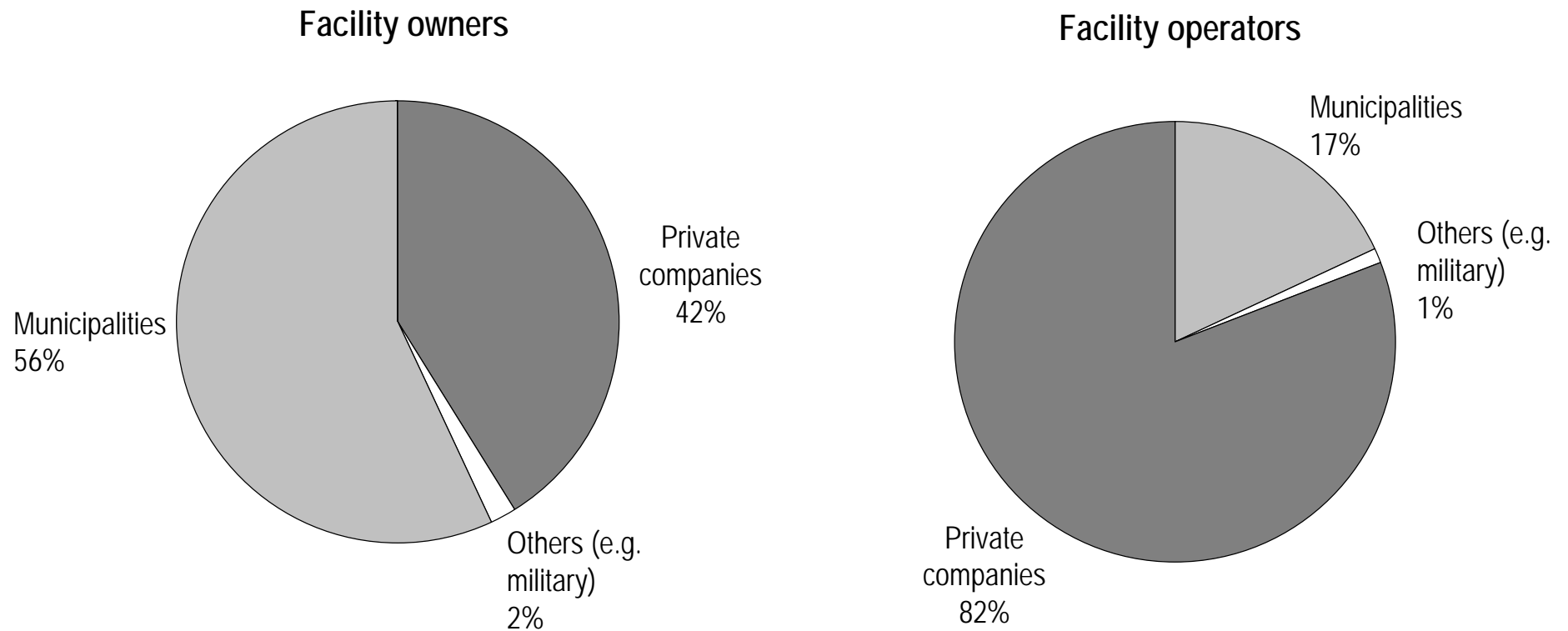
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# ALMOST 60% OF THE WTE PLANTS ARE OWNED BY MUNICIPALITIES

- But 80% of the facilities are operated by private companies

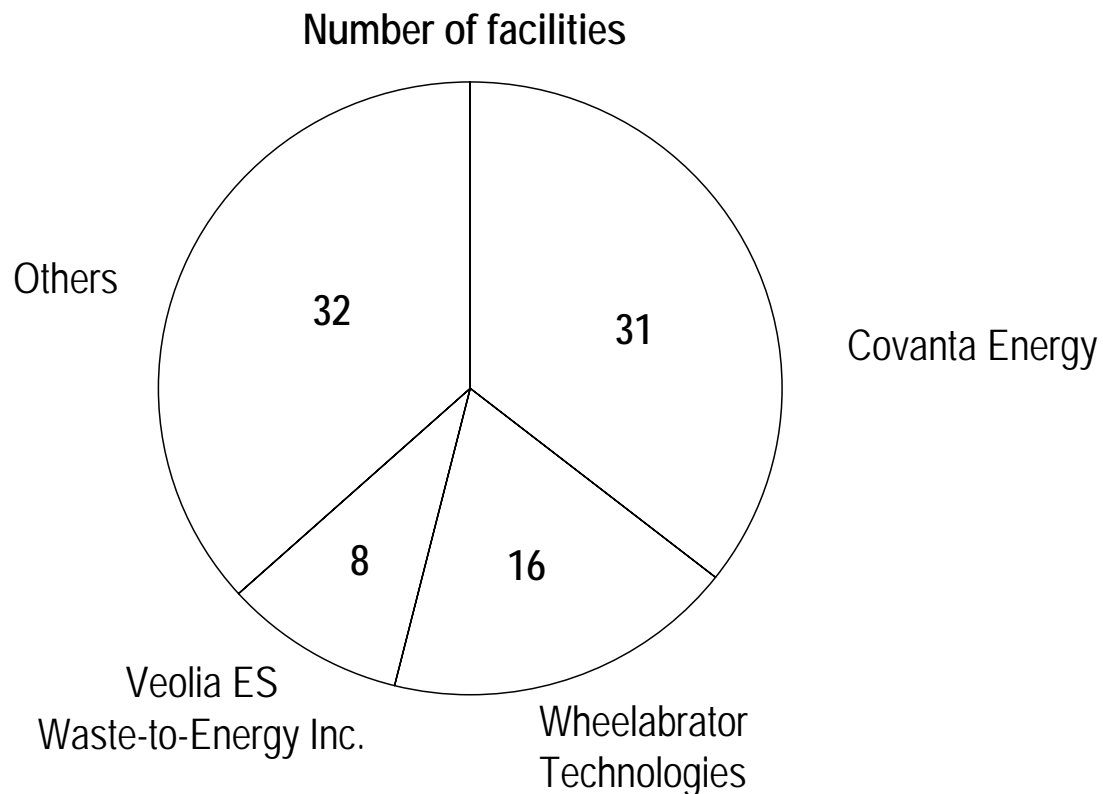


**In Sweden, approximately 80% of the waste-to-energy plants are owned and operated by municipalities**



## THREE COMPANIES OPERATE 63% OF ALL THE FACILITIES

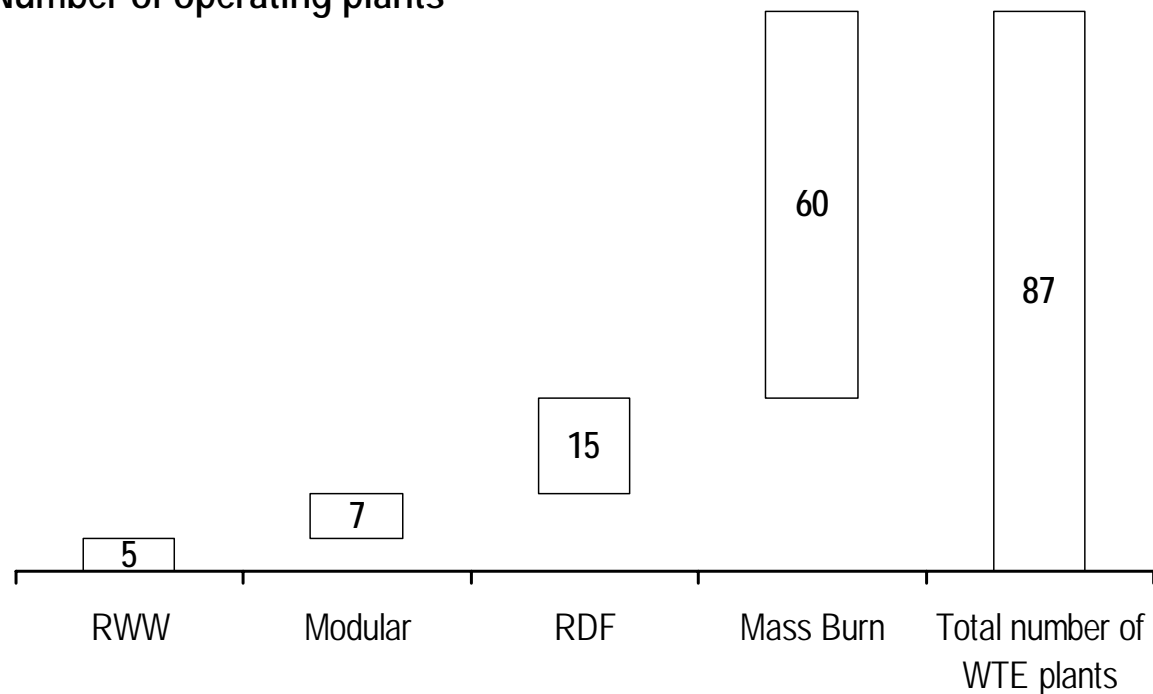
- Covanta, Wheelabrator and Veolia



## THE LEADING WTE FURNACE TECHNOLOGY IS MASS BURN

- 60 out of 87 waste-to-energy plants use the technology

Number of operating plants



**Mass burn** – generated electricity and/or steam from trash by feeding MSW into large furnaces

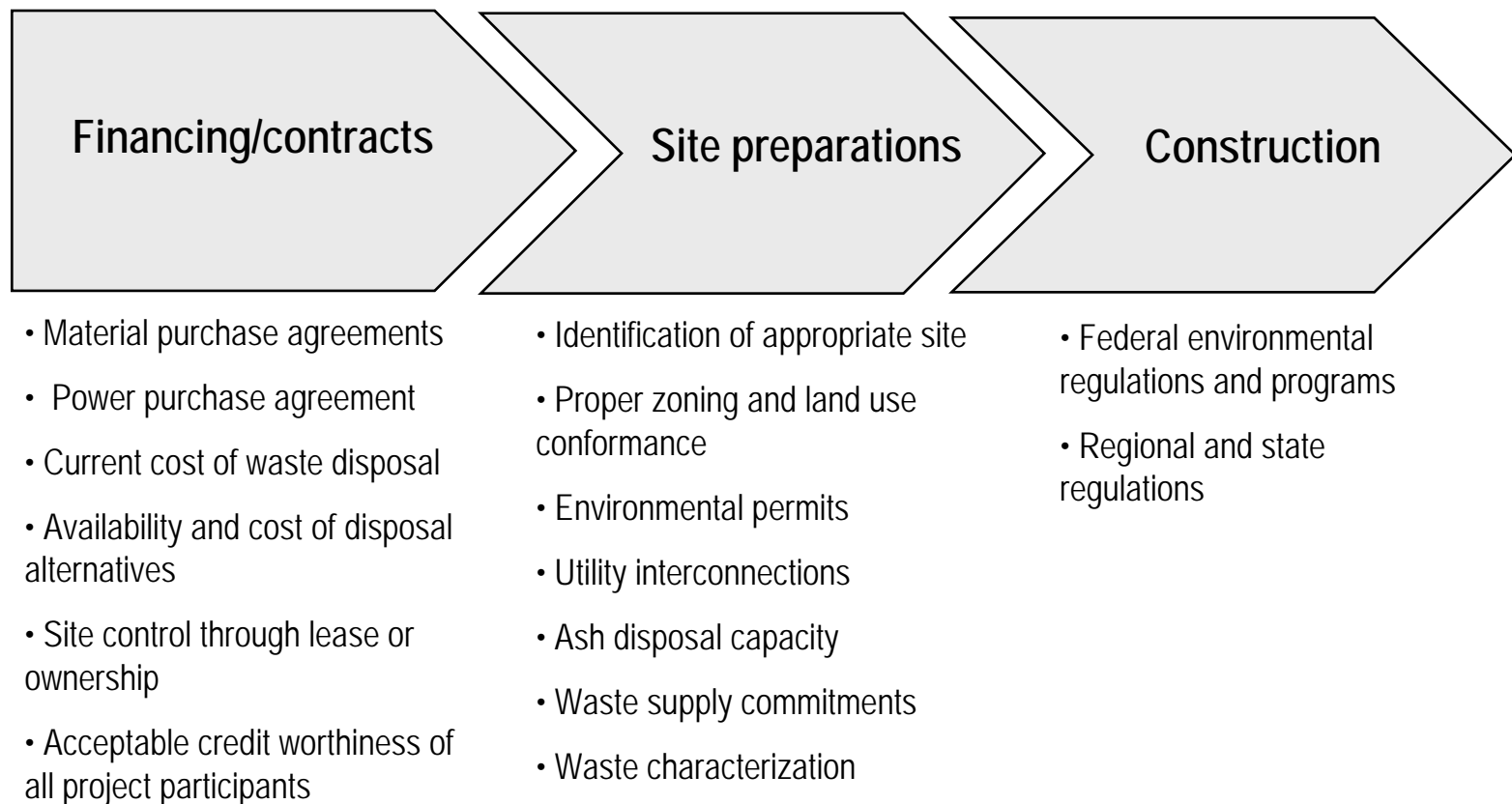
**Refused-derived fuel (RDF)** – combustion of homogenized fuel in a combustion chamber

**Modular** – similar to mass burn facilities, but smaller and typically prefabricated offsite and assembled where they are needed

**RWW** – rotary water wall combustor mainly fed by yard and wood products

Some projects with emerging technologies, such as gasification, are underway but they are still unusual

## CONSTRUCTION OF A WASTE-TO-ENERGY FACILITY





## MOST EXISTING WTE FACILITIES ARE FINANCED THROUGH PUBLIC UTILITY REGULATORY POLICY ACT (PURPA) CONTRACTS

### Public Utility Regulatory Policy Act (PURPA)

- Enacted in 1978, Public Utility Regulatory Policy Act was intended to encourage more energy-efficient and environmentally friendly commercial energy production
- Waste-to-energy plants are, together with a number of other alternative energy sources, defined under the Public Utility Regulatory Policies Act (PURPA), as qualified facilities (QFs)
- Utility companies are obliged to purchase energy from QF facilities based on a pricing structure referred to as avoided cost rates
- PURPA is starting to become out of date, since many of the contracts during the 1980s are expiring

*"PURPA has probably been the most effective single measure in promoting renewable energy. But in the last 15 years, it has not been decisive for the number of new waste-to-energy facilities built."*

Ted Michaels, Integrated Waste Services Association

**PURPA is less important today than it was 20 years ago. The renewable production tax credit\* will probably become a more important incentive**

\* See slide 27  
Source: Integrated Waste Services Association

## EQUIPMENT IS OFTEN PURCHASED THROUGH A TENDER PROCESS

- But personal contact is also very important

*"We always use competitive bidding. We have some suppliers that we have been working with for a very long time. But we still prefer to use competitive bidding."*

Jeff Harnley  
Xcel Energy, Minnesota

*"We have a bidding list for the routine maintenance we do. We have a long relationship with most of the companies on it, but we are always looking for new technologies."*

Matt Eaton  
Commerce Refuse-to-Energy Facility, Los Angeles

*"We have a technology license with VonRoll, which means they provide us with grate, boiler and emission control systems. For all other equipment, we use a bidding process. We are always interested in getting in contact with companies that could offer better technologies than the ones we use now."*

Mark Lyons  
Wheelabrator

**It is important that Swedish equipment suppliers are known to the plant managers and technology consultants making equipment selection decisions**



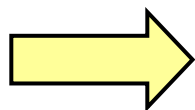
## THERE ARE CURRENTLY NO NEW WTE FACILITIES BEING BUILT

- Opportunities are within expansions and upgrades of existing facilities

Operator	Description	Upgrades/expansions	Equipment purchase procedures
Covanta	The largest waste-to-energy operator in the U.S. Currently operates 31 waste-to-energy facilities. The headquarter is in Fairfield, NY.	They perform continuous expansions and upgrades of existing facilities. They have a technology license agreement with Martin Gmbh which means they supply them with all the stoker grate equipment and air pollution equipment.	Contact Ted Hoefler, VP Operations or Scott Whitney, VP Business Development, +1 973 882 9000 for discussions on opportunities.
Wheelabrator	The second largest waste-to-energy operator in the U.S. Operates 16 waste-to-energy facilities. The headquarter is in Hampton, NH	Confidential regarding upgrades and expansions. They have a technology license agreement with VonRoll and use them for all equipment related to graders, boilers and air pollution control systems. For all other equipment, they are always looking for better technologies and encourage Swedish companies to contact them for discussions on opportunities.	Call +1 603 929 3000 and ask for David Raymond, VP of Engineering and Construction. They are open for discussions on opportunities and how to get on their bidding list.
Xcel Energy	Xcel owns and operates 3 facilities: Xcel Energy Red Wing Steam Plant in Red Wing, MN; Xcel Energy Wilmarth Plant in Mankato, MN and Xcel Energy La Crosse County Resource Recovery Facility in La Crosse, WI.	They are currently looking into boiler optimization techniques for all of their facilities.	They have suppliers they've worked with for a very long time, but they still use competitive bidding for all upgrades. Contact Jeff Harnly, Plant Manager at Xcel Energy in Minnesota, +1 651 385-5603 for more information on opportunities and how to get on their bidding list.

## MUNICIPAL OPERATORS ARE MORE DEPENDENT ON FUNDING FOR UPGRADES AND EXPANSIONS THAN PRIVATE OPERATORS

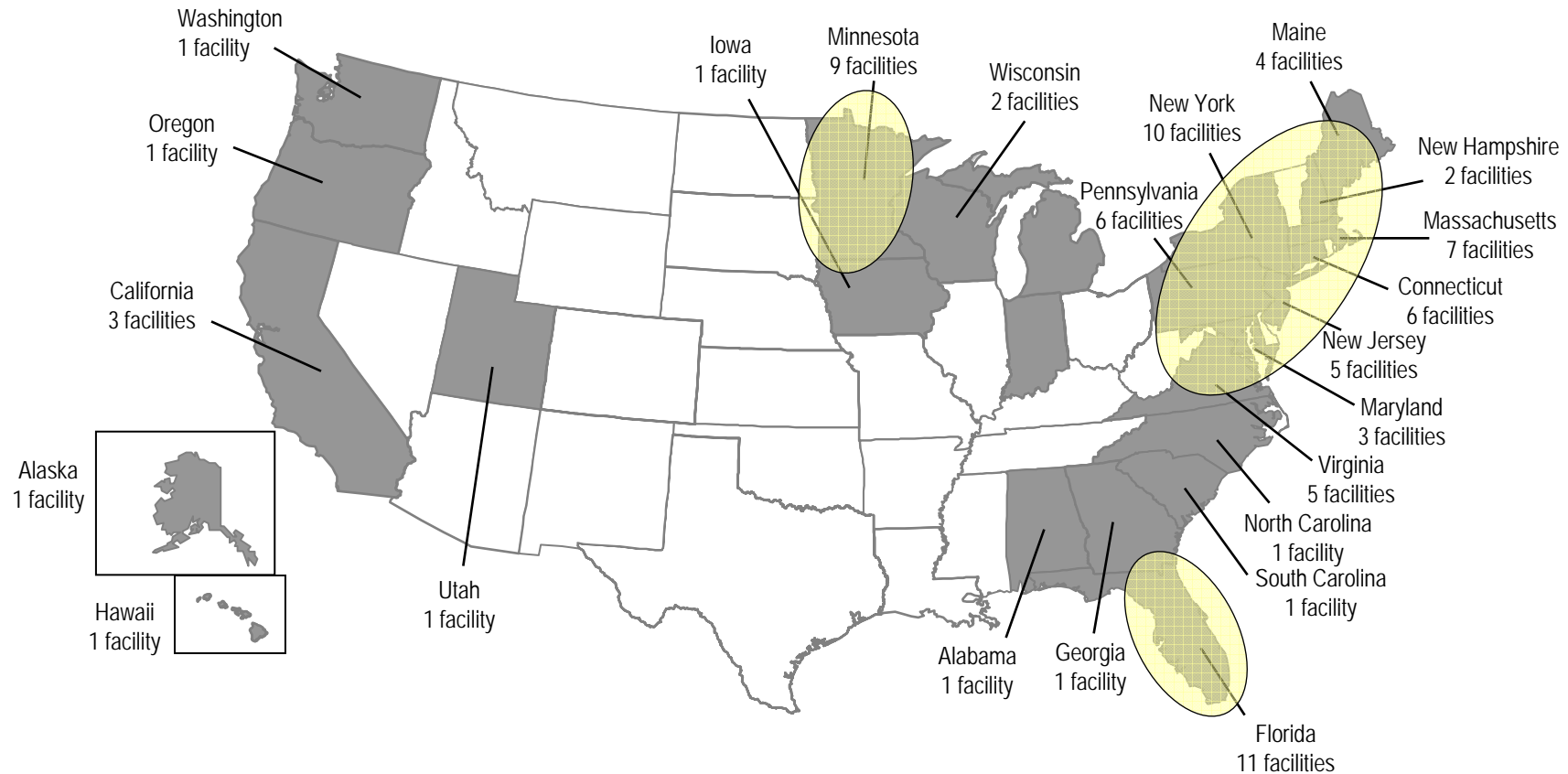
Facility	Description	Upgrades/expansions	Equipment purchase procedures
Olmsted Waste-to-Energy Facility, Rochester, MN	See appendix C	They will start an expansion project in order to double the size of the plant. A bidding process will start by the end of 2007-beginning of 2008.	Contact John Helmers, Plant Manager and Project Leader for the expansion, +1 507 328 7070 for discussions on how to participate in the bidding process.
New Hanover County – Wastec, Wilmington, NC	See appendix C	No upgrades or expansions planned at the moment, but it might change in the near future depending on 2008 funding.	Contact the Plant Manager Al Canady, +1 910 798 4435 for information on future needs and opportunities.
Wasatch Integrated Waste Management District, Layton, UT	See appendix C	No upgrades or expansions planned at the moment, but it might change in the near future depending on next year funding.	Contact Plant Manager John Watson, +1 801 614 5603, for information about future needs.
Pope/Douglas Solid Waste Management, Alexandria, MN	See appendix C	They are currently expanding. A new combustor, boiler and air pollution control system will be installed during next year. They are finalizing the bidding process and are basically set on which technologies and vendors to use.	Contact the Plant Manager Peter Olmscheid, +1 320 763 9340, to discuss future needs.



A comprehensive list of current upgrades and equipment purchase procedures is published in the appendix

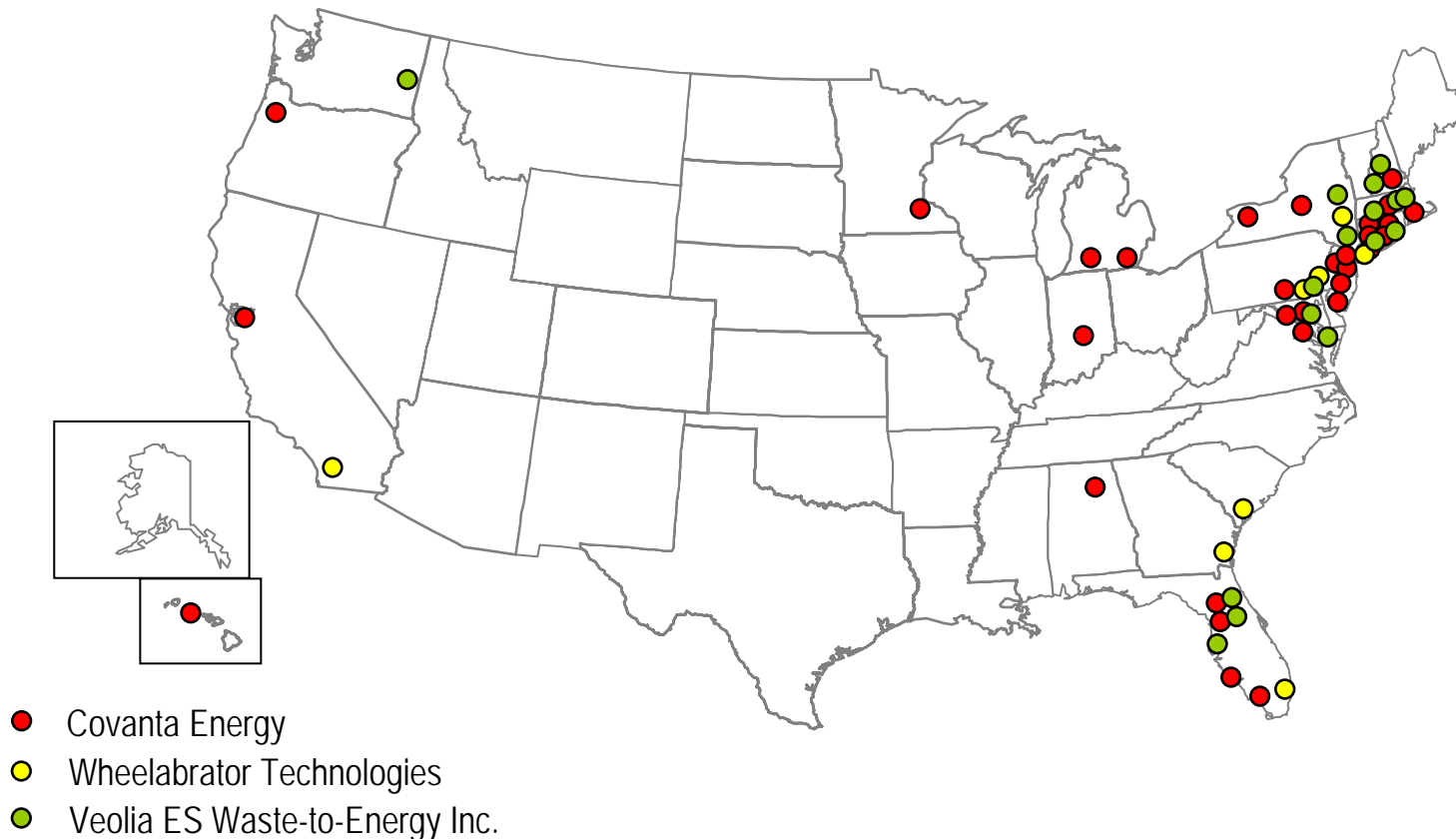
# THE NORTHEAST STATES, FLORIDA AND MINNESOTA OFFER THE MOST PROMISING BUSINESS OPPORTUNITIES

- More than 70% of all the waste-to-energy facilities are located in these states



## A KEY TO SUCCESS ON THE U.S. MARKET IS STRONG RELATIONSHIPS WITH COVANTA, WHEELABRATOR AND VEOLIA

- Together they operate 55 out of 87 plants, mainly in the Northeast states and Florida





## IT IS AN ADVANTAGE TO BE PRESENT IN THE U.S.

### - Either through a partner or by establishing an own entity

- Interviews show that customers prefer to purchase equipment from companies they have established relationships with
- You need to understand the specific conditions on the U.S. market
- Exhibitions, conferences and other industry events are good opportunities to meet with key people from the industry
- Evaluate potential partners carefully, don't go for "first available"

*"It is important to be established in the U.S. You have to participate in exhibitions, be visible and build networks. My advice is also to find a reliable American partner."*

Anders Rydåker,  
District Energy St. Paul

*"To be successful on the U.S. market I think you have to have an American partner. The waste-to-energy industry is conservative and you have to know the culture of the industry. To say 'this is the way we do it in Europe' is not a very successful strategy."*

Ulf Hagström, Ecomb AB



## EVEN IF THE WTE MARKET IS TURNING AROUND IN THE U.S. THERE ARE SOME ENTRY BARRIERS ONE SHOULD BE AWARE OF

- The waste-to-energy market in the U.S. has not been very favorable the last 15 years, since the number of facilities steadily have decreased
- There is still a degree of public and political resistance in the U.S. towards waste-to-energy
- It is difficult to sell from Sweden. You should have representation in the U.S. which few Swedish waste-to-energy companies do
- The current low value of the US dollar is negative for Swedish exporters

*"There is of course potential on the U.S. market, there are a lot of people looking into alternative energy solutions right now. But we feel that the political interest still isn't there"*

Anders Södergren, ÅF Consulting

*"There are not many Swedish waste-to-energy companies present in the U.S. that I know of. I think it is difficult to sell and deliver equipment from Sweden."*

Anders Rydåker, District Energy St. Paul, Minnesota

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## THE WASTE-TO-ENERGY INDUSTRY IN THE U.S. IS MAINLY DOMINATED BY A FEW LARGE COMPANIES\* 1(3)

### Martin Gmbh

- The leading furnace supplier in the U.S. They have a technology license agreement with Covanta, meaning that they supply them with all their stoker grate and air pollution equipment
- The company is based in Germany

[www.martingmbh.de](http://www.martingmbh.de)

### Von Roll Inova

- The second largest furnace supplier in the U.S. They have technology license agreement with Wheelabrator, meaning that they supply them with all their furnaces, boilers and air pollution equipment
- The company is based in Switzerland

[www.vonrollinova.ch](http://www.vonrollinova.ch)

### Foster Wheeler

- Operates through two business groups: The Engineering & Construction group and the Global Power Group. The latter makes steam-generating units and related equipment for power and industrial plants, including fluidized-bed and conventional boilers
- The company is based in Clinton, NJ

[www.fwc.com](http://www.fwc.com)

### Fisia Babcock Environment GmbH

- Specialized in waste treatment, flue gas cleaning, mechanical biological waste treatment and solar energy recovery
- The company is based in Germany

[www.fisia-babcock.com](http://www.fisia-babcock.com)

\* The selection has mainly been done through interviews with The Integrated Waste Services Association (IWSA) and The Waste-to-Energy Research and Technology Council (WTERT)

## THE WASTE-TO-ENERGY INDUSTRY IN THE U.S. IS MAINLY DOMINATED BY A FEW LARGE COMPANIES 2(3)

### Babcock Power, Inc.

- Specialized in engineering, manufacturing, construction, and aftermarket products and services for heat exchangers, HRSGs, environmental systems, and steam generators
  - The company is based in Danvers, MA
- [www.babcockpower.com](http://www.babcockpower.com)

### Dvirka & Bartilucci Consulting Engineers

- An engineering consulting specialized in planning, investigation, feasibility study, design and construction management. Some of the expertise areas are solid waste management, brown field assessment and air quality studies and emissions permitting
  - The company is based in Woodbury, NY
- [www.dvirkaandbartilucci.com](http://www.dvirkaandbartilucci.com)

### Jansen Combustion & Boiler Technologies Inc.

- Specialized in combustion and industrial boiler technology. They provide full-service process and design engineering, equipment procurement, construction capabilities, field services, and maintenance support
  - The company is based in Kirkland, WA
- [www.jansenboiler.com](http://www.jansenboiler.com)

### HDR, Inc.

- One of the leading architectural, engineering and consulting firm working with waste reduction, recycling, material as well as energy recovery and residual disposal. They are also specialized in waste-to-energy facility design
  - The company is based in Omaha, NE
- [www.hdrinc.com](http://www.hdrinc.com)



## THE WASTE-TO-ENERGY INDUSTRY IN THE U.S. IS MAINLY DOMINATED BY A FEW LARGE COMPANIES 3(3)

### Malcolm Pirnie

- Specialized in environmental management and restoration projects, including solid- and hazardous waste management. Services include planning and feasibility studies, pollution control designs, construction observation, and facility management

- The company is based in White Plains, NY

[www.pirnie.com](http://www.pirnie.com)

### EMCO Chemical Distributors Inc.

- Provides a number of waste services such as feasibility studies, insurance and financial advising, operations, training and safety and advising regarding permits and authorizations

- The company is based in North Chicago, IL

[www.emcochem.com](http://www.emcochem.com)

### Joule' Industrial Contracting

- An industrial contractor providing commercial, industrial, and technical personnel to clients on a temporary or project basis. Some of the areas they are specialized in are plant relocations and retrofits and major maintenance projects

- The company is based in Edison, NJ

[www.jouleindustrialcontractors.com](http://www.jouleindustrialcontractors.com)

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  - Customers and procurement process
  - Competition
  - **Summary WTE**
  - Sammanfattning (på svenska)
- Conclusions and recommendations
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## SUMMARY WASTE-TO-ENERGY

- Even if the last 15 years have been tough for the waste-to-energy industry in the U.S., there are now indications of an increased interest. The main reasons are:
  - Increased electricity price makes waste-to-energy production more profitable. Higher fuel prices also increase costs for transportation of waste to landfills
  - There are important state and regional incentives and regulations in place that are favorable to waste-to-energy production
- There are also factors that make the market challenging:
  - The number of waste-to-energy facilities have continuously decreased the last 15 years and there are currently no new facilities being built
  - There is still a degree of public and political resistance in the U.S. towards waste-to-energy
- It is also to be noted that U.S. companies and plant managers on a general level express great interest in European companies and solutions. Those with specific knowledge of the Swedish WTE industry all rate it very highly.

**The waste-to-energy industry in the U.S. shows signs of positive development  
but there are still some hurdles to overcome**

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## SAMMANFATTNING AVFALLSHANTERING MED ENERGIUTVINNING

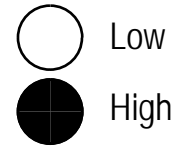
- Studien visar att även om de senaste 15 åren har varit tuffa för branschen som helhet, så finns det nu indikationer på ett ökat intresse för avfallsförbränning. Huvudorsakerna är:
  - Ökat pris för elektricitet gör energiutvinning från avfallsförbränning mer lönsam. Högre bränslepriser gör det också dyrare att transportera avfall till deponier
  - Det finns flera viktiga incentiv på delstatlig och regional nivå som gör avfallsförbränning med energiutvinning mer fördelaktigt
- Men det finns också ett antal utmaningar för branschen:
  - Antalet anläggningar för avfallsförbränning har minskat kontinuerligt de senaste 15 åren och det byggs för tillfället inga nya anläggningar
  - Det finns fortfarande ett visst politiskt och allmänt motstånd i USA mot avfallsförbränning
- Det är även intressant att notera att många amerikanska företag och anläggningsansvariga är positivt inställda till europeiska företag. I de fall där man specifikt känner till vad Sverige gör inom området är man överlag mycket positivt inställd till svenska företag.




**Avfallsförbränning med energiutvinning uppvisar som bransch för tillfället en positiv utveckling, men det finns fortfarande hinder att överkomma**

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## CONCLUSIONS WASTE-TO-ENERGY



Industry sector	Key observations	Attractiveness
• Furnaces / boilers	<ul style="list-style-type: none"> <li>• U.S. market dominated by a few large international players</li> <li>• There are no large Swedish manufacturers</li> <li>• Opportunities exist within the component side</li> </ul>	
• Consulting	<ul style="list-style-type: none"> <li>• Swedish companies have cutting edge knowledge</li> <li>• U.S. market dominated by domestic companies</li> <li>• Swedish consulting companies currently do not prioritize the U.S. market</li> </ul>	
• Air quality control systems / ash handling	<ul style="list-style-type: none"> <li>• Sweden is relatively strong within flue gas cleaning</li> <li>• There are Swedish companies active on the U.S. market</li> <li>• Emission regulations are not as strict in the U.S. as in Sweden, which is somewhat of a hurdle for market expansion</li> </ul>	

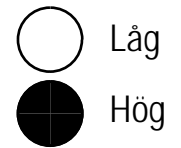
## RECOMMENDATIONS WASTE-TO-ENERGY




- ➔ Even if there are currently no new waste-to-energy facilities being built in the U.S., but there are opportunities for Swedish companies within expansions and upgrades of existing facilities
- ➔ Equipment is often purchased through a tender process but personal contacts are also very important. Therefore it is important for Swedish equipment suppliers to be known to plant managers and technology consultants making equipment decisions
- ➔ A key to success for Swedish companies is to develop good relations with Covanta, Wheelabrator and Veolia since they operate 63% of all the facilities in the U.S.
- ➔ Swedish companies should focus their sales efforts on New York, Minnesota and Florida since they offer the most promising business opportunities
- ➔ There is an advantage for Swedish companies to be present in the U.S. either through a partner or by establishing an own entity

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# SLUTSATSER AVFALLSFÖRBRÄNNING MED ENERGIUTVINNING



Bransch	Nyckelobservationer	Marknadspotential
<ul style="list-style-type: none"> <li>• Fluidiserade bäddar / roasters</li> </ul>	<ul style="list-style-type: none"> <li>• USA-marknaden domineras av ett fåtal stora internationella aktörer</li> <li>• Det finns inga stora svenska tillverkare</li> <li>• Affärsmöjligheter finns på komponentsidan</li> </ul>	
<ul style="list-style-type: none"> <li>• Konsultföretag</li> </ul>	<ul style="list-style-type: none"> <li>• Svenska företag har ledande kunskaper</li> <li>• USA-marknaden domineras av inhemska aktörer</li> <li>• Merparten av de svenska företagen prioriterar för tillfället inte USA-marknaden</li> </ul>	
<ul style="list-style-type: none"> <li>• Rökgasrening / hantering av restavfall</li> </ul>	<ul style="list-style-type: none"> <li>• Sverige är relativt starka inom rökgasrening</li> <li>• Det finns svenska företag aktiva på USA-marknaden</li> <li>• Utsläppsregleringar är inte lika strikta i USA som i Sverige. Med strängare regler hade svenska produkter troligtvis varit ännu mer attraktiva</li> </ul>	

## REKOMMENDATIONER AVFALLSHANTERING MED ENERGIUTVINNING

- ➔ Studien visar att även om det för tillfället inte byggs några nya anläggningar för avfallshantering med energiutvinning, så finns det affärsmöjligheter inom utbyggnader och uppgraderingar av befintliga anläggningar
- ➔ Utrustning köps ofta genom en upphandlingsprocess. Men det är också viktigt att ha bra personliga relationer med personer ansvariga för utbyggnader och uppgraderingar
- ➔ Ett sätt att komma in på marknaden är att närma sig och utveckla goda relationer med Covanta, Wheelabrator och Veolia. De driver inte mindre än 63% av alla anläggningar i USA
- ➔ Svenska företag bör huvudsakligen fokusera sitt försäljningsarbete till de nordöstra delstaterna, Minnesota och Florida, eftersom de flesta affärsmöjligheter finns lokaliserade här
- ➔ Det är en fördel för svenska företag att finnas etablerade på plats i USA, antingen genom ett eget företag eller genom en partner



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## LIST OF INTERVIEWED PEOPLE 1(4)

Company/Organization	Contact	Title
ÅF Consulting	Lars Fritz	Head of Waste management & landfill
ÅF Process	Anders Södergren	Vice President
Ames Municipal Electric Utility, Ames, IA	Edie Schmidt	Procurement Specialist
Avfall Sverige	Inge Johansson	Responsible for the WTE section
Borlänge Energi	Ronny Arnberg	Head of International Projects
Columbia University, Earth Engineering Center	Werner Sunk	Research Engineer
Commerce Refuse-to-Energy Facility, Los Angeles, CA	Matt Eaton	Supervising Engineer
Covanta Energy	Paula Soos	Director, Government Relations
District Energy St. Paul	Anders Rydåker	President
Earth Engineering Center, The Fu Foundation, School of Engineering and Applied Science	Priscilla Ulloa	Master of Science Candidate



## LIST OF INTERVIEWED PEOPLE 2(4)

Company/Organization	Contact	Title
Earth Engineering Center; WTERT	Nickolas J. Themelis	Professor and Director
Ecomb AB	Ulf Högström	CEO
EPA, Region 6	Robert Snowbarger	Environmental Scientist
Götaverken Miljö	Lennart Gustavsson	CEO
Great River Energy: Elk River Station Waste-to-Energy, Elk River, MN	Wayne Hanson	Plant Manager
Greater Portland Resource Recovery Facility, Portland, ME	Kevin Trytek	Chief Engineer
Hampton – NASA Steam Plant, Hampton, VA	Bill Myers	Maintenance Manager
Hawkins, Delafield & Wood LLP	Eric Sapir	Attorney
Integrated Waste Services Association, IWSA	Ted Michaels	President
Martin GmbH	Ekkehart Gartner	Dipl. Ing.

## LIST OF INTERVIEWED PEOPLE 3(4)

Company/Organization	Contact	Title
New Hanover County – Wastec, Wilmington, NC	Al Canady	Plant Manager
Olmsted Waste-to-Energy Facility, Rochester, MN	John Helmers	Plant Manager
Opsis AB	Karl Kamme	Sales Manager North and South America
Oswego County Energy Recovery Facility, Fulton, NY	Frank Wisser	Plant Manager
Perham Resource Recovery Facility, Perham, MN	Brian Schmidt	Plant Manager
Polk County Solid Waste Resource Recovery Plant, Fosston, MN	Bill Wilson	Plant Manager
Pope/Douglas Solid Waste Management, Alexandria, MN	Peter Olmscheid	Plant Manager
Red Wing Resource Recovery Facility, Red Wing, MN	Jeff Huppert	Plant Manager
Sweco Viak	Bo Karlsson	CEO
SYSAV	Håkan Rylander	CEO

## LIST OF INTERVIEWED PEOPLE 4(4)

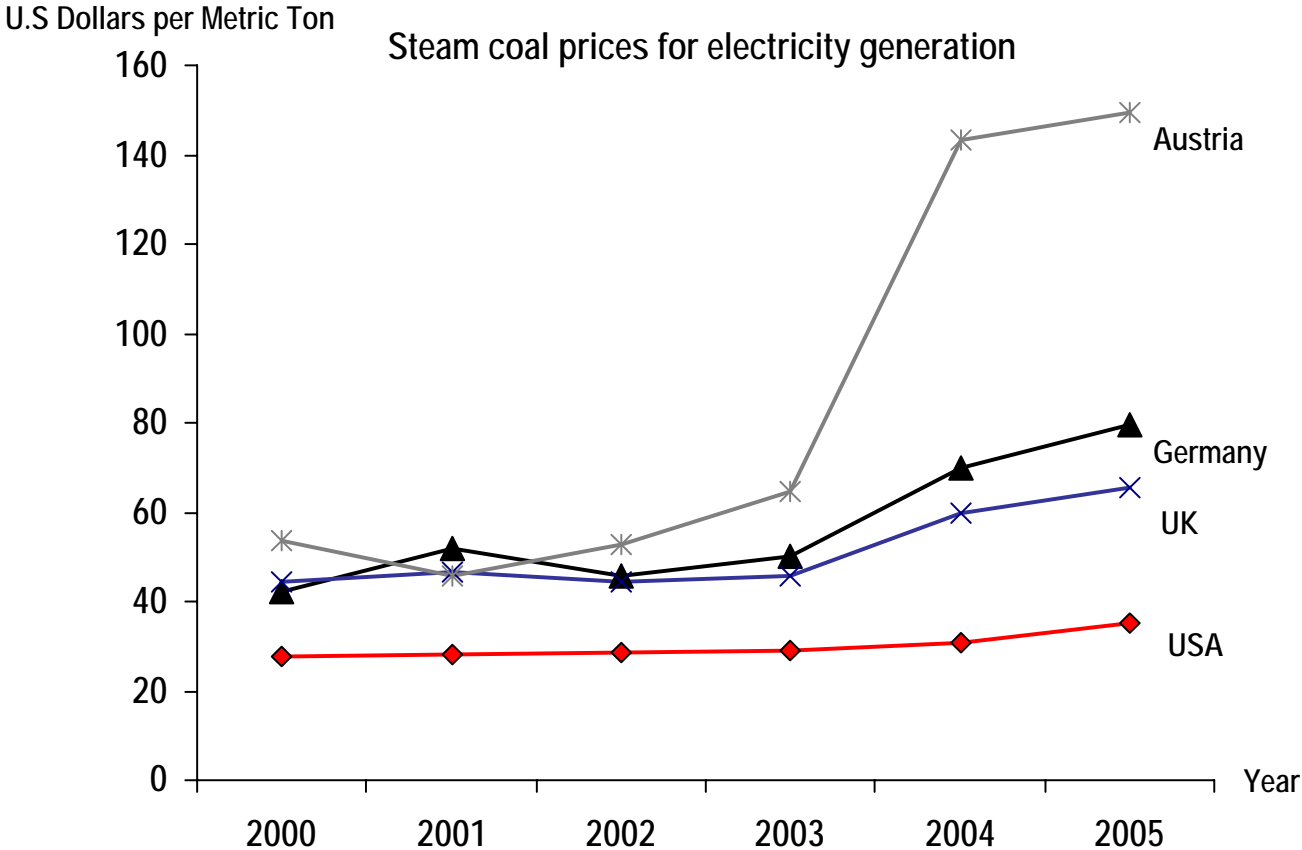
Company/Organization	Contact	Title
Wasatch Integrated Waste Management District, Layton, UT	John Watson	Wasatch Integrated Waste Management District, Layton, UT
Xcel Energy Minnesota	Jeff Hamley	Xcel Energy Minnesota

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# VERY LOW COAL PRICES MAKES IT DIFFICULT FOR RENEWABLE ENERGIES TO BE COST EFFICIENT IN THE U.S.

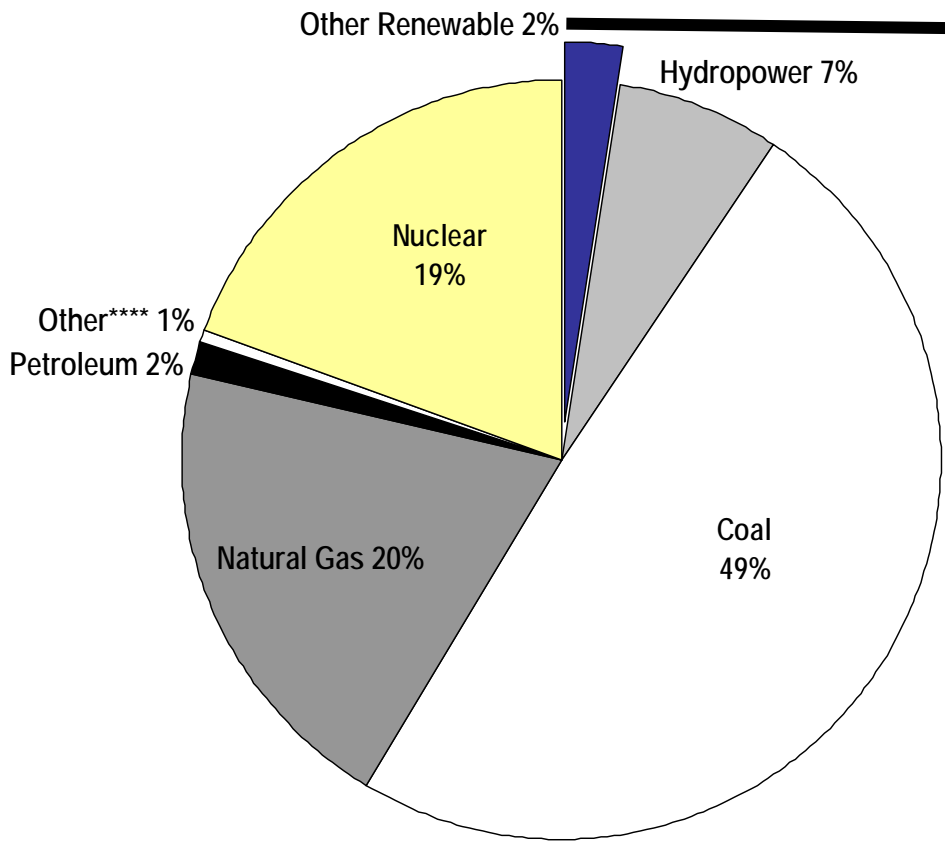


Coal is a very cheap energy source in the U.S. compared to most European countries

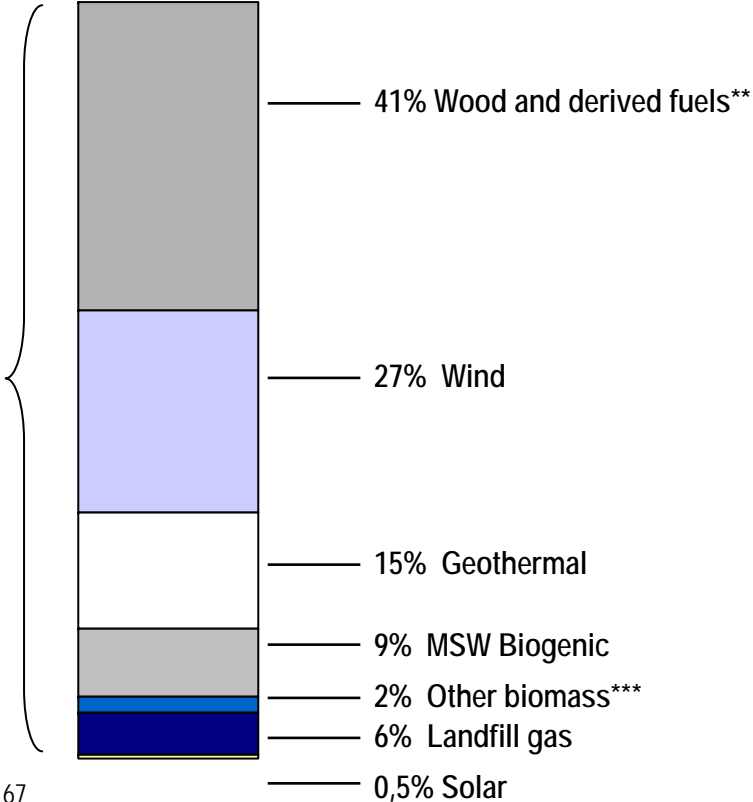
# ONLY 2% OF THE ELECTRICITY PRODUCED IN THE U.S. COME FROM RENEWABLE ENERGY SOURCES OTHER THAN HYDROPOWER

- Coal represent 49% of the total electricity generation in the U.S.

Electricity Net Generation in the U.S (2006)  
100% = 4053 Billion Kilowatt-hours



Electricity net Generation from Renewable Energy\* (2006)  
100% = 96,7 Billion Kilowatt-hours



\*\*\*\* Non-biogenic municipal solid waste, batteries, chemicals, hydrogen, pitch, purchased steam, sulfur, tire-derived fuels and miscellaneous technologies.

\* Excluding conventional hydroelectric power \*\* black liquor and wood/woodwaste solids and liquids

\*\*\* agricultural bioproducts, sludge waste and other biomass solids, liquids and gases

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# UPGRADES AND EXPANSIONS OF EXISTING WTE FACILITIES 1(5)

## - Private operators

Operator	Description	Upgrades/expansions	Equipment purchase procedures
Covanta	The largest waste-to-energy operator in the U.S. Currently operates 31 waste-to-energy facilities. The headquarter is in Fairfield, NY.	They perform continuous expansions and upgrades of existing facilities. They have a technology license agreement with Martin Gmbh which means they supply them with all the stoker grate equipment and air pollution equipment.	Contact Ted Hoefler, VP Operations or Scott Whitney, VP Business Development, +1 973 882 9000 for discussions on opportunities.
Wheelabrator	The second largest waste-to-energy operator in the U.S. Operates 16 waste-to-energy facilities. The headquarter is in Hampton, NH	Confidential regarding upgrades and expansions. They have a technology license agreement with VonRoll and use them for all equipment related to graders, boilers and air pollution control systems. For all other equipment, they are always looking for better technologies and encourage Swedish companies to contact them for discussions on opportunities.	Call +1 603 929 3000 and ask for David Raymond, VP of Engineering and Construction. They are open for discussions on opportunities and how to get on their bidding list.
Veolia ES Waste-to-Energy Inc.	The third largest waste-to-energy operator in the U.S. Operates 8 waste-to-energy facilities. The headquarter for Veolia ES Waste-to-Energy is in New York, NY	Confidential.	Inquiries are referred to the corporate office in New York, +1 212 947 5824.
Xcel Energy	Xcel owns and operates 3 facilities: Xcel Energy Red Wing Steam Plant in Red Wing, MN; Xcel Energy Wilmarth Plant in Mankato, MN and Xcel Energy La Crosse County Resource Recovery Facility in La Crosse, WI.	They are currently looking into boiler optimization techniques for all of their facilities.	They have suppliers they've worked with for a very long time, but they still use competitive bidding for all upgrades. Contact Jeff Harnly, Plant Manager at Xcel Energy in Minnesota, +1 651 385-5603 for more information on opportunities and how to get on their bidding list.



## UPGRADES AND EXPANSIONS OF EXISTING WTE FACILITIES 2(5)

### - Municipal facilities

Facility	Description	Upgrades/expansions	Equipment purchase procedures
Commerce Refuse-to-Energy Facility, Los Angeles, CA	See separate description in this appendix	They do routine maintenance, but no new expansions or upgrades at the moment.	Contact Matt Eaton, Supervising Engineer, +1 323 721 1278, ext. 4008 for information about opportunities and how to get on their bidding list.
Ames Municipal Electric Utility, Ames, IA	See separate description in this appendix	They do routine maintenance, but no new expansions or upgrades at the moment.	Contact Edie Schmidt, Procurement Specialist, +1 515 239 5183 or <a href="mailto:ESchmidt@city.ames.ia.us">ESchmidt@city.ames.ia.us</a> to receive a copy of their Vendor Application.
Olmsted Waste-to-Energy Facility, Rochester, MN	See separate description in this appendix	They will start an expansion project in order to double the size of the plant. A bidding process will start by the end of 2007-beginning of 2008.	Contact John Helmers, Plant Manager and Project Leader for the expansion, +1 507 328 7070 for discussions on how to participate in the bidding process.
Perham Resource Recovery Facility, Perham, MN	See separate description in this appendix	They are expanding their facility and adding one new boiler. They are however already set on technologies and vendors to use.	They have vendors they've worked with for a long time and they are satisfied with their products and services. Brian Schmidt, Plant Manager, is responsible for purchase decisions. He can be reached at +1 218 346 4404.



## UPGRADES AND EXPANSIONS OF EXISTING WTE FACILITIES 3(5)

### - Municipal facilities

Facility	Description	Upgrades/expansions	Equipment purchase procedures
Polk County Solid Waste Resource Recovery Plant, Fosston, MN	See separate description in this appendix	No upgrades or expansions at the moment.	Contact the Plant Manager Bill Wilson, +1 218 435 6501, to present your technology. They use competitive bidding for their upgrades.
Pope/Douglas Solid Waste Management, Alexandria, MN	See separate description in this appendix	They are currently expanding. A new combustor, boiler and air pollution control system will be installed during next year. They are finalizing the bidding process and are basically set on which technologies and vendors to use.	Contact the Plant Manager Peter Olmscheid, +1 320 763 9340, to discuss future needs.
Red Wing Resource Recovery Facility, Red Wing, MN	See separate description in this appendix	No upgrades or expansions at the moment.	Contact the Plant Manager Jeff Huppert, +1 651 385 3658 to discuss future needs and how to get on their bidding list.
Oswego County Energy Recovery Facility, Fulton, NY	See separate description in this appendix	They did a large upgrade 8 years ago and have nothing planned for the near future.	They Plant Manager, Frank Wisser, +1 315 591 9282, says he prefers if companies interested in becoming vendors send them a mail with information about products and reference customers. He thinks it's an advantage if you have an American partner compared to selling direct from Europe.



## UPGRADES AND EXPANSIONS OF EXISTING WTE FACILITIES 4(5)

### - Municipal facilities

Facility	Description	Upgrades/expansions	Equipment purchase procedures
New Hanover County – Wastec, Wilmington, NC	See separate description in this appendix	No upgrades or expansions planned at the moment, but it might change in the near future depending on 2008 funding.	Contact the Plant Manager Al Canady, +1 910 798 4435 for information on future needs and opportunities.
Hampton – NASA Steam Plant, Hampton, VA	See separate description in this appendix	The did a large upgrade last year and it will probably take a while before they do a new one.	They do currently not have a Plant Manager. The Maintenance Manager Bill Myers, +1 757 865 1914, is responsible for operations at the moment.
Harrisonburg Resource Recovery Facility, Harrisonburg, VA	See separate description in this appendix	No upgrades or expansions at the moment.	Contact Charlie Honecker +1 540 434 5928 for discussion on future opportunities.
Greater Portland Resource Recovery Facility, Portland, ME	See separate description in this appendix	No upgrades or expansions at the moment.	Contact the Chief Engineer Kevin Trytek, +1 207 773 6465, for information about how to get on their bidding list.
Great River Energy: Elk River Station Waste-to-Energy, Elk River, MN	See separate description in this appendix	No upgrades or expansions at the moment.	Contact the Plant Manager Wayne Hanson, + 1 763 441 3121, for information about future needs and how to get on their bidding list.



## UPGRADES AND EXPANSIONS OF EXISTING WTE FACILITIES 5(5)

### - Municipal facilities

Facility	Description	Upgrades/expansions	Equipment purchase procedures
Wasatch Integrated Waste Management District, Layton, UT	See separate description in this appendix	No upgrades or expansions planned at the moment, but it might change in the near future depending on next year funding.	Contact Plant Manager John Watson, +1 801 614 5603, for information about future needs.

## WASTE-TO-ENERGY FACILITIES IN THE U.S. 1(11)

### KEY TERMS:

- **Design capacity** – The rated capacity for each unit housed at a facility. The number of units at a facility followed by the capacity for each unit. The total daily design is also provided
- **Technology** – The furnace technology used at a facility
  - MBWW: Mass Burn, Water Wall furnace
  - MBRW: Mass Burn, Refractory Wall furnace
  - MCU: Modular Combustion Unit
  - RWW: Rotary Water Wall combustor
  - RRW: Rotary bed combustion chamber, Refractory Wall
  - RDF: Refuse-Derived Fuel facility that burns the RDF previously processed from trash
  - SSWW: Spreader Stoker, Water Wall furnace
- **Project startup** – The actual year of commercial startup
- **Owner** – The current owner of the facility



## WASTE-TO-ENERGY FACILITIES IN THE U.S. 2(11)

Facility Name	City	State	Design Capacity (Unit & Total TPD)	Technology Type	Project Status/Startup Year	Owner
Eielson Airforce Base	North Pole	AK	5x2=10	RDF (co-fired in Coal Boiler)	1995	Eielson Airforce Base
Huntsville Solid Waste-to-Energy Facility	Huntsville	AL	2x345=690	MBWW	1990	City of Huntsville Solid Waste Disposal Authority
Commerce Refuse-to-Energy Facility	Commerce	CA	1x350=350	MBWW	1987	Commerce Refuse-to-Energy Authority
Southeast Resource Recovery Facility (SERRF)	Long Beach	CA	3x460=1380	MBWW	1988	City of Long Beach
Stanislaus County Resource Recovery Facility	Crows Landing	CA	2x400=800	MBWW	1989	Covanta Stanislaus, Inc.
Bristol Resource Recovery Facility	Bristol	CT	2x325=650	MBWW	1988	Covanta Bristol, Inc.
Mid-Connecticut Resource Recovery Facility	Hartford	CT	3x666.6=2000	RDF-SSWW	1987	Connecticut Resource Recovery Authority
Riley Energy Systems of Lisbon Connecticut Corp.	Lisbon	CT	2x250=500	MBWW	1995	Eastern Connecticut Resource Recovery Authority
Southeastern Connecticut Resource Recovery Facility	Preston	CT	2x344.5=689	MBWW	1991	Covanta Company of Southeastern Connecticut

## WASTE-TO-ENERGY FACILITIES IN THE U.S. 3(11)

Facility Name	City	State	Design Capacity (Unit & Total TPD)	Technology Type	Project Status/Startup Year	Owner
Wallingford Resource Recovery Facility	Wallingford	CT	3x140=420	MBRW	1989	Connecticut Resource Recovery Authority
Wheelabrator Bridgeport Company, L.P.	Bridgeport	CT	3x750=2250	MBWW	1988	Wheelabrator Technologies Inc.
Bay County Resource Recovery Center	Panama City	FL	2x250=500	RWW	1987	Bay County
Hillsborough County Resource Recovery Facility	Tampa	FL	2x600=1200	MBWW	1987	Hillsborough County
Lake County Resource Recovery Facility	Okahumpka	FL	2x264=528	MBWW	1991	Covanta Lake, Inc.
Lee County Resource Recovery Facility	Fort Myers	FL	2x600; 1x636=1836	MBWW	1994	Lee County
McKay Bay Refuse-to-Energy Facility	Tampa	FL	4x250=1000	MBWW	1985	City of Tampa
Miami-Dade County Resource Recovery Facility	Miami	FL	4x648=2592	RDF - SSWW	1979	Miami-Dade County
North County Resource Recovery Facility	West Palm Beach	FL	2x900=1800	RDF - SSWW	1989	Solid Waste Authority of Palm Beach County

# WASTE-TO-ENERGY FACILITIES IN THE U.S. 4(11)

Facility Name	City	State	Design Capacity (Unit & Total TPD)	Technology Type	Project Status/Startup Year	Owner
Pasco County Resource Recovery Facility	Spring Hill	FL	3x350=1050	MBWW	1991	Pasco County
Pinellas County Resource Recovery Facility	St. Petersburg	FL	3x1000=3000	MBWW	1983	Pinellas County
Wheelabrator North Broward, Inc.	Pompano Beach	FL	3x750=2250	MBWW	1991	Wheelabrator Technologies Inc.
Wheelabrator South Broward, Inc.	Ft. Lauderdale	FL	3x750=2250	MBWW	1991	Wheelabrator Technologies Inc.
Montenay Savannah Operations, Inc.	Savannah	GA	2x250=500	MBWW	1987	Montenay Savannah Limited Partnership
Honolulu Resource Recovery Venture—HPOWER	Honolulu	HI	2x925.5=1851	RDF-SSWW	1990	City & County of Honolulu
Ames Municipal Electric Utility	Ames	IA	1x175=175	RDF-Pulverized Coal WW	1975	City of Ames
Indianapolis Resource Recovery Facility	Indianapolis	IN	3x787.3=2362	MBWW	1988	Marion County
Haverhill Resource Recovery Facility	Haverhill	MA	2x825=1650	MBWW	1989	City of Haverhill



## WASTE-TO-ENERGY FACILITIES IN THE U.S. 5(11)

Facility Name	City	State	Design Capacity (Unit & Total TPD)	Technology Type	Project Status/Startup Year	Owner
Pioneer Valley Resource Recovery Facility	Agawam	MA	3x136=408 (design); 3x120=360 (permit)	MBRW	1988	eco/Springfield L.L.C.
Pittsfield Resource Recovery Facility	Pittsfield	MA	3x120=360 (design); 3x80=240 (actual practice)	MBRW	1981	eco/Pittsfield , L.L.C.
SEMASS Resource Recovery Facility	West Wareham	MA	3x900=2700	RDF-SSWW	1989	Covanta SEMASS, L.P.
Wheelabrator Millbury Inc.	Millbury	MA	2x750=1500	MBWW	1987	CIT
Wheelabrator North Andover Inc.	North Andover	MA	2x750=1500	MBWW	1985	Wheelabrator North Andover Inc.
Wheelabrator Saugus, J.V.	Saugus	MA	2x750=1500	MBWW	1975	Wheelabrator Saugus, J.V.
Baltimore Refuse Energy Systems Company (BRESKO)	Baltimore	MD	3x750=2250	MBWW	1985	John Hancock Life Insurance Company
Harford Waste-to-Energy Facility	Joppa	MD	4x90=360	MCU	1988	Northeast Maryland Waste Disposal Authority
Montgomery County Resource Recovery Facility	Dickerson	MD	3x600=1800	MBWW	1995	Northeast Maryland Waste Disposal Authority

# WASTE-TO-ENERGY FACILITIES IN THE U.S. 6(11)

Facility Name	City	State	Design Capacity (Unit & Total TPD)	Technology Type	Project Status/Startup Year	Owner
Greater Portland Resource Recovery Facility	Portland	ME	2x275=550	MBWW	1988	ecomaine
Maine Energy Recovery Company	Biddeford	ME	2x300=600	RDF - SSWW	1987	Casella Waste Systems
Mid-Maine Waste Action Corporation	Auburn	ME	2x100=200	RWW	1992	Mid-Maine Waste Action Corporation
Penobscot Energy Recovery Corp.	Orrington	ME	2x750=1500	RDF	1988	USA Energy Group LLC; PERC Holdings LLC; Communities
Greater Detroit Resource Recovery Facility	Detroit	MI	3x944=2832	RDF-SSWW	1991	City of Detroit, MI (GDRRA)
Jackson County Resource Recovery Facility	Jackson	MI	2x100=200	MBWW	1987	Jackson County
Kent County Waste-to-Energy Facility	Grand Rapids	MI	2x312.5=625	MBWW	1990	Kent County
Great River Energy - Elk River Station	Elk River	MN	2x250; 1x500=1000	RDF - SSWW	1989	Great River Energy (Rural Electric Gen/Trans Coop)
Hennepin Energy Resource Co.	Minneapolis	MN	2x606=1212	MBWW	1989	Hennepin County

## WASTE-TO-ENERGY FACILITIES IN THE U.S. 7(11)

Facility Name	City	State	Design Capacity (Unit & Total TPD)	Technology Type	Project Status/Startup Year	Owner
Olmsted Waste-to-Energy Facility	Rochester	MN	2x100=200	MBWW	1987	Olmsted County
Perham Resource Recovery Facility	Perham	MN	2x58=116	MCU	1986; 2002 (upgrade)	City of Perham
Polk County Solid Waste Resource Recovery Plant	Fosston	MN	2x40=80	MCU	1988	Polk County
Pope/Douglas Solid Waste Management	Alexandria	MN	2x40=80	MCU	1987	Pope/Douglas Solid Waste Management Board
Red Wing Resource Recovery Facility	Red Wing	MN	2x45=90	MCU	1983	City of Red Wing
Xcel Energy - Red Wing Steam Plant	Red Wing	MN	2x360=720	RDF - SSWW	1988	Xcel Energy
Xcel Energy-Wilmarth Plant	Mankato	MN	2x360=720	RDF - SSWW	1987	Xcel Energy
New Hanover County-Wastec	Wilmington	NC	2x100; 1x300= 500	MBWW	1984 (units 1&2); 1991 (unit 3)	New Hanover County
Wheelabrator Claremont Co, L.P.	Claremont	NH	2x100=200	MBWW	1987	Wheelabrator Claremont, L.P.



## WASTE-TO-ENERGY FACILITIES IN THE U.S. 8(11)

Facility Name	City	State	Design Capacity (Unit & Total TPD)	Technology Type	Project Status/Startup Year	Owner
Wheelabrator Concord Company, L.P.	Penacook	NH	2x288=575	MBWW	1989	Wheelabrator Concord, L.P.
Camden Resource Recovery Facility	Camden	NJ	3x350=1050	MBWW	1991	Camden County Energy Recovery Associates
Essex County Resource Recovery Facility	Newark	NJ	3x933=2800	MBWW	1990	Covanta Energy Corporation
Union County Resource Recovery Facility	Rahway	NJ	3x480=1440	MBWW	1994	Union County Utility Authority
Warren Energy Resource Company	Oxford Township	NJ	2x200=400	MBWW	1988	Covanta Warren Energy Resource Co, L.P.
Wheelabrator Gloucester Company, L.P.	Westville	NJ	2x287=575	MBWW	1990	Wheelabrator Gloucester Inc.
Babylon Resource Recovery Facility	Babylon	NY	2x375=750	MBWW	1989	Covanta Babylon, Inc.
Dutchess County Resource Recovery Facility	Poughkeepsie	NY	2x225=450	RWW	1988	Dutchess County Resource Recovery Agency
Hempstead Resource Recovery Facility	Westbury	NY	3x890.3=2671	MBWW	1989	Town of Hempstead



## WASTE-TO-ENERGY FACILITIES IN THE U.S. 9(11)

Facility Name	City	State	Design Capacity (Unit & Total TPD)	Technology Type	Project Status/Startup Year	Owner
Huntington Resource Recovery Facility	East Northport	NY	3x250=750	MBWW	1991	Covanta Huntington, Inc.
MacArthur Waste-to-Energy Facility	Ronkonkoma	NY	2x243=486	RWW	1989	Islip Resource Recovery Agency
Niagara Falls Resource Recovery Facility	Niagara Falls	NY	2x1100=2200	MBWW	1996	Covanta Energy Corporation
Onondaga County Resource Recovery Facility	Jamesville	NY	3x330=990	MBWW	1995	Onondaga County Resource Recovery Agency
Oswego County Energy Recovery Facility	Fulton	NY	4x50=200	MCU	1985	Oswego County
Wheelabrator Hudson Falls Inc.	Hudson Falls	NY	2x220=440	MBWW	1991	Warren & Washington Counties Industrial Development Agency
Wheelabrator Westchester Company, L.P.	Peekskill	NY	3x750=2250	MBWW	1984	Wheelabrator Technologies Inc.
Marion County Solid Waste-to-Energy Facility	Brooks	OR	2x275=550	MBWW	1986	Covanta Marion Inc.
Delaware Valley Resource Recovery Facility	Chester	PA	6x448=2688	RWW	1992	Covanta Delaware Valley, L.P.

# WASTE-TO-ENERGY FACILITIES IN THE U.S. 10(11)

Facility Name	City	State	Design Capacity (Unit & Total TPD)	Technology Type	Project Status/Startup Year	Owner
Harrisburg Resource Recovery Facility	Harrisburg	PA	3x267=801	MBWW	2006 (retrofit completion; startup)	City of Harrisburg
Lancaster County Resource Recovery Facility	Bainbridge	PA	3x600=1800	MBWW	1991	Lancaster County Solid Waste Management Authority
Montenay Energy Resources of Montgomery County, Inc.	Conshohocken	PA	2x600=1200	MBWW	1992	Montenay Montgomery Limited Partnership
Wheelabrator Falls Inc.	Morrisville	PA	2x750=1500	MBWW	1994	Wheelabrator Falls Inc.
York Resource Recovery Center/Montenay York	York	PA	3x448=1344	MBWW	1989	York County Solid Waste Authority
Montenay Charleston Resource Recovery Inc.	Charleston	SC	2x300=600	MBWW	1989	AT&T
Wasatch Integrated Waste Management District	Layton	UT	2x200=400	MBRW	1986	Wasatch Integrated Waste Management District
Alexandria/Arlington Resource Recovery Facility	Alexandria	VA	3x325=975	MBWW	1988	Covanta Arlington/Alexandria, Inc.
Hampton-NASA Steam Plant	Hampton	VA	2x120=240	MBWW	1980	NASA & City of Hampton



## WASTE-TO-ENERGY FACILITIES IN THE U.S. 11(11)

Facility Name	City	State	Design Capacity (Unit & Total TPD)	Technology Type	Project Status/Startup Year	Owner
Harrisonburg Resource Recovery Facility	Harrisonburg	VA	2x100=200	MBRW	1982	City of Harrisonburg
I-95 Energy-Resource Recovery Facility (Fairfax)	Lorton	VA	4x750=3000	MBWW	1990	Covanta Fairfax, Inc.
Southeastern Public Service Authority of Virginia	Portsmouth	VA	4x500=2000	RDF-SSWW	1988	Southeastern Public Service Authority
Spokane Regional Solid Waste Disposal Facility	Spokane	WA	2x400=800	MBWW	1991	City of Spokane
Barron County Waste-to-Energy & Recycling Facility	Almena	WI	2x50=100	MCU	1986	Barron County
Xcel Energy French Island Generating Plant	LaCrosse	WI	2x200=400	RDF - SSWW (co-fired with wood waste)	1987	Xcel Energy

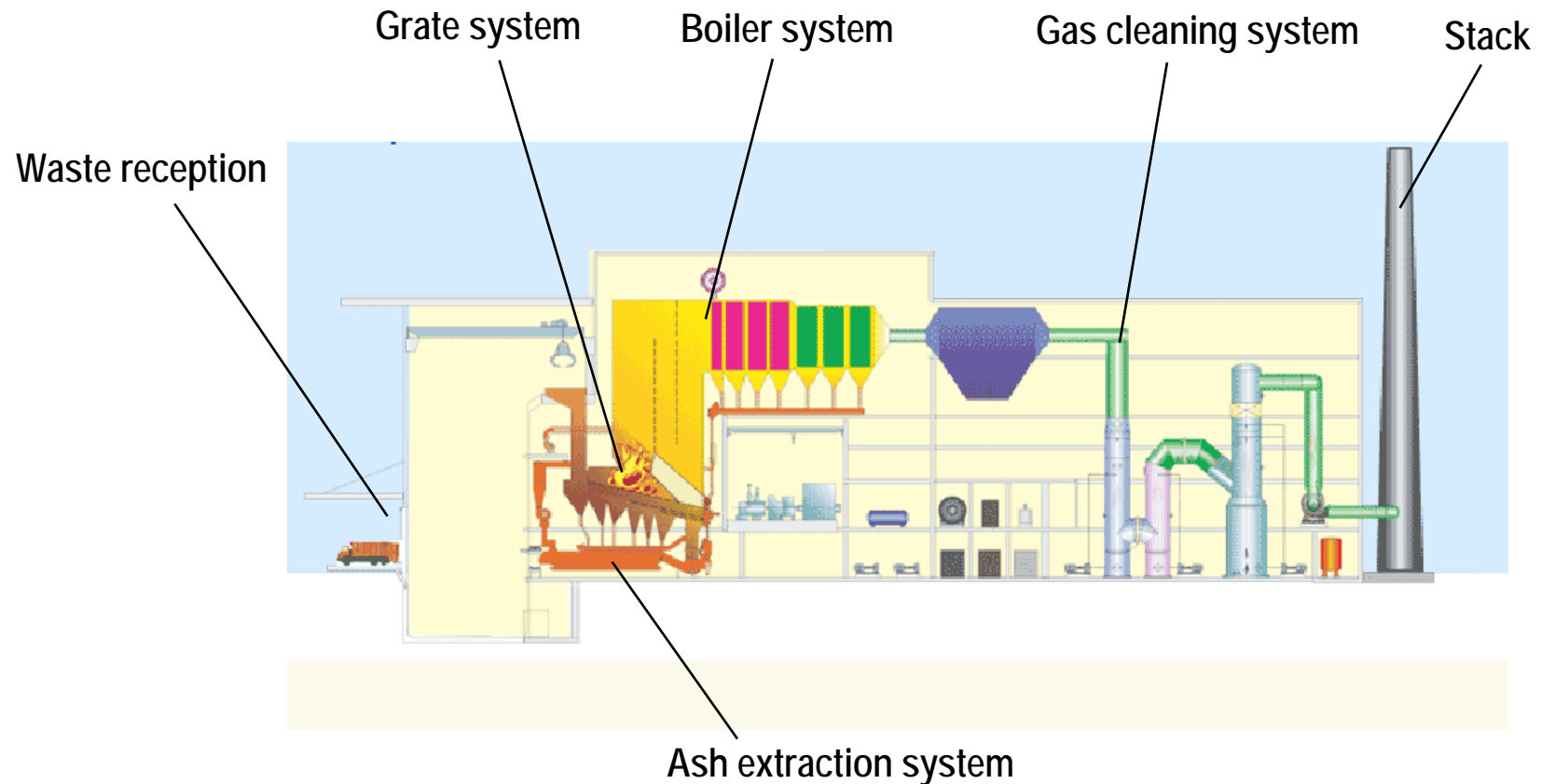
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## THERE ARE THREE MAIN COMPONENTS IN A WTE FACILITIES

- The grate system, the boiler system and the gas cleaning system



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## IT IS IMPORTANT TO CONSIDER LEGAL MATTERS WHEN DOING BUSINESS ON THE U.S. MARKET

Legal concerns are common among Swedish companies considering the U.S. market. However, these are risks that any company active on the U.S. market are exposed to and that can be accounted for. Nevertheless, it is important to address legal matters in an appropriate way

- ➡ Find a U.S. lawyer that know the industry well and can assist you in addressing necessary issues
- ➡ Establish a U.S. subsidiary will facilitate doing business with U.S. companies and can also limit liability for the Swedish aktiebolag
- ➡ Have a U.S. lawyer review contracts in order to make sure that protection is really protective of your company
- ➡ Get insurance that is adequate to cover the risk and project

More information is also available online [www.swedishtrade.se/usa](http://www.swedishtrade.se/usa) and by contacting the Swedish Trade Council in the U.S.

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## EXAMPLES OF U.S. VENTURE CAPITAL FIRMS INVESTING IN RENEWABLE ENERGY 1(2)

Company	Web address
3i	<a href="http://www.3i.com">www.3i.com</a>
Blue Hill Partners	<a href="http://www.bluehillpartners.com">www.bluehillpartners.com</a>
Chrysalix Energy	<a href="http://www.chrysalix.com">www.chrysalix.com</a>
Citigroup Venture Capital International	<a href="https://www.citigroupai.com">https://www.citigroupai.com</a>
Cleantech Group	<a href="http://www.cleantech.com">www.cleantech.com</a>
Enertech Capital	<a href="http://www.enertechcapital.com">www.enertechcapital.com</a>
Environmental Capital ECP	<a href="http://www.ecpcapital.com">www.ecpcapital.com</a>
Expansion Capital Partners	<a href="http://www.expansioncapital.com">www.expansioncapital.com</a>
Global Environmental Fund	<a href="http://www.globalenvironmentfund.com">www.globalenvironmentfund.com</a>

## EXAMPLES OF U.S. VENTURE CAPITAL FIRMS INVESTING IN RENEWABLE ENERGY 2(2)

Company	Web address
Kleiner Perkins Caufield & Byers	<a href="http://www.kpcb.com">www.kpcb.com</a>
Mohr Davidow Ventures	<a href="http://www.mdv.com">www.mdv.com</a>
Morgan Stanley	<a href="http://www.morganstanley.com">www.morganstanley.com</a>
NGEN Partners LLC	<a href="http://www.ngenpartners.com">www.ngenpartners.com</a>
Nth Power LLC	<a href="http://www.nthpower.com">www.nthpower.com</a>
Rockport Capital Partners	<a href="http://www.rockportcap.com">www.rockportcap.com</a>
Sequoia	<a href="http://www.sequoiacap.com/us">www.sequoiacap.com/us</a>
Silicon Valley Bank	<a href="http://www.svb.com">www.svb.com</a>
Technology Partners	<a href="http://www.technologypartners.com">www.technologypartners.com</a>
Vantage Point Venture Partners	<a href="http://www.vpvp.com">www.vpvp.com</a>



## EXAMPLES OF SWEDISH VENTURE CAPITAL FIRMS INVESTING IN RENEWABLE ENERGY

Company	Web address
Sustainable Technology Fund	<a href="http://www.stechfund.com">www.stechfund.com</a>
Borevind	<a href="http://www.borevind.se">www.borevind.se</a>
Industrifonden	<a href="http://www.industrifonden.se">www.industrifonden.se</a>
Provider Venture Partner	<a href="http://www.providerventure.com">www.providerventure.com</a>
Greencap Cleantech Venture Partner	<a href="http://www.dealflower.com">www.dealflower.com</a>