COVANTA
ENERGY
for a cleaner world

COVES 2008

Commonwealth of Virginia Energy & Sustainability

September 19, 2008

Opportunities for Reducing Carbon Emissions in Solid Waste Management

Overview

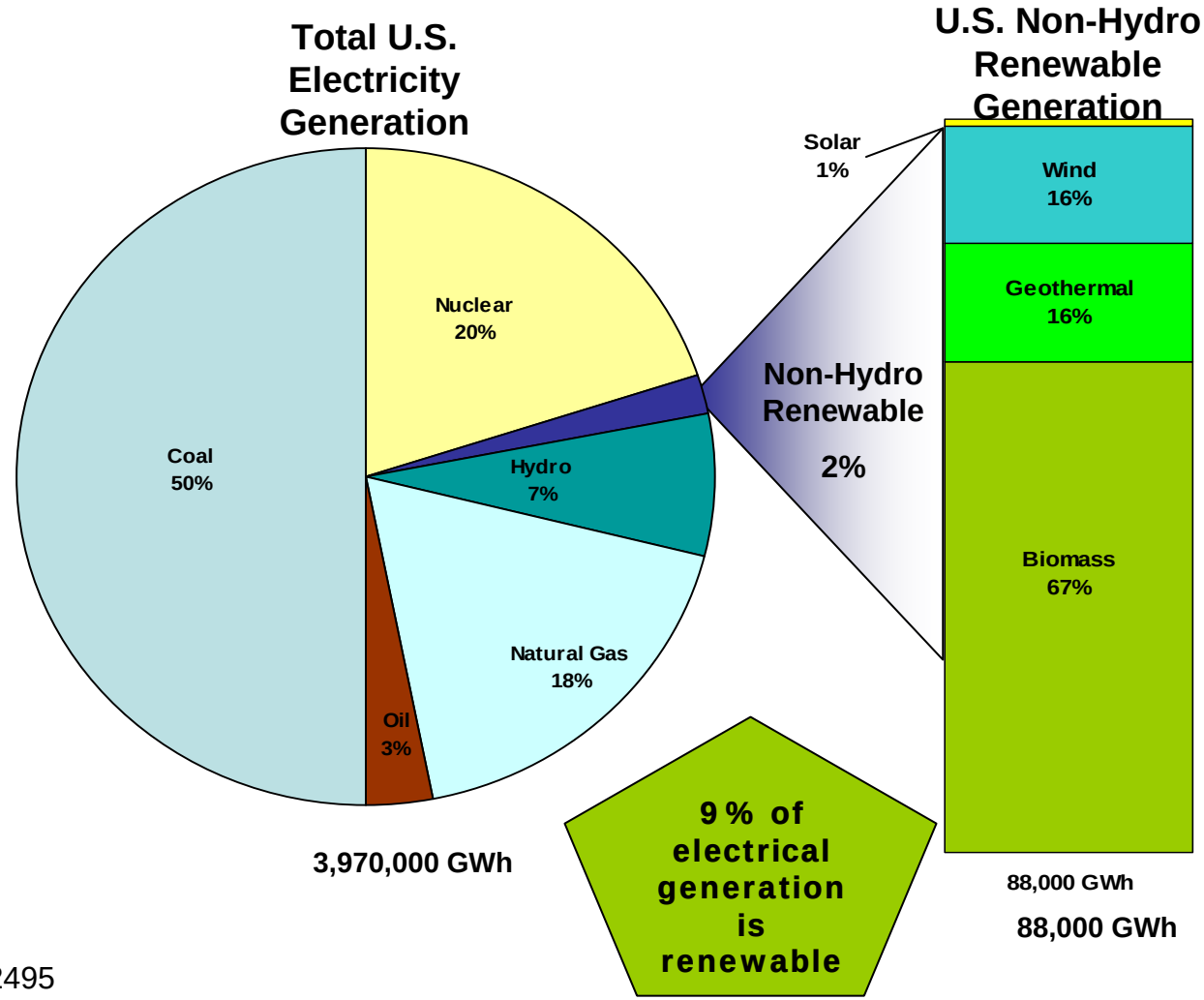
- A little about us
- Energy-from-Waste and carbon reduction
- Covanta sustainability practices

EfW in the United States

There are 87 EfW facilities in 25 states that:

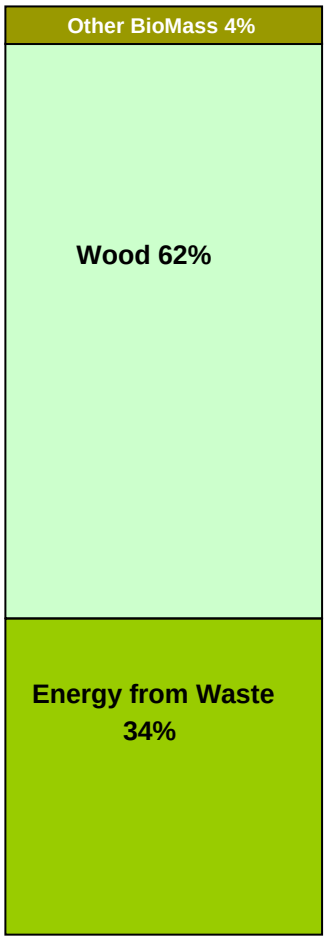
- Combust MSW to reduce its volume
- Produce energy, usually as electricity
- Recover ferrous and sometimes non-ferrous metals for recycling

The Role of Renewable Electricity Generation in the United States



Source: US Department of Energy, Energy Information Administration 2004 Report

Energy from Waste Generates 34% of the Nation's Biomass Renewable Electricity



60,000 GWh = Total U.S Biomass Renewable Generation

COVANTA

is a leader in renewable generation

- Over 8,000 GWh produced from Covanta owned and operated facilities
- 35 Energy-from-Waste Facilities
- 8 Wood Waste Facilities
- 5 Biogas Facilities

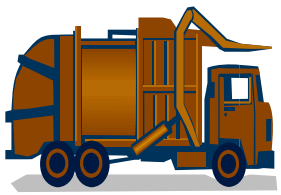
Note: *Energy-from-Waste* energy value derived from biomass and non-biomass sources.

Source: US Department of Energy, Energy Information Administration 2004 Report

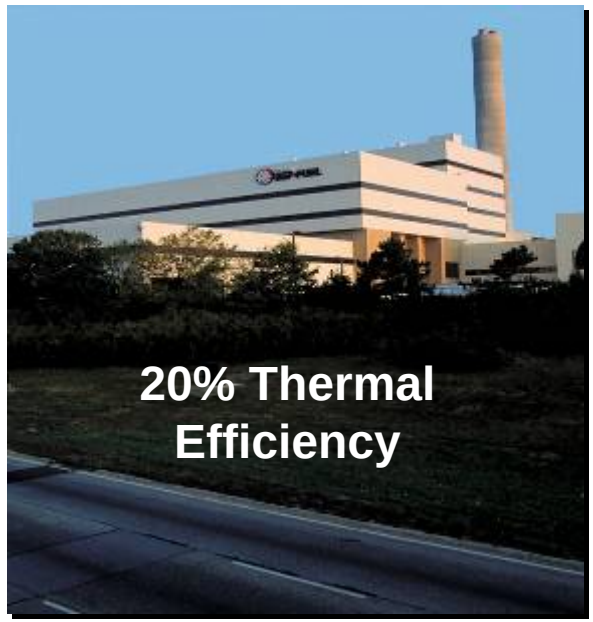
Typical EfW Facility Process Inputs and Outputs

Flue Gases

CO2: biogenic, nonbiogenic



MSW
2000 lb



Power 550 kWh

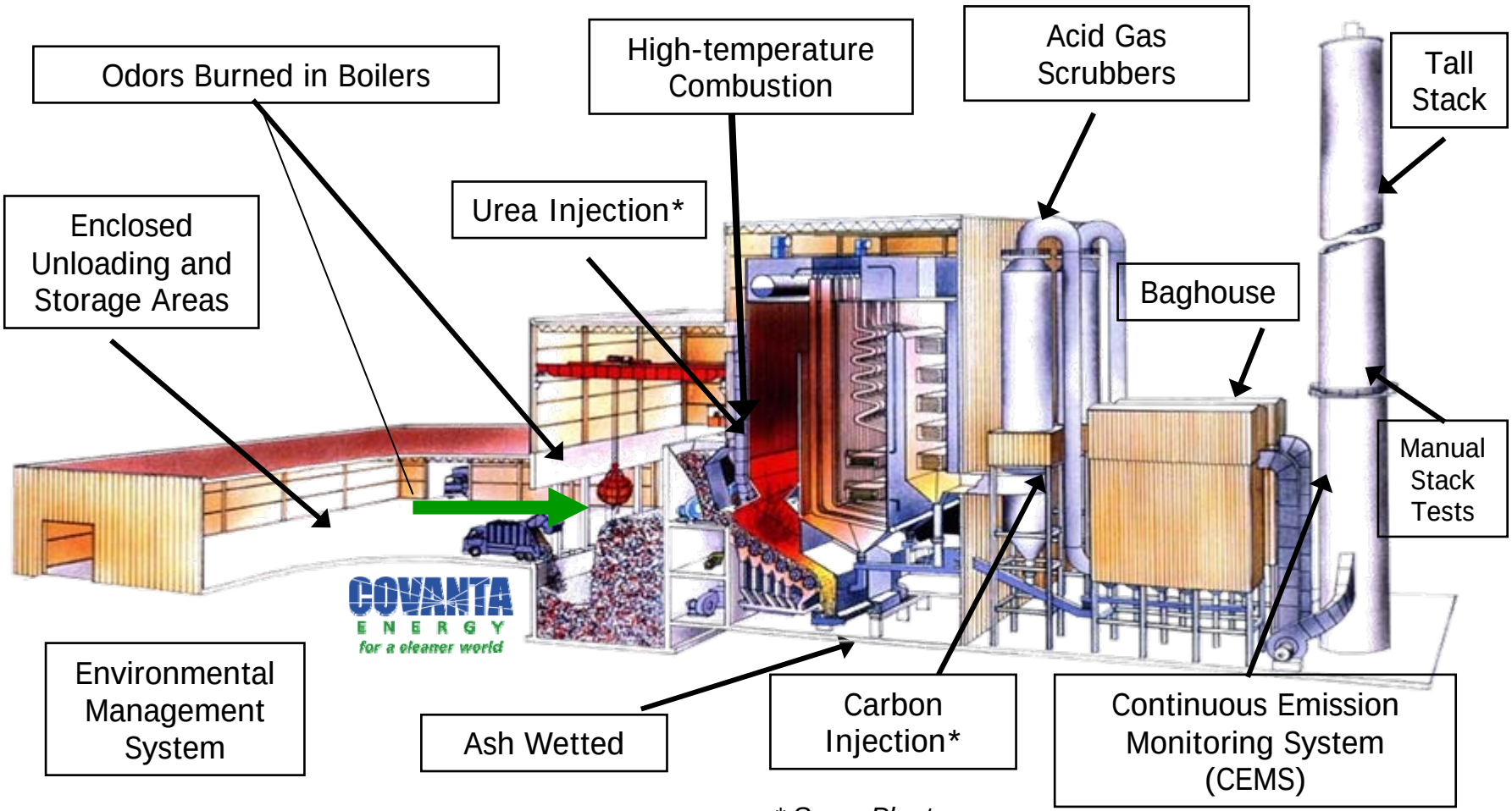
Fe/non-Fe Metals:
55 lbs

Water
Air
Lime
Carbon

Ash: 500 lb

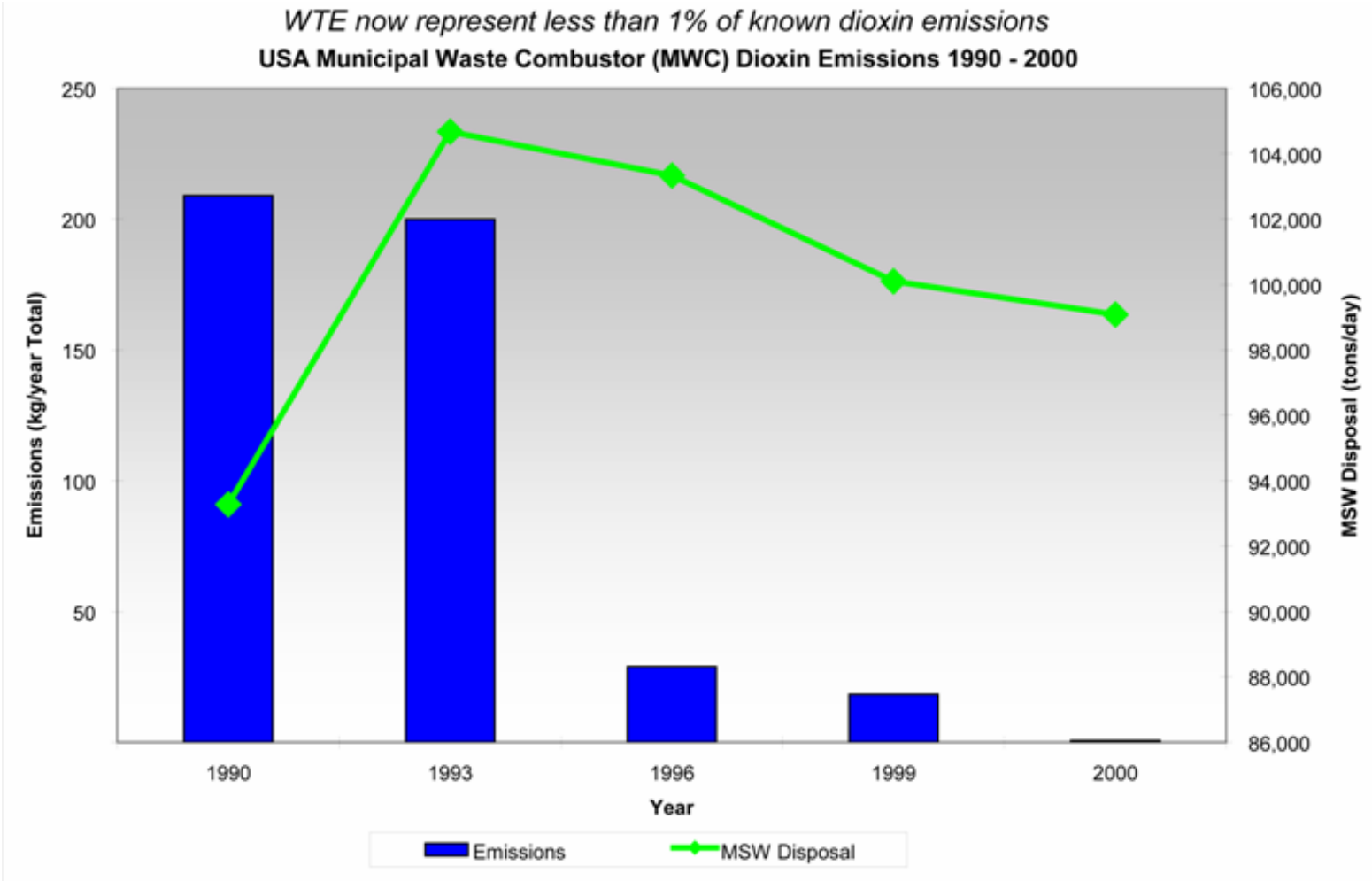
Process Wastewater:
Typically zero

Typical Air Pollution Control Systems

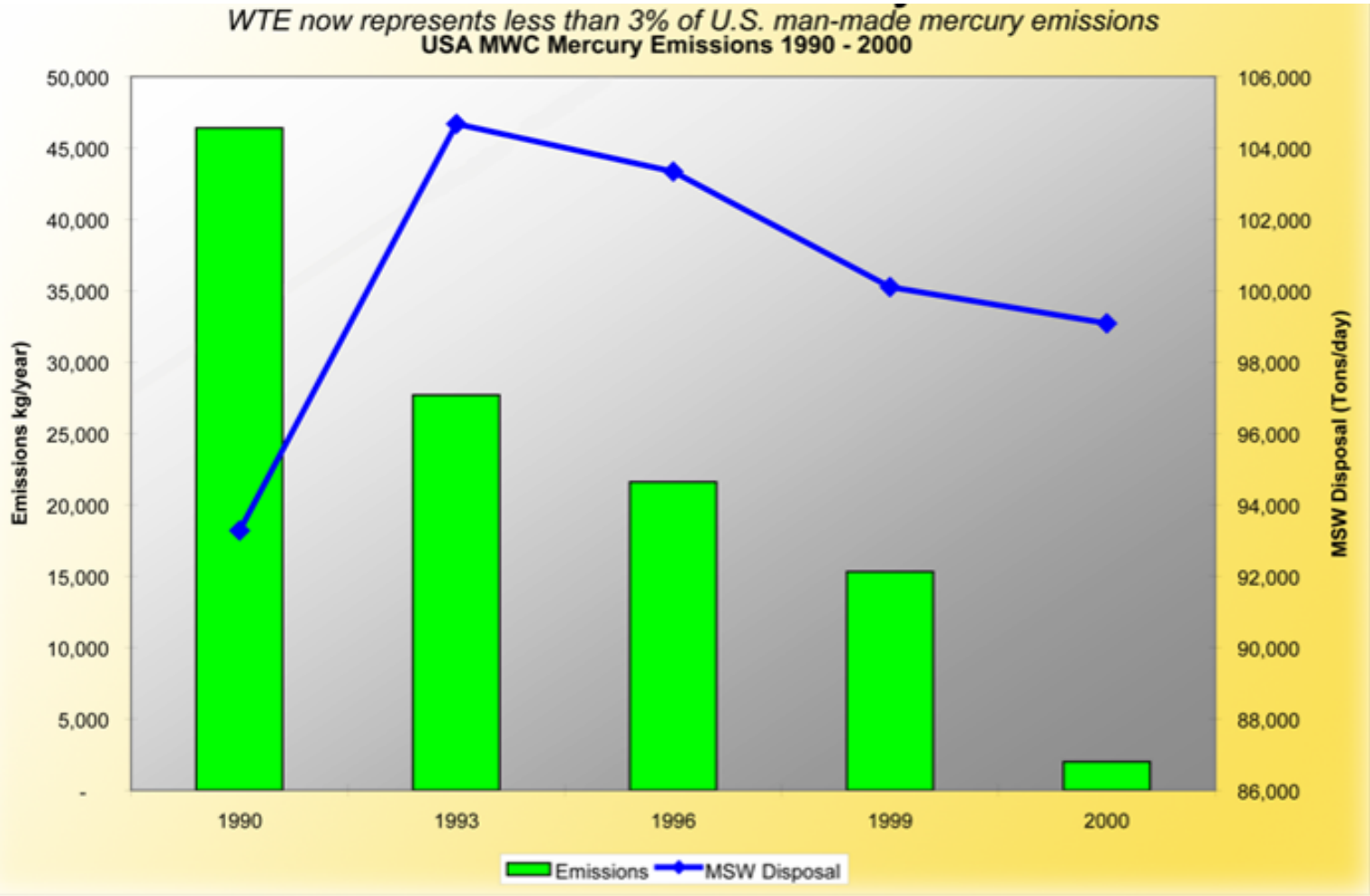


** Some Plants*

Air Emissions - Dioxins



Air Emissions - Mercury



Safe Waste Disposal and Clean Energy Solutions…

for Generations to Come

Alexandria / Fairfax Accomplishments

- Both accepted into OSHA VPP program
- Fairfax in EPA NEPT program
- Alexandria accepted into VADEQ Environmental Excellence program as an E4 facility.
- Fairfax recipient of Hg challenge award

Alexandria Waste-to-Energy Facility

Actual vs. Allowable Emissions

	Permit Limit	2003 – 2007 Actual Results	% Below Limit
Particulate (mg/dscm)	27	1.91	92.9%
Dioxin/Furan (ng/dscm)	30	3.81	87.3%
Mercury (µg/dscm)	80	0.62	99.2%
Lead (µg/dscm)	440	4.47	99.0%
Cadmium (µg/dscm)	40	0.25	99.4%

Note: All concentrations corrected to 7% oxygen.

Fairfax Waste-to-Energy Facility

Actual vs. Allowable Emissions

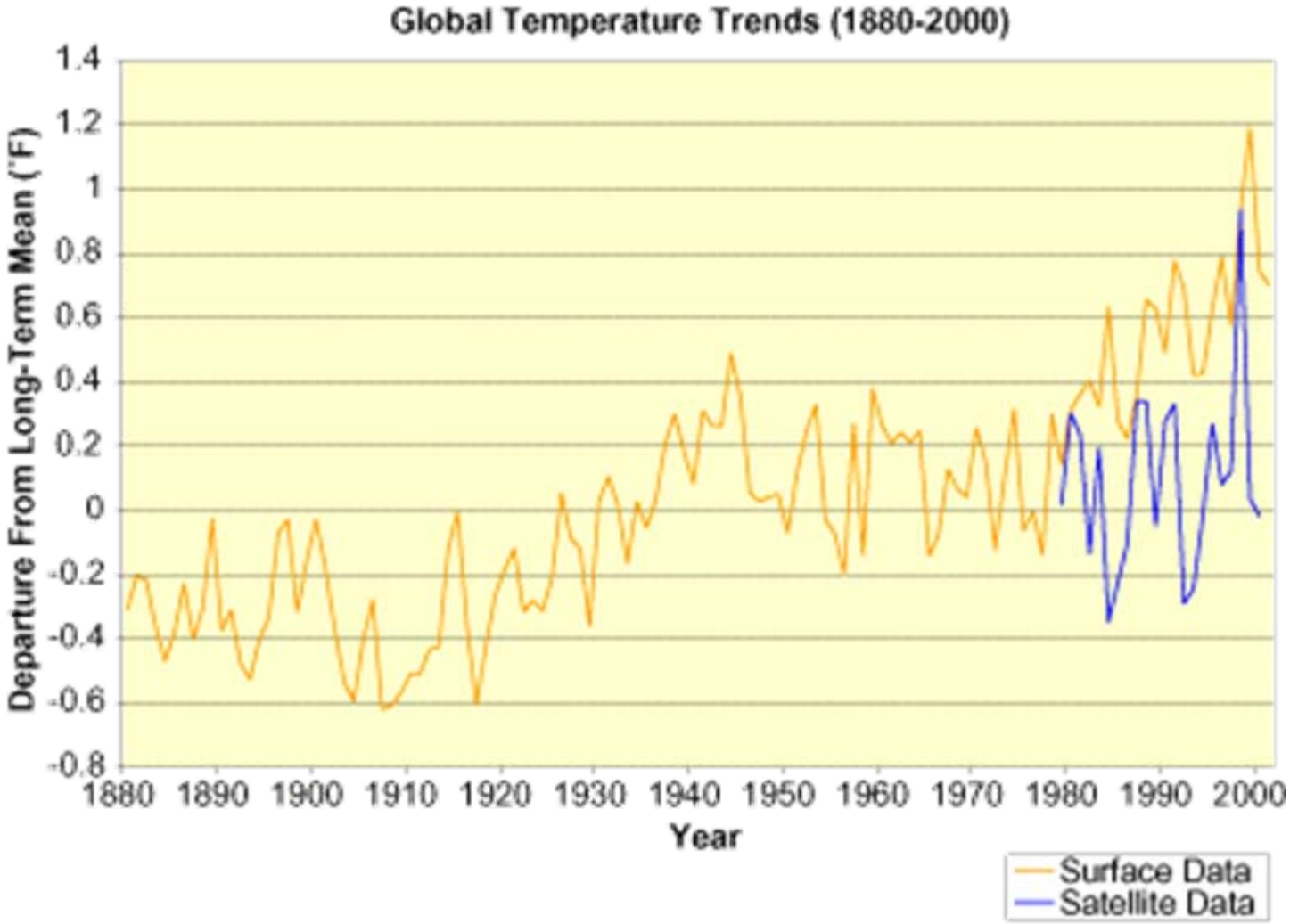
	Permit Limit	2000 – 2008 Actual Results	% Below Limit
Particulate (mg/dscm) 2004-2008	**27**	**3.8** (*based on 5 yr avg*)	**85.9%**
Dioxin/Furan (ng/dscm)	**30**	**1.1**	**96.4%**
Mercury (µg/dscm)	**80**	**2.02**	**97.5%**
Lead (µg/dscm)	**440**	**10.2**	**97.7%**
Cadmium (µg/dscm)	**40**	**0.9**	**97.8%**

Note: All concentrations corrected to 7% oxygen.

Global Warming

- Temperatures are rising
- Effects have already started
- Planning is under way

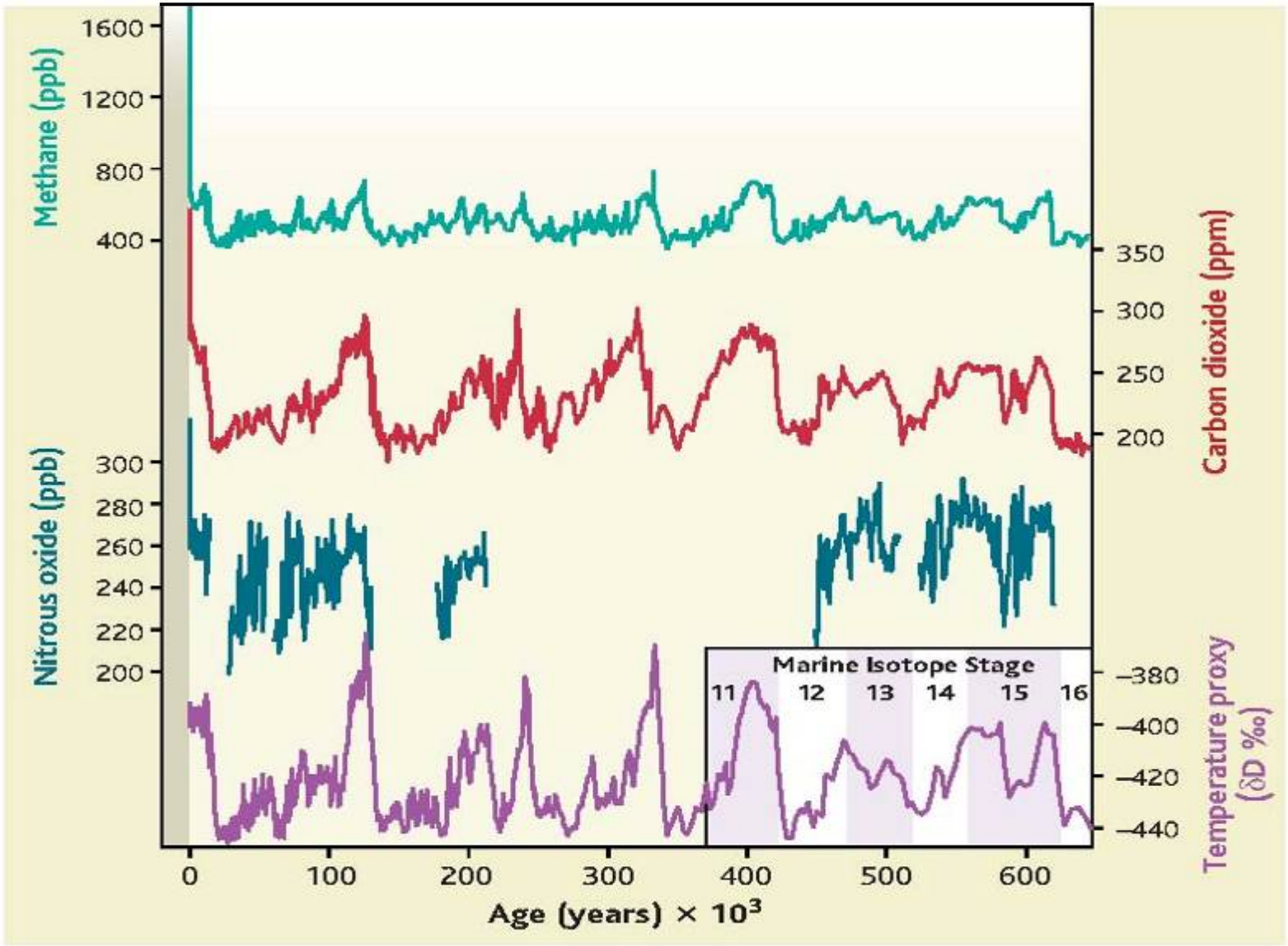
Current Temperature Trends



Surface Data Source: National Climatic Data Center, 2001.

Satellite Data Source: John R. Christy, University of Alabama in Huntsville, and Roy Spencer, National Aeronautics and Space Administration.

630,000 years of Gases and Temperatures

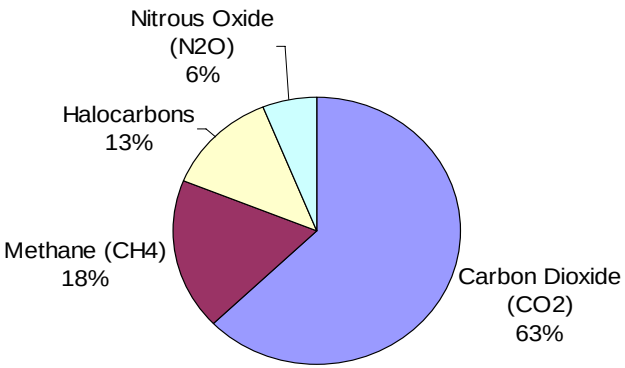


Global Warming

"Most of the observed increase in globally averaged temperatures since the mid-20th century is *very likely* due to the observed increase in anthropogenic (man-made) greenhouse gas concentrations" (Intergovernmental Panel on Climate Change – IPCC 2007)

Carbon dioxide and methane are the two major GHGs causing global warming

(IPCC 2001, 2007)

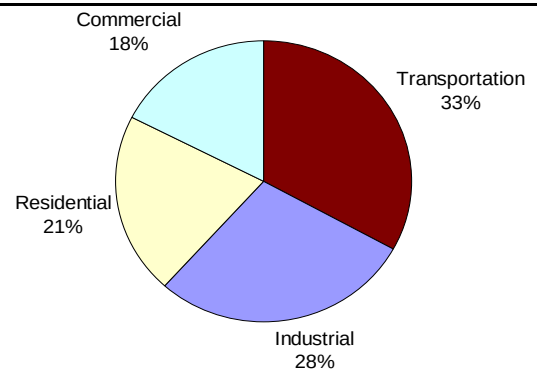


Carbon dioxide and methane together are 81% of GHGs

Methane is 21 times more potent than Carbon Dioxide

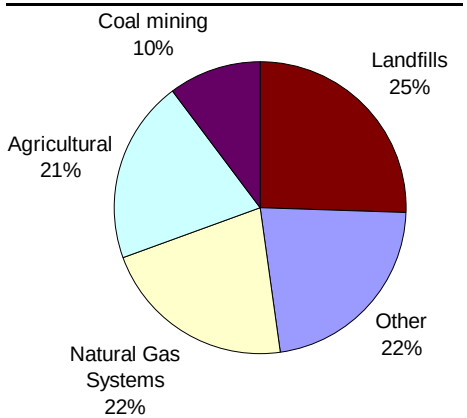
Reduction of both is required

Sources of Carbon Dioxide



40% of carbon dioxide is from fossil fuel combustion for electricity *(EPA 2004)*

Sources of Methane



Landfills are the major source of man-made methane *(EPA 2004)*

Management of Waste

Carbon is reduced with

- Less waste produced
- Recycling / Reuse
- Energy-from-Waste
- Landfilling with flaring or electrical production

The Value of Recycling

Recycle One Ton	Reduce GHG Emissions by
Aluminum Cans	13.7 tons
Office Paper	4.3 tons
Newspaper	2.5 tons
Steel Cans	1.7 tons

- Savings versus landfilling

Source: USEPA


This recycled coin was recovered from Covanta's SEMASS Facility Non-Ferrous Recovery System
Recycled Coin

EfW vs. Long Haul

	1.1 MM Tons Net Savings		
	Truck	**Rail**	**Barge**
Fossil Fuels (annual)	1.24 MM barrels	1.13 MM barrels	1.14 MM barrels
Ferrous for Production (project)(1)	25,380 tons	31,654 tons	15,561 tons
Fe/Non-Fe Recovery (annual)(2)	22,000-33,000 tons	22,000-33,000 tons	22,000-33,000 tons
Reduced GHG	1.2 MM tons	1.1 MM tons	1.1 MM tons

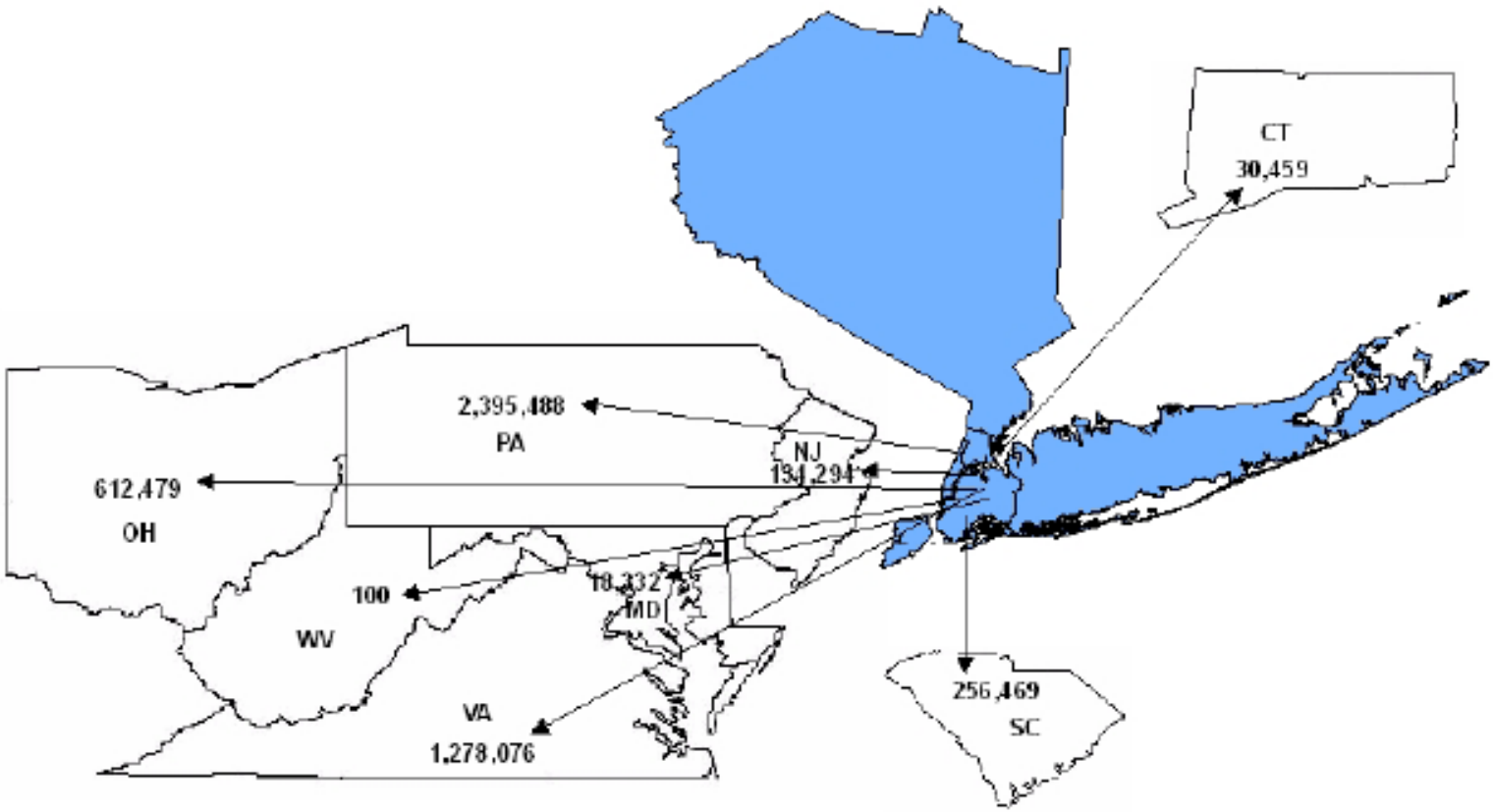
Notes:

(1) The "project" is defined as a 20 year period and required equipment replacement of containers and trucks after 10 years.

(2) Based on a WTE recovery rate of 2 to 3 percent

New York State

2006 Waste Exports (Tons)



Assumptions

• NYC packer fossil fuel usage	7 mile/gal
• Containerization fossil fuel usage factor	0.25 gal/ton MSW
• Barge transport fossil fuel usage factor (300 mi)	2.16 gal/ton MSW
• Rail transport fossil fuel usage factor (300 mi)	1.57 gal/ton MSW
• MSW tonnage per packer	8 tons
• MSW tonnage per rail car	84 tons/car
• MSW tonnage per container	21 tons/ container
• MSW tonnage per barge	6,000 tons
• Barges/Tug	1
• Kwh/ton EfW	520 – 580
• Kwh/ton Landfill gas	116
• 1 Barrel of Oil	580 Kwh

MSW Direct Haul from Manhattan Wastesheds to the Marine Transfer Station with Rail

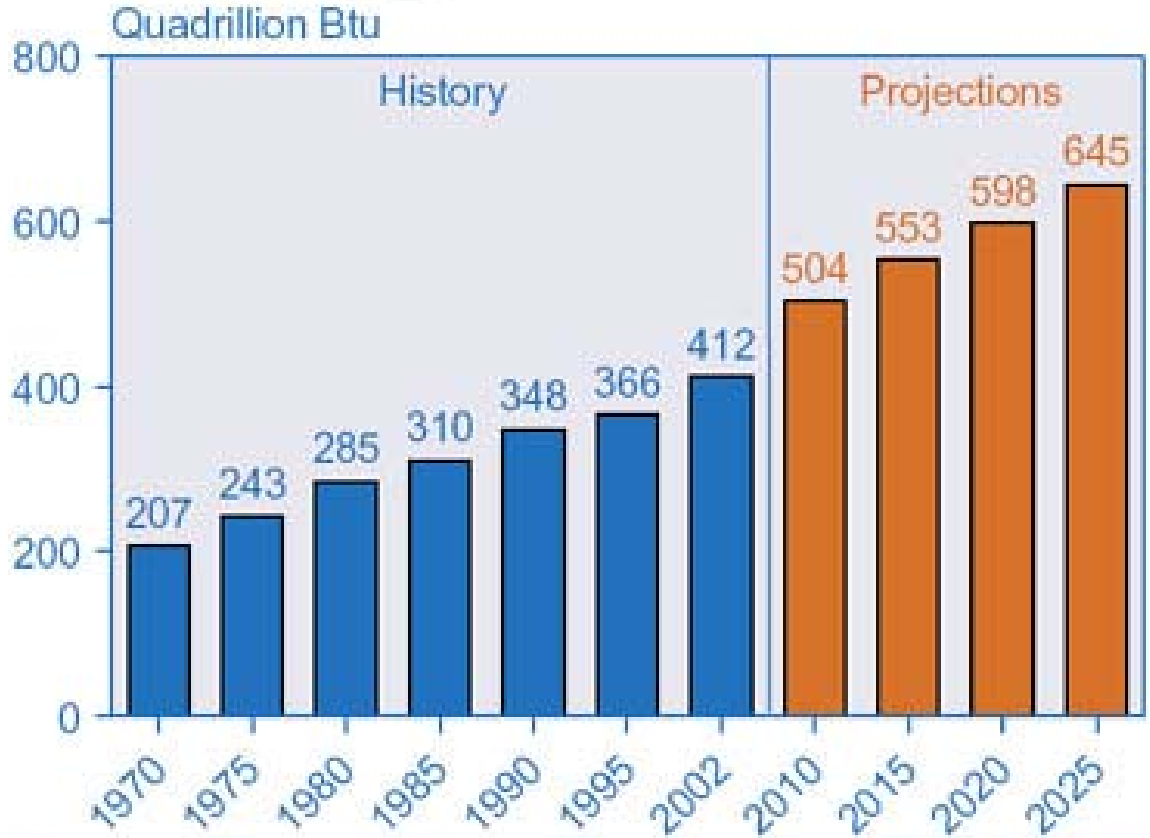
Manhattan Wasteshed	Distance from Wasteshed to the Facility (miles)	Total Fossil Fuel Used to Rail Haul (gal/ton MSW)	Truck and Rail Fossil Fuel Usage 100,000 tons Direct Haul (gallons)	Truck and Rail Fossil Fuel Usage 300,000 tons Direct Haul (gallons)	Truck and Rail Fossil Fuel Usage 700,000 tons Direct Haul (gallons)	Truck Tailpipe and Rail Emissions - 100,000 tons Direct Haul				
						CO (tons)	NOx (tons)	VOCs (tons)	SO2 (tons)	CO2 (tons)
MN9	0.4	1.8	15,291	45,874	107,040	0.39	2.0	0.14	0.052	145
MN10	1.6	1.9	15,649	46,946	109,540	0.40	2.0	0.14	0.052	150
MN12	1.4	1.9	15,589	46,767	109,123	0.40	2.0	0.14	0.052	149
MN11	2.4	1.9	15,887	47,660	111,206	0.40	2.1	0.15	0.052	153
MN8	1.4	1.9	15,589	46,767	109,123	0.40	2.0	0.14	0.052	149
MN5	4.0	2.0	16,363	49,088	114,540	0.42	2.1	0.15	0.052	158
MN6	3.8	2.0	16,303	48,910	114,123	0.42	2.1	0.15	0.052	158
MN1	6.2	2.0	17,018	51,053	119,123	0.44	2.2	0.15	0.053	166
MN3	4.6	2.0	16,541	49,624	115,790	0.42	2.1	0.15	0.052	161
MN2	4.2	2.0	16,422	49,267	114,956	0.42	2.1	0.15	0.052	159
MN7	1.9	1.9	15,738	47,213	110,165	0.40	2.1	0.14	0.052	151
MN4	1.2	1.9	15,529	46,588	108,706	0.39	2.0	0.14	0.052	148
Total			**191,919**	**575,758**	**1,343,435**	**4.9**	**25**	**1.7**	**0.63**	**1847**

Note: The values listed at the bottom of the table represent the total fuel usage and transportation emissions to handle and transport 100,000 tons of MSW.

NYC/VA MSW Disposal Summary

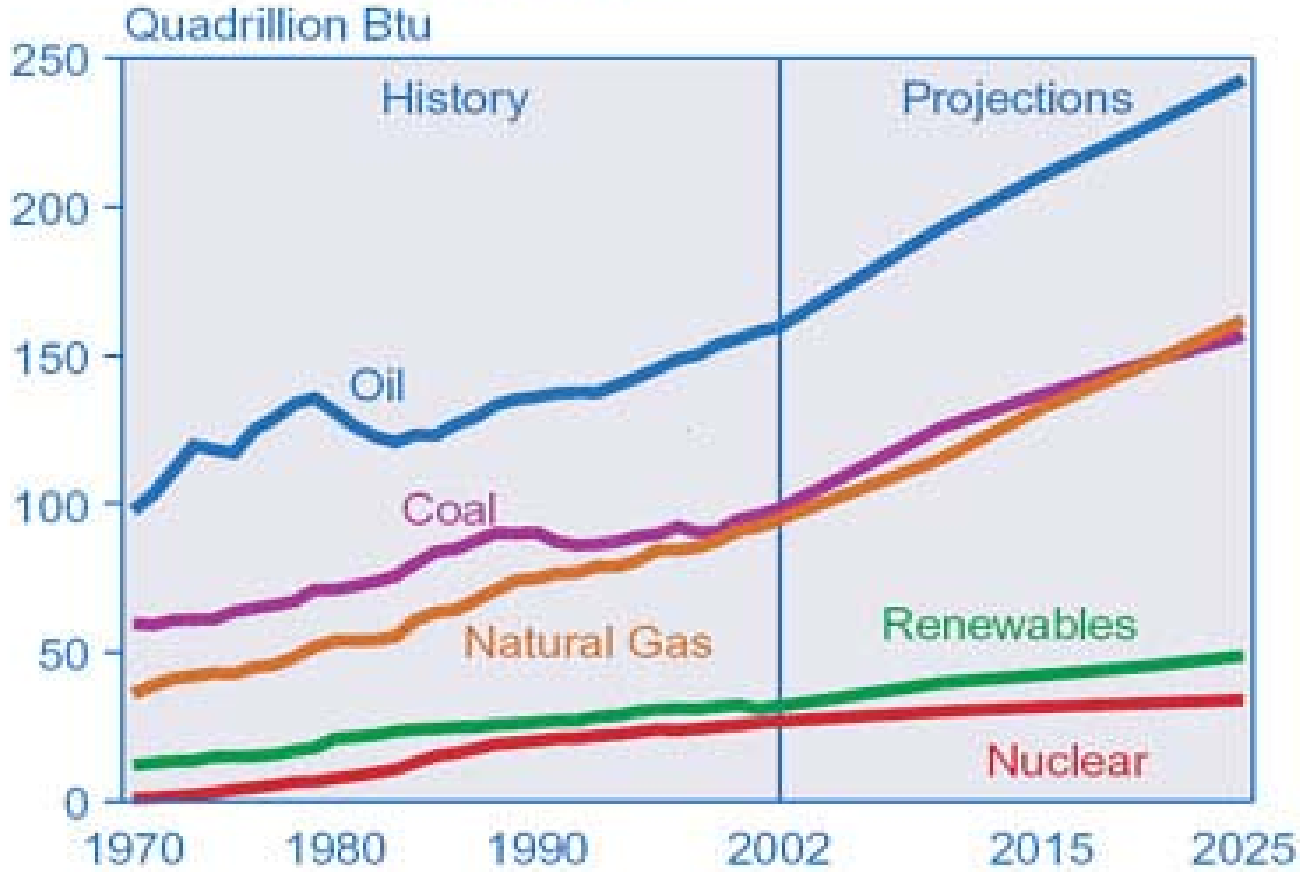
- Tons – 1.3 MM
- GHG Landfilling vs. EfW - ~1.3 MM tons excess emissions
- Fossil Fuel for transport – 2.5 MM gallons
- Fossil Fuel GHG emissions (as CO_2) – 24,000 tons

Figure 7. World Marketed Energy Consumption, 1970-2025



Sources: **History:** Energy Information Administration (EIA), *International Energy Annual 2002*, DOE/EIA-0219(2002) (Washington, DC, March 2004), web site www.eia.doe.gov/iea/. **Projections:** EIA, System for the Analysis of Global Energy Markets (2005).

Figure 10. World Marketed Energy Use by Fuel Type, 1970-2025



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Energy Use Quantitative Considerations

- A Quadrillion has 15 zeros
- We are using about 500 Quadrillion BTUs per year
- The available credible evidence suggests temperatures will continue to rise even with substantial curtailment of fossil fuel emissions
- Sheer magnitude of global warming and worldwide energy use dictates using **all reasonable paths**

Too Warm? Too Much Fossil Fuels?

Must Solve:

- Efficiency
- Transportation
- Diversity of
  - Energy Supply
  - Approaches

Ethanol Energy Balances

	Energy Balance (renewable output to fossil input)
Sugarcane, Brazil	10.2
Sugar beet, Europe, 2003	2.1
Corn, U.S., 2006	1.4
Cellulose ethanol, U.S.	10.0

Source: Science, Vol 315, 9 February 2007

Covanta Power Make and Energy Balance

Town	Kwh/ton	Energy Balance
Alexandria	450	105
Fairfax	630	44

Note: **Preliminary data – Do not Cite or Quote.**

Calculations based on supplemental fuel input only; does not evaluate energy input to construct a facility or for the fuel used to transport waste, facility reagents, or employees.

Overview of Energy-from-Waste

- Is Clean
- Serves multiple U.S. needs
- Addresses GHG & Energy issues
- Is renewable in fact

Covanta Sustainability Initiative

- Reduce our emissions footprint
- Improve our Power Generation
- Integrate more fully in our communities

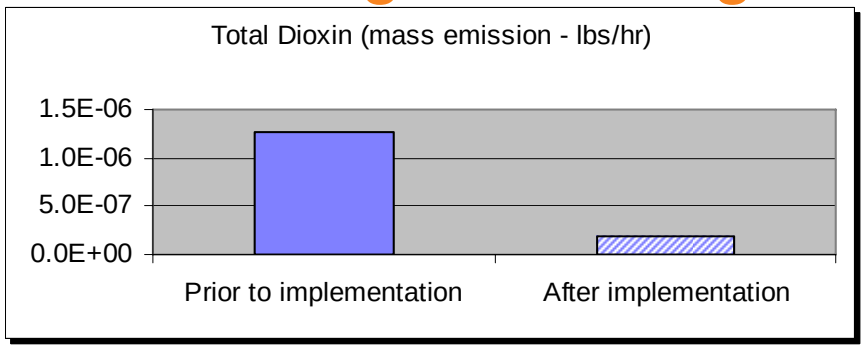
Reduce our Emissions Footprint

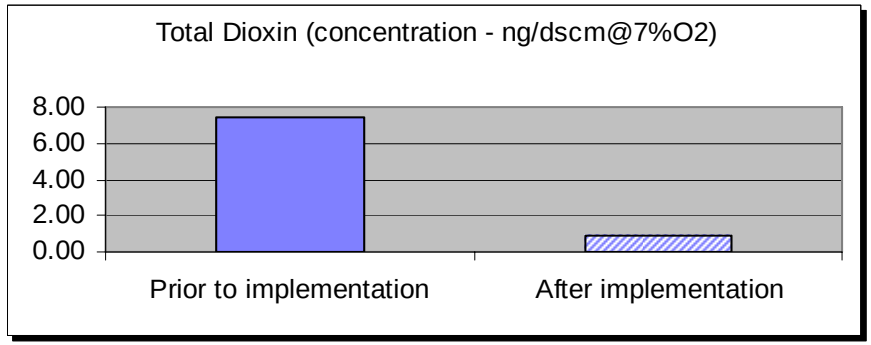
- Dioxins
- Mercury
- Nitrogen Oxides
- Particulates

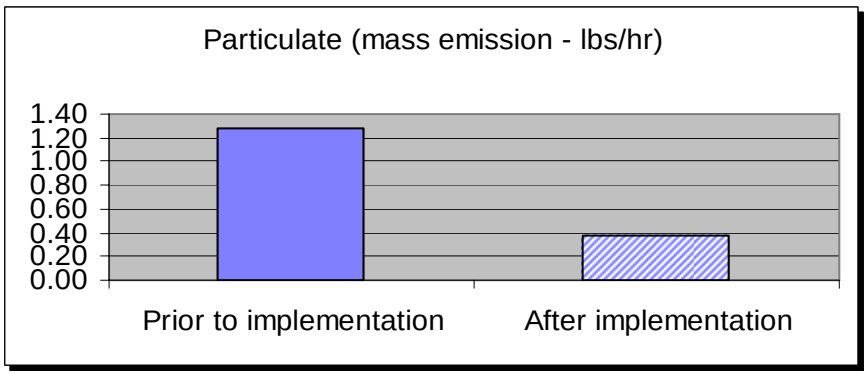
Reducing Emissions

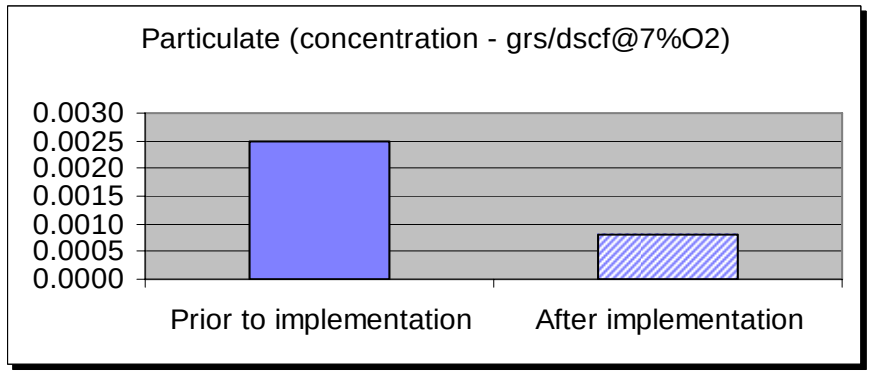
- Reagent Use
- Technology Application
- Technology Componentry
- Clean Ops

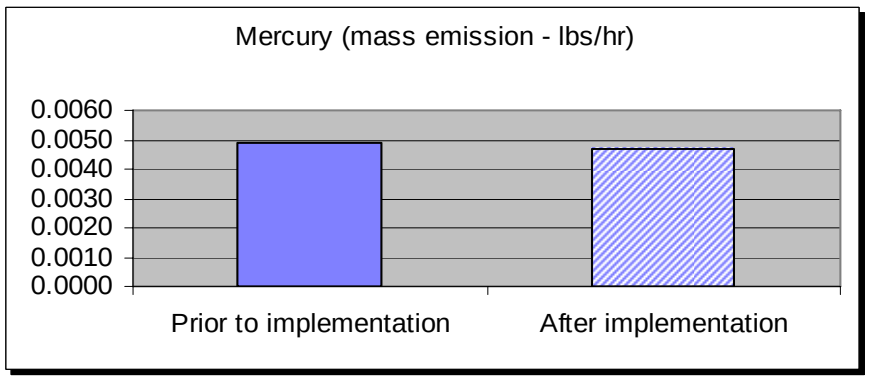
Delaware Valley Resource Recovery Facility Effect of APC Management Program

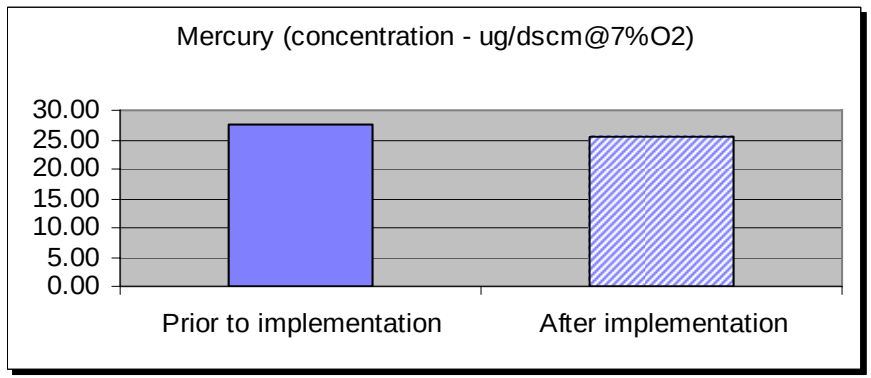












Covanta Hg Action Plan

"Keep the Mercury from Rising"

- Seek bans of Mercury Containing Products
- Use outreach to remove mercury
  - Sponsored recycling
  - Bounty programs
- Reduction in our stacks
  - Conventional approaches
  - New Reagents/Technology

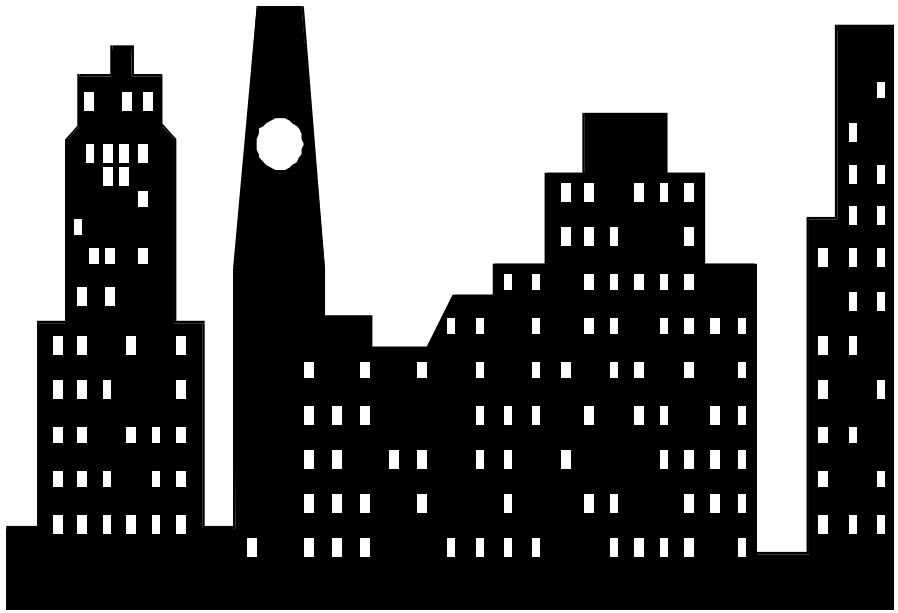
Power Generation Improvements

- Optimize Production
- Reduce In-House Load
  - Lighting
  - Dynamic breaking on cranes
- Other alternative energy

Covanta Outreach

- Cataloging portfolio
- Generic ‘Good Neighbor Model’
  - Tour ready
  - Share information ‘Open Book’
  - Local involvement / sponsorship
- Regulators
- Non-government Organizations
- Professional Organizations
- Commissions / Task Forces etc.

- Seek “Good Corporate Citizen” Mantel



Conclusion

- EfW Clean Renewable Fuel
- EfW reduces fossil fuel use and GHG production
- Our Virginia plants are leaders in our clean ops / sustainability push


Today's trash. Tomorrow's Green Energy.
LANCASTER COUNTY SOLID WASTE MANAGEMENT AUTHORITY
www.lcswma.org