Wasatch Integrated Waste Management

Overview of Presentation

I. **WTE and the Industry**
- What is WTE?
- Waste Disposal
- Energy Generation
- Operating Facility Locations
- WTE History and Outlook in the US
- WTE Internationally

II. **WTE Facility Design and Operation**
- Current Technologies
- Inputs and Outputs
- Mass Burn Plant Cross-section
- APC Cross-section
- Future Technologies

III. **Environmental Attributes of WTE**
- Air Emissions
- Land Use
- Ash Management
- Recycling
- Renewable Energy
- Climate Change
  - EPA Decision Support Tool
  - Life Cycle Analysis

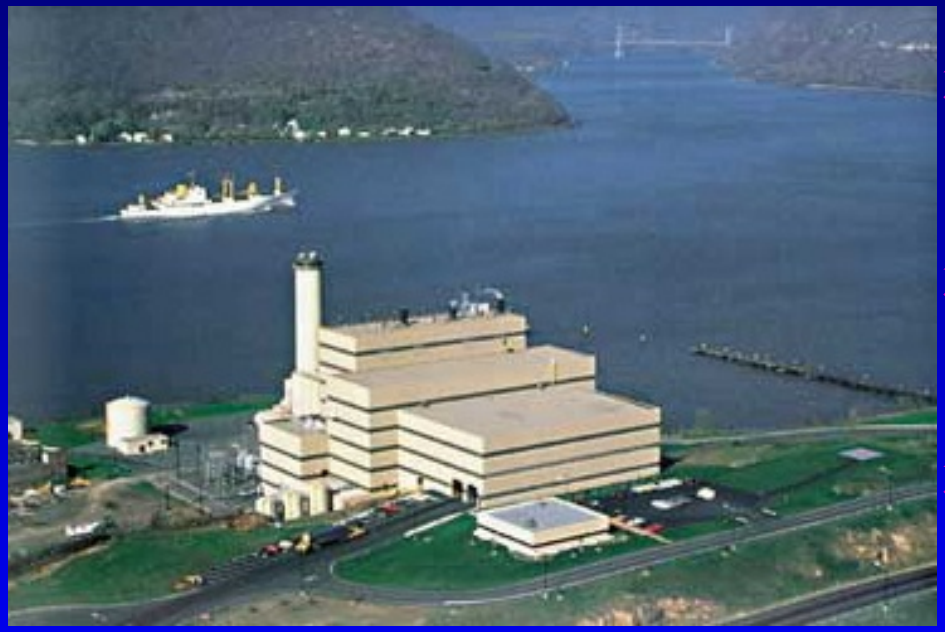
IV. **Summary**

What is WTE?

There are 89 WTE facilities in 27 states that:

- Combust MSW to reduce its volume
- Produce energy, usually as electricity
- Recover ferrous and sometimes non-ferrous metals for recycling

Trash Disposal by WTE

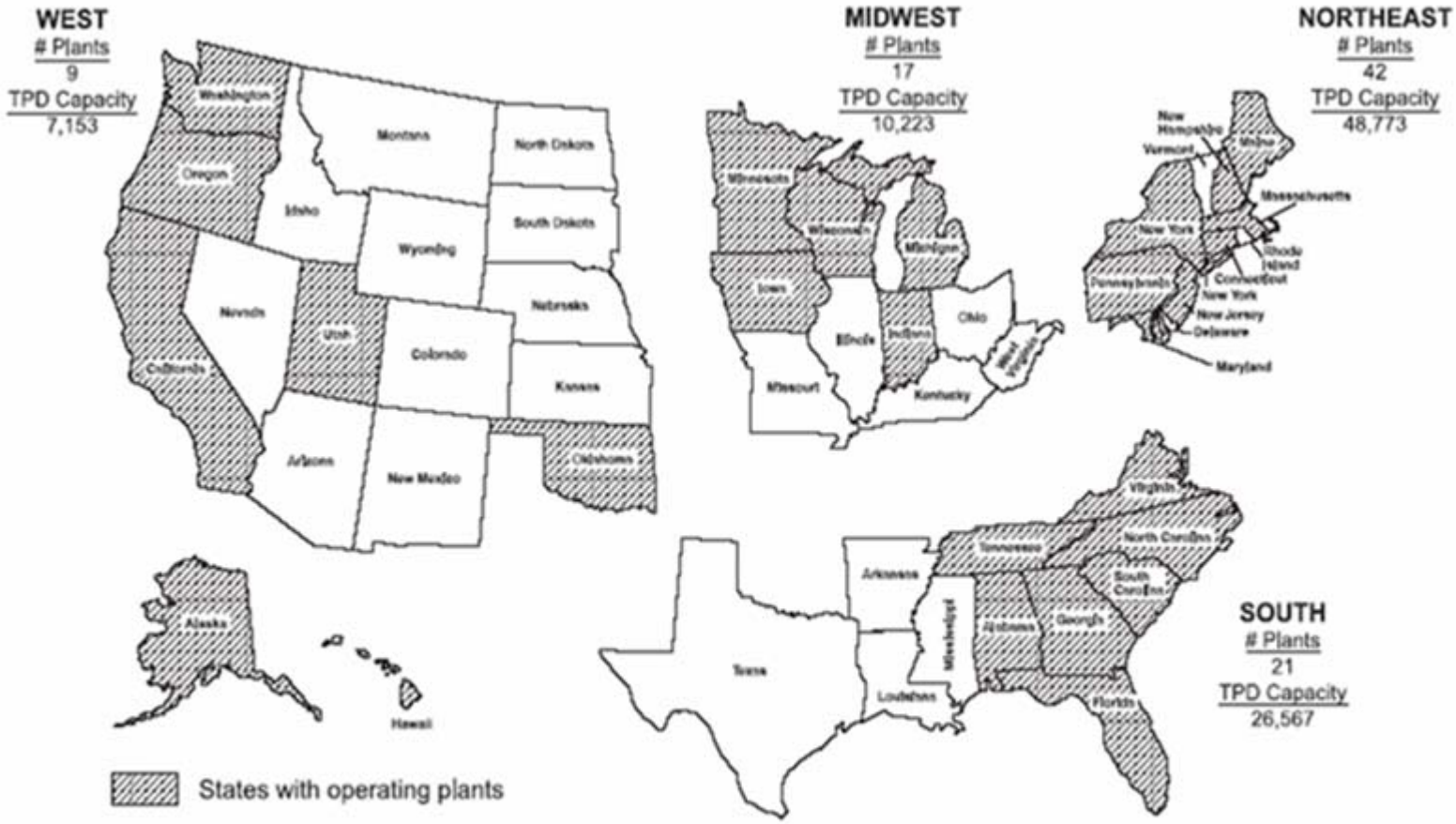


- Percentage of U.S. Waste Managed: 13%
- Disposal Capacity: 93,000 TPD
- Annual Disposal: 29 million tons
- People Served: 36 million

Electricity Production by WTE

- Power Generation Capacity: 2500 MW
- Steam Export Capacity: 2.5 million lbs/hr
- Annual Power Generation: 16 million MW-hours
- Homes served: 1.98 million
- Percentage of Total National Generation: 0.4%

Regional Overview of Operating WTE Plants

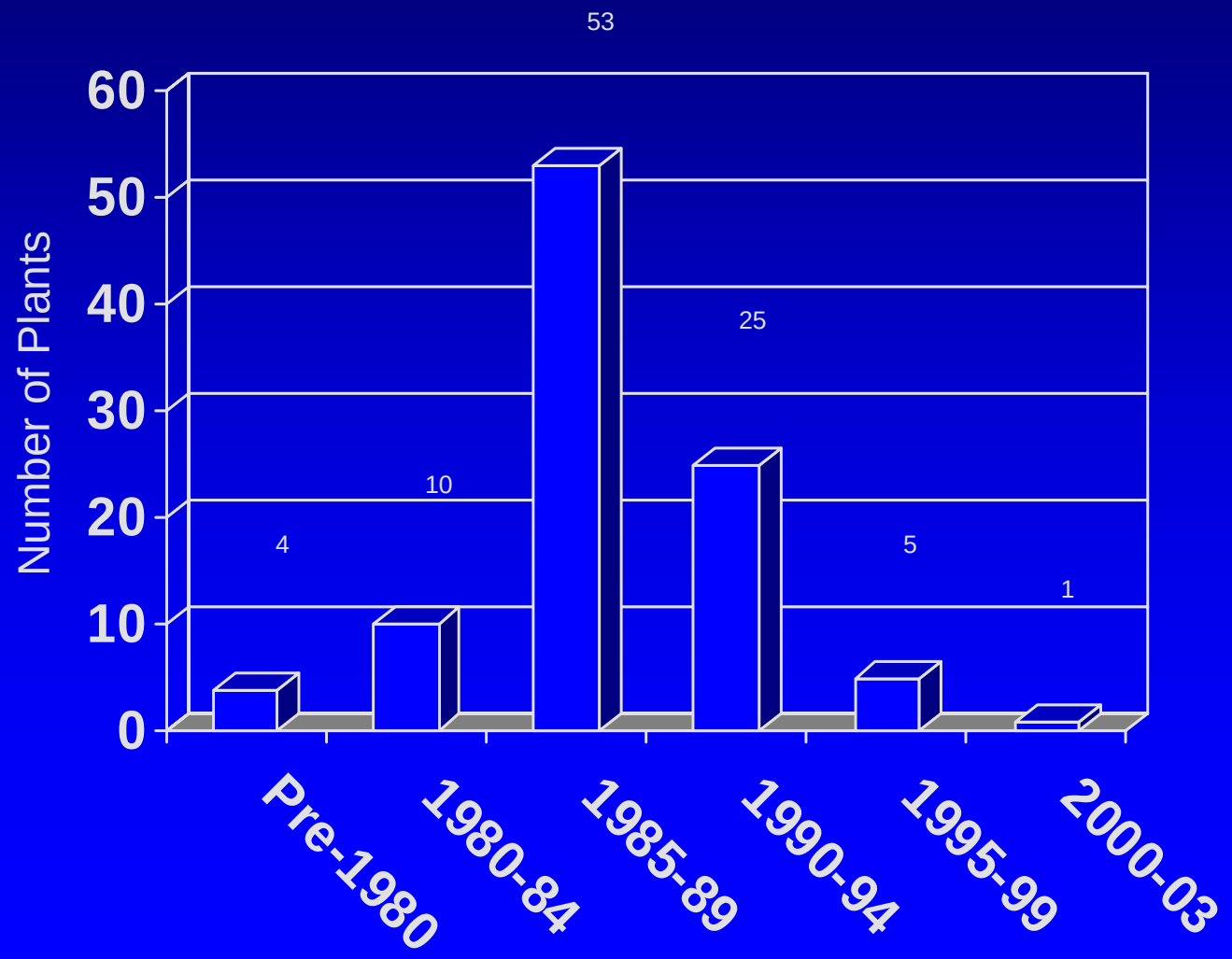


Source: J. V. L. Kiser and M. Zannes, Integrated Waste Services Association, April 2004.

WTE Plants are Modern Facilities

- New, larger WTEs were built meeting more stringent standards.
- Implementation of EPA “Maximum Achievable Control Technology” (MACT) from during 1998-2000 required older, high-emission plants to either retrofit or close.
- WTE invested nearly $1 billion in MACT.
- Outstanding environmental results.

Waste-to-Energy Plant Start-Ups



WTE Industry - 1980's

- Solid waste regulations → landfill closures, rising tipping fees
- Communities seeking long-term solid waste solution
- PURPA – favorable energy contracts
- Financial drivers – tax credits, accelerated depreciation

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New Plants

WTE Industry - 1990's

- Falling tip fees – landfill competition/long haul
- Falling energy prices
- Energy deregulation – uncertainties
- MACT investment
- Tax credits eliminated

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Industry Consolidation

WTE Industry - 2000's

- Proven track record – reliability, environmental
- Production tax credits
- Renewable status
- Expiring long-term contracts
- Retiring debt
- Good locations of existing plants

Tip fee trends?

New regulation?

Political climate?

Energy price trends?

Permittability?

Taxes on imports?

Ash reuse?

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Existing plants operate at full capacity
Selected new / expansion opportunities

WTE is Accepted Internationally (as of 2004)

Location	Number of Facilities	Amount of MSW Managed by WTE as a % of Total MSW Generated
USA	89	8 - 15% based on MSW reported by EPA and Biocycle data
Europe	400	varies from country to country
Japan	100[a]	70 to 80%
Other nations (Taiwan, Singapore, China, etc.)	70	varies from country to country

(a) Facilities with energy recovery

International Trends

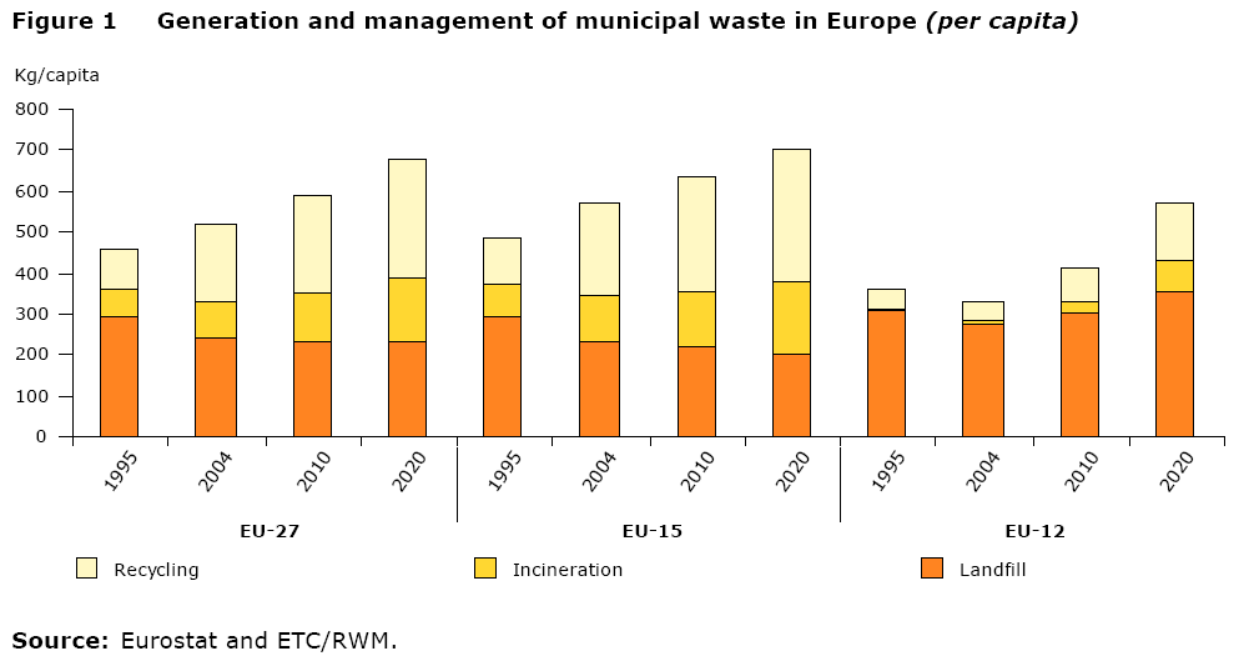
The European Union, Japan, Taiwan and others have established a waste management hierarchy based on:

- Waste prevention and minimization,
- Recycle and recovery (including waste-to-energy), and;
- Landfill as little as possible

Principal goals:

- Land preservation
- Reduce green house gases
- Reduce environmental impact on a lifecycle basis
- Promote recovery of materials and energy to safeguard natural resources

International Trends – European Directive



Member States:
EU-15 - Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and the United Kingdom.
EU-12 - Bulgaria, Czech Republic, Cyprus, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovenia and the Slovak Republic.

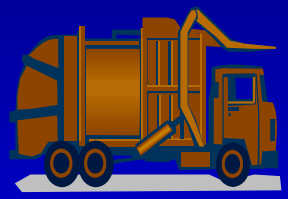
II. WTE Facility Design and Operation

- Process Inputs & Outputs
- Mass Burn Plant Cross-section
- APC Cross-section

Typical WTE Facility Process Inputs & Outputs

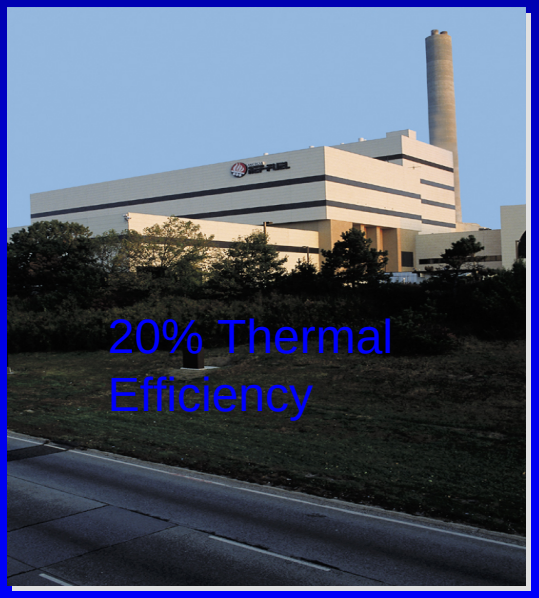
Flue Gases

CO_2: biogenic, nonbiogenic



MSW
2000 lb

Water
Air
Lime
Carbon



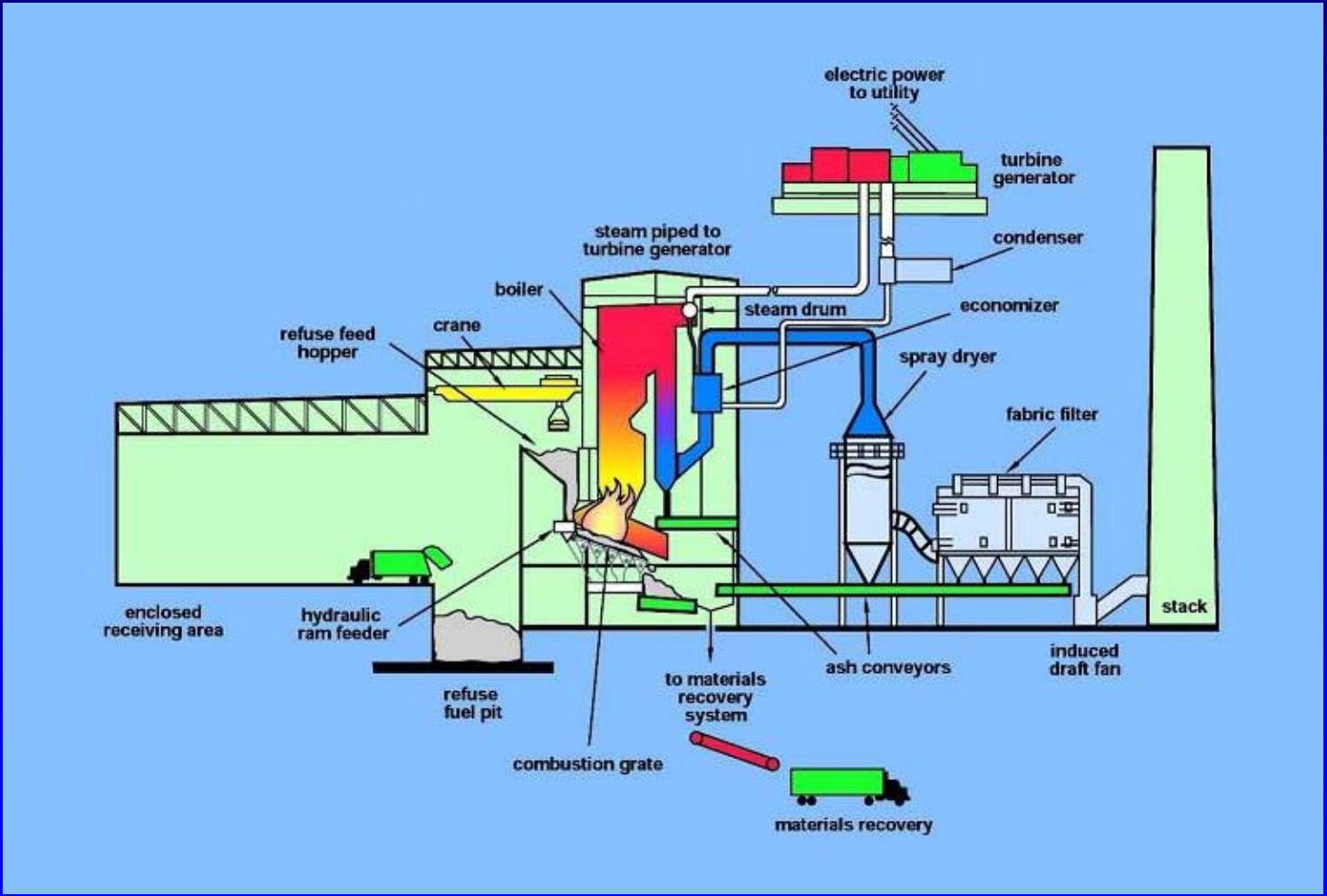
Power 550 kWh

Fe/non-Fe Metals:
55 lbs

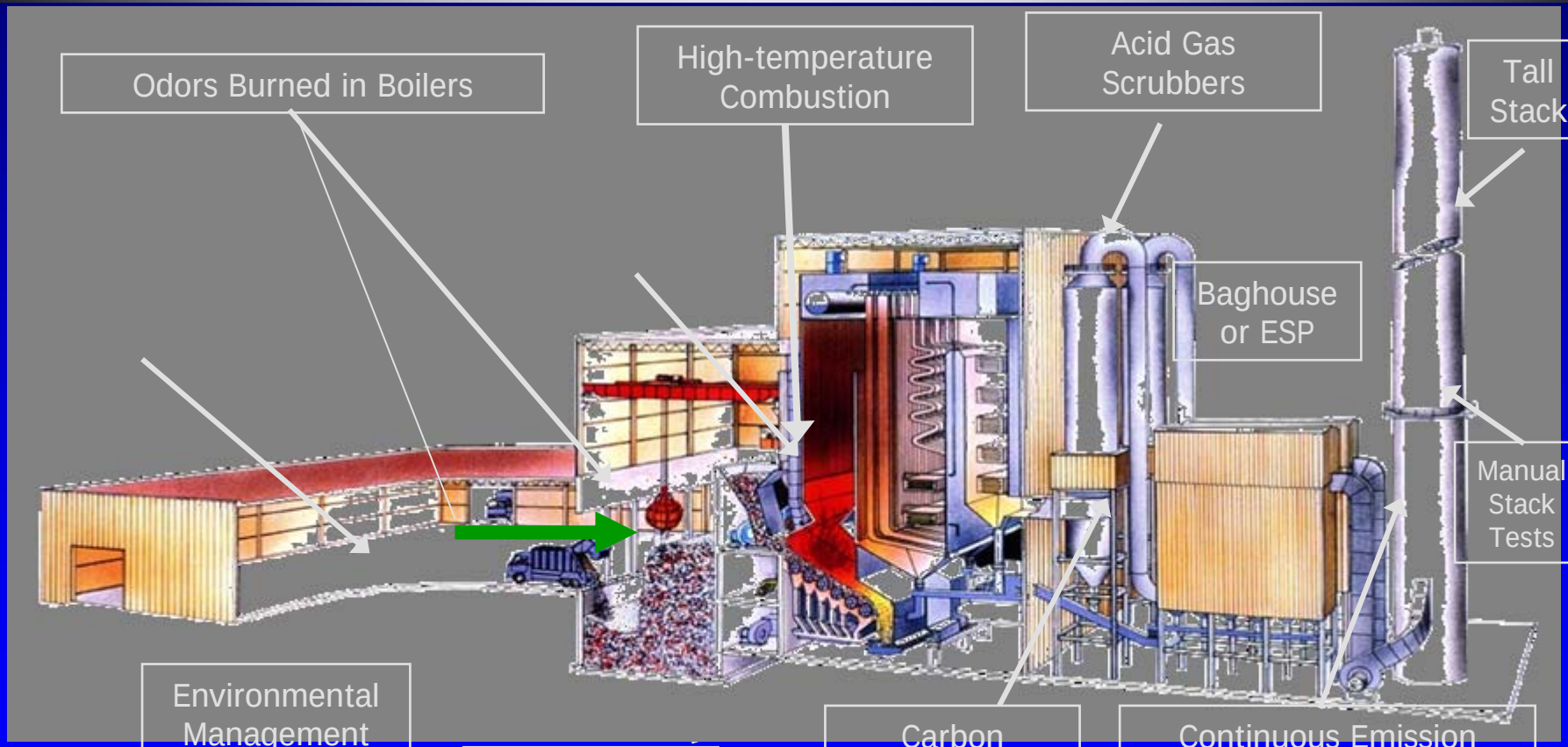
Ash: 500 lb

Process Wastewater:
Typically zero

Typical Waste-to-Energy Facility Schematic



Typical Air Pollution Control Systems



** Some Plants*

III. Environmental Attributes of WTE

- Air Emissions
- Land Use
- Ash Management
- Recycling
- Renewable Energy
- Climate Change

Air Emissions --- A Success Story

Upgrading of the emission control systems of large combustors to exceed the requirements of the Clean Air Act Section 129 standards is an impressive accomplishment. The completion of retrofits of the large combustion units enables us to continue to rely on municipal solid waste as a clean, reliable, renewable source of energy. With the capacity to handle approximately 15 percent of the waste generated in the U.S., these plants produce 2800 megawatts of electricity with less environmental impact than almost any other source of electricity.

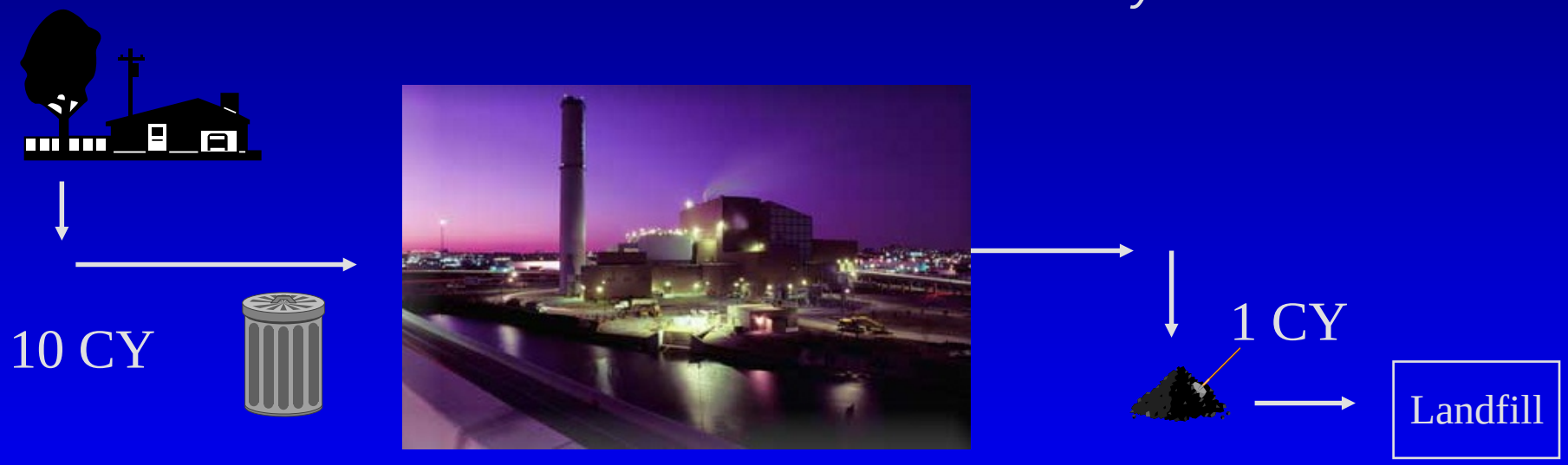
--Assistant Administrators Jeff Holmstead and Marianne Horinko, U.S. EPA, February 2003

WTE – Air Emissions

- WTE emissions now represent less than 1% of known dioxin inventory.
- WTE now represent less than 3% of U.S. man-made mercury emissions.

Land Use

WTE reduces landfilled waste volumes by 90%



Ash Management

Ash is safe for landfilling and suitable for many reuse applications

- WTE ash is stable and inert
- Normally handled in combined form (bottom & fly ash)
- Moisture reduces fugitive emissions
- Compacts and hardens in landfills
- RCRA non-hazardous
- Demonstrated low metals leaching
- Can be reused in landfills and other applications

WTE is Compatible with Recycling

WTE and recycling are complementary parts of an integrated waste management program.

- 2002 survey of solid waste management in all US WTE communities:
- **Results:** Actual recycling rate of WTE communities (33%) greater than the national average (28%)

Source: Recycling and Waste-to-Energy: The ongoing compatibility success story, J.V.L. Kiser (2002)

WTE is Compatible with Recycling

- 2004 Survey of WTE facilities and solid waste managers:

- Results for On-site Recycling:
  - Ferrous metals recovery: 706,000 tons/yr
  - Non-ferrous metals recovery: 21,000 tons/yr
  - Other materials recovery[1]: 88,000 tons/yr

[1]excluding ash

WTE is Compatible with Recycling

Results for Off-Site Recycling:

Ash Reuse in 2004: 2.9 million tons

- Current reuse:
  - Landfill cover and roadways
  - Landfill closure
  - Roadway sub-base and fill
- Potential Reuse:
  - Mine and brownfield reclamation
  - Concrete and asphalt construction projects

WTE is Compatible with Recycling

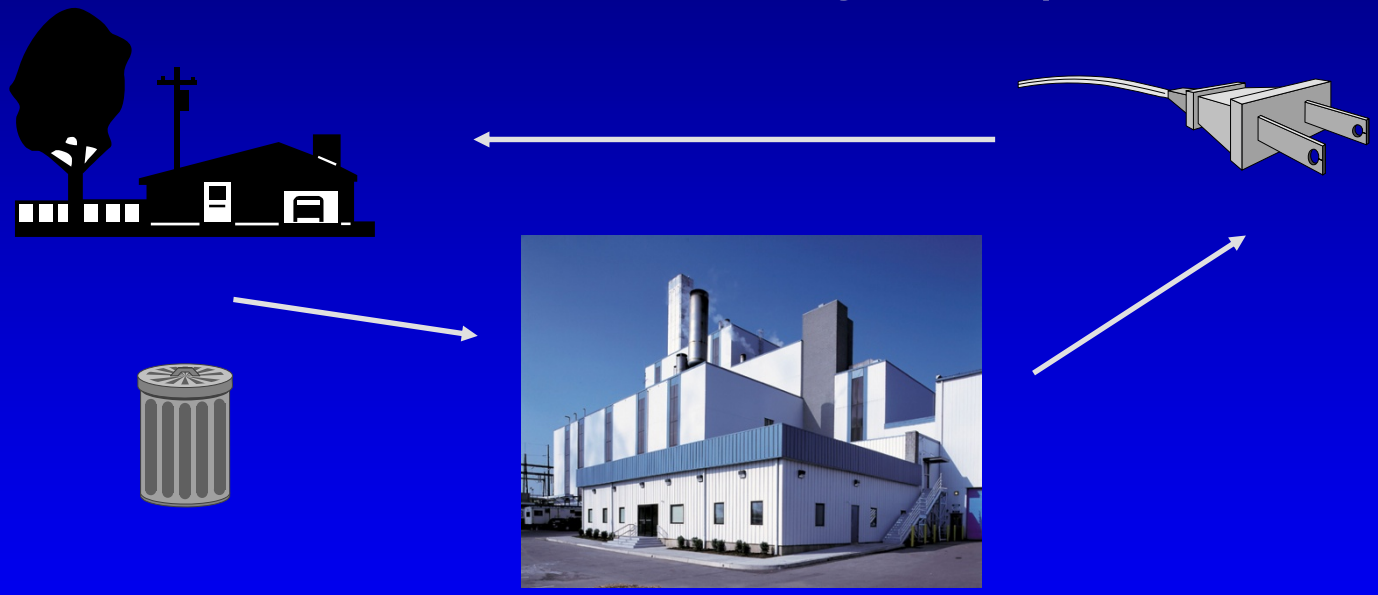
- *European experience has illustrated that waste-to-energy and recycling are compatible.*

Country	%WTE	%Recycling + Composting
Austria	13.3	52.6
Belgium	22.1	57.1
Denmark	54.3	40.0
Finland	5.8	27.2
France	28.6	12.4
Germany	12.3	55.0
Ireland	0	9.8
Italy	6.3	21.3
Netherlands	36.5	52.3
Norway	17	25
Spain	20.7	5.9
UK	5.7	8.1

Source: European Environment Agency (2002)

WTE Energy is Renewable Energy

WTE is sustainable, “home-grown” power



- MSW is considered biomass
- WTE contributes to fuel diversity
- WTE plants are located near power users
- WTE reduces use of transportation fuel

Greenhouse Gases

WTE provides a net Greenhouse Gas benefit

- Eliminates methane emissions from garbage
- Offsets fossil fuel energy with biomass
- Reduces CO2 emissions from ferrous/non-ferrous metals production

- Four independent studies (including one by EPA) have shown that:

  For every ton of trash disposed in a waste-to-energy plant, there would be nearly one ton LESS of carbon dioxide released into the air due to avoided land disposal, fossil fuel power generation, and metals productions.

Waste-to-Energy: Turning Its Ability to Reduce Greenhouse Gas into an Asset

- Annually, Waste-to-Energy reduces greenhouse gases by 11 million metric tons carbon equivalent or 33 million metric tons CO2 equivalent. Source: RTI, US EPA, IWSA Technical Paper, September,2002
- Seeking Accreditation of Model to Quantify Credits and Trade on the International Greenhouse Gas Trading Market

V. Summary

- WTE serves communities through reliable disposal services while producing clean, renewable energy.
- The most common misperceptions of WTE are based on outdated anecdotes.
- WTE and recycling are compatible.
- The avoided GHG emissions of WTE make it a very attractive alternative to landfilling with regard to reducing U.S. CO_2 emissions.

Wasatch Integrated Waste Management

- Question and Answer