



**Making a Case for WTE**

**&**

**Zero Wastes to Landfills**

**Presented at:**

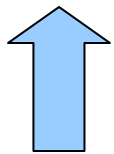
**NYS Business Council  
2009 Industry-Environment Conference  
October 16, 2009**

**Turning Waste into Energy  
Saratoga Hilton  
Saratoga, New York**

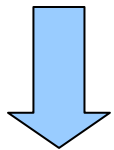
**By Jack D. Lauber PE BCEE  
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# Nationally MSW is...

Recycled..... 28 - 30%



Landfilled..... 60%



Combusted to produce energy.....12%

# America's Waste Stream

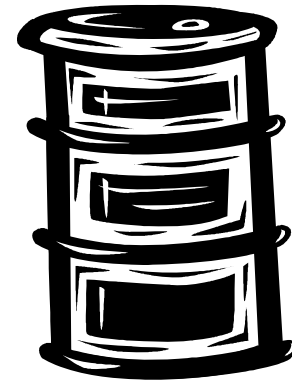
1 ton MSW

=

c. 1 barrel oil



=



# Recyclables

- Recycle, Dispose or Utilize?
- Glass, Paper, Metal, Plastics
- Recycle only about 15% of plastics
  - Plastics have the same energy as coal
  - Technical and economic reasons

# **Different management options can have different impacts...**

- Landfills
- Waste to energy facilities
- Transportation

# Landfills

- Adverse environmental effects of MSW landfills, including
  - toxic air emissions
  - future leaking, etc.
- Public health effects are estimated to be an order of magnitude or more greater than those of state-of-the-art WTE facilities.

# Landfill Emissions

3/12/1996 the U.S. EPA issued the New Source Performance Standards

- NMOC implicated in the formation of atmospheric ozone
- NSPS required reduction of emissions of non-methane organic compounds (NMOC)

# Landfill Emissions



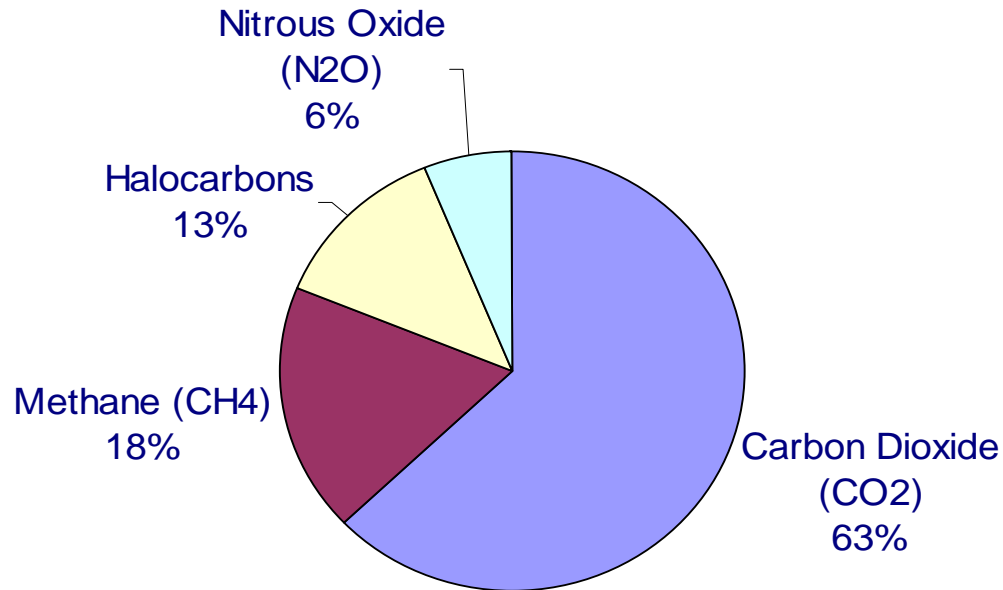
- MSW landfills are estimated to release approx. 14,300 tons/yr of NMOC
- Landfill gases are likely to form dioxin/furan emissions when burned without proper controls

# Typical NMOC's from Landfills

<b>Chemical</b>	<b>% Dry Volume</b>	<b>NMOC</b>	<b>ppmv</b>
<b>Methane</b>	<b>45 - 60</b>		
<b>Carbon Dioxide</b>	<b>40 - 55</b>	<b>Toluene</b>	<b>35</b>
<b>Nitrogen</b>	<b>2 - 5</b>	<b>Dichloromethane</b>	<b>25</b>
<b>Ammonia</b>	<b>0.1 - 1.0</b>	<b>Ethylbenzene</b>	<b>7</b>
<b>Sulfur Comp</b>	<b>0.01 - 1.0</b>	<b>Acetone</b>	<b>7</b>
<b>Oxygen</b>	<b>0.1 - 1.0</b>	<b>Vinyl Acetate</b>	<b>6</b>
<b>Carbon Monoxide</b>	<b>0 - 0.2</b>	<b>Tetrachloroethylene</b>	<b>5</b>
<b>Hydrogen</b>	<b>0 - 0.2</b>	<b>Vinyl Chloride</b>	<b>4</b>
<b>NMOC</b>	<b>0.01 - 1.0</b>	<b>Methyl Ethyl Ketone</b>	<b>3.1</b>
		<b>Xylenes</b>	<b>2.6</b>
		<b>Dichloroethylene</b>	<b>2.8</b>
		<b>Trichloroethylene</b>	<b>2.1</b>
		<b>Benzene</b>	<b>2.1</b>

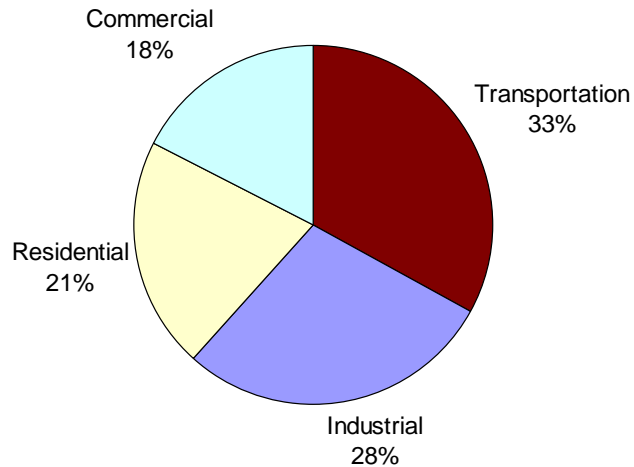
# Global Warming Potential from Landfills

Carbon Dioxide and Methane are  
the 2 major GHGs causing global  
warming

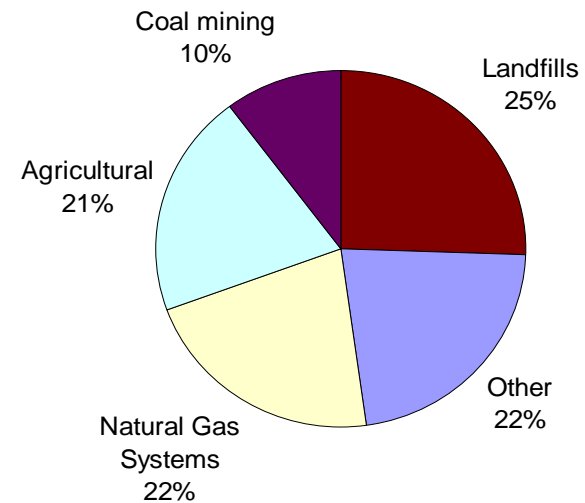


# Global Warming Potential

## Sources of CO<sub>2</sub>



## Sources of CH<sub>4</sub>



# Global Warming Potential

- Methane from landfills is 21x more potent in trapping solar heat than CO<sub>2</sub>
- Even at 60% LFG collection rates, landfills are still 20x worse than WTE
- Equivalent carbon emissions of landfills (with active gas collection) is about 1.3 tons of CO<sub>2</sub> greater than WTE combustion

# Truck Emissions

- Dioxin emissions due to combustion of the fuel
- US EPA estimates 0.8ng TEQ per truck mile; Norwegian results higher & may have to do with salt & sulfur
- Polycyclic aromatic hydrocarbons (PAH)

# Trucking Impact

NYC 2004 - 3 Million tons

= many 20 ton travel trailers to PA, VA & OH

= 26 million truck miles

= 32,000 lbs PAH (The average emissions of PAH was about 16kg/day/state, which is variable)

# Health Risks

- As many as 15% of the general population suffer from multiple chemical sensitivity (MCS)

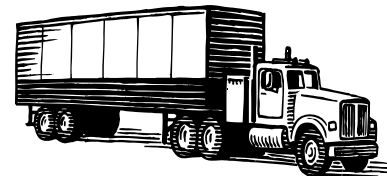
– *National Academy of Sciences*

- Women near studied landfills have a four-fold increased chance of bladder cancer or leukemia

– *NYS Department of Health*

# Health Risks

- Disposing of waste via landfill can increase health risks 30-fold
- Emissions from diesel truck engines transporting waste to landfills resulted in a 10-fold increase in health risks



# Waste-to-Energy Emissions

Yes, WTE has controlled emissions,  
but...

- Better multistage control equipment
- More consistent monitoring

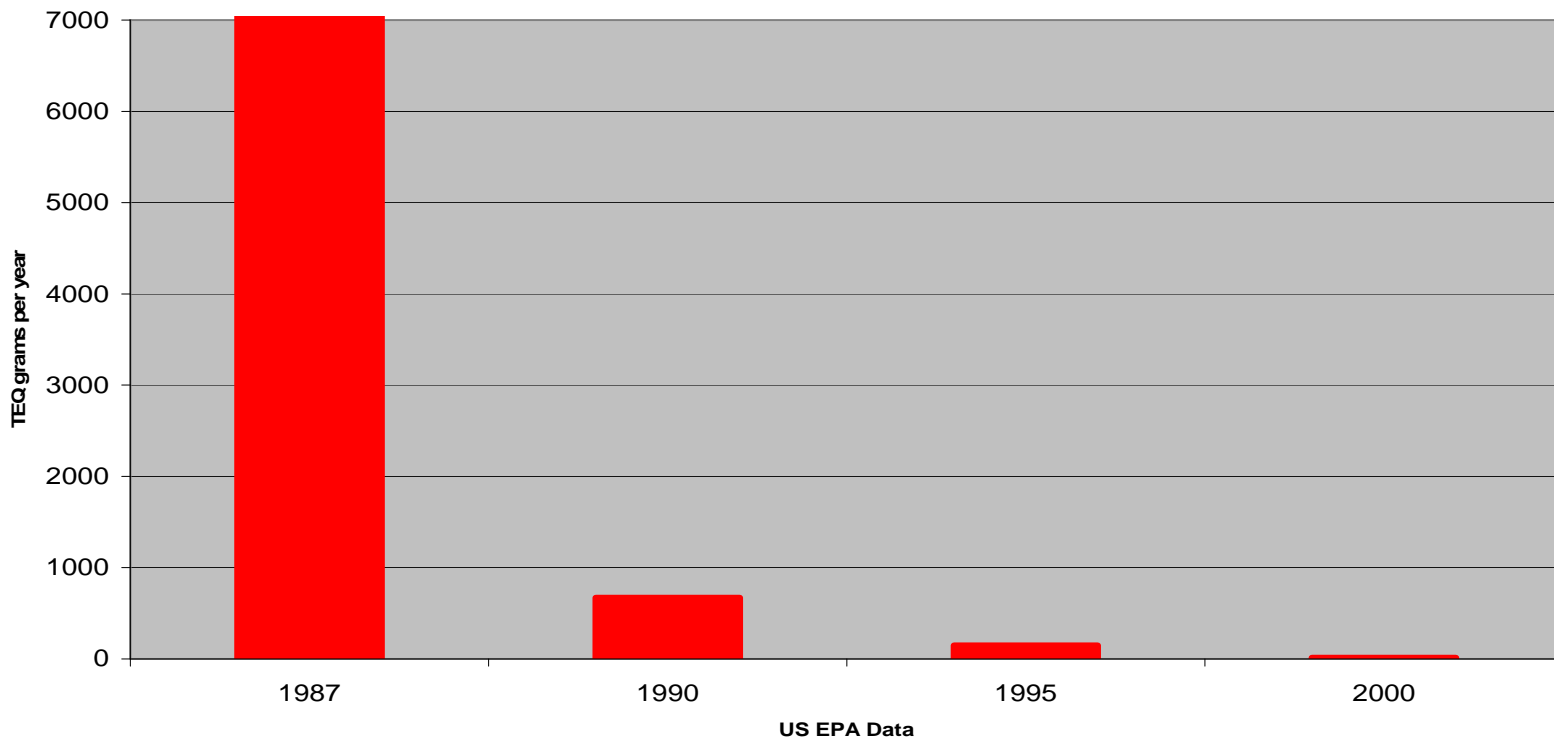
# Waste-to-Energy Emissions

The general public still voices the most concern about dioxins when considering a WTE plant:

- Dioxin emissions have dropped to insignificant levels in WTE facilities over the past 20 years
- 1987 – WTE is 63% of sources measured
- 2002 – WTE is 17% of sources measured

# Reduction of Dioxins in U.S. Waste-to-Energy Plants

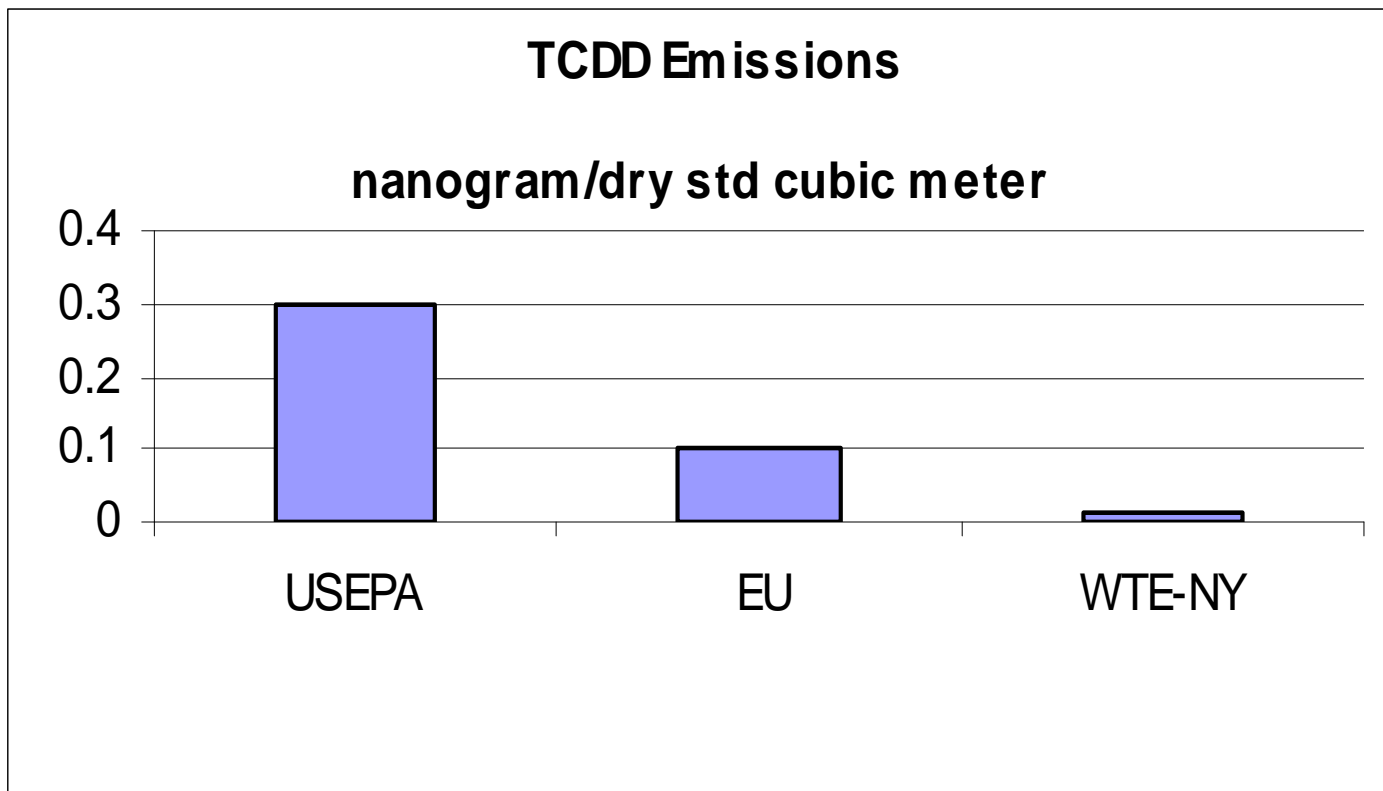
Annual Dioxins Emissions  
Total for US



# Average Emissions of 95 US Waste-to-Energy Plants

Pollutant	Average Emission	EPA standard <sup>a</sup>	Average Emission % of EPA Standard	Unit
Dioxin/Furan, TEQ basis	0.05	0.26	19.2%	ng/dscm
Particulate Matter	4	24	16.7%	mg/dscm
Sulfur dioxide	6	30	20%	ppmv
Nitrogen Oxides	170	180	94.4%	ppmv
Hydrogen Chloride	10	25	40%	ppmv
Mercury	0.01	0.08	12.5%	mg/dscm
Cadmium	0.001	0.020	5%	mg/dscm
Lead	0.02	0.20	10%	mg/dscm
Carbon Monoxide	33	100	33.3%	ppmv

# TCDD Emissions



# Environmental and Economic Impacts



- Reduction of fossil fuel importation and use
- Generation of electricity and heat
- Recovery of ferrous and non-ferrous metals
- Production of saleable products from ash residue

# Environmental and Economic Impacts



- Reduction in number of transfer stations
- Cleaner local environment
- More jobs
- More recycling

# Health Impacts

- Using multi-stage BACT air cleaning systems, the health risks of a modern WTE plant are about 1 to 2 per million;
- Those of urban diesel trucking are over 100 per million;

Being struck  
by lightning  
16 per  
million.



# WTE...Part of the Global Warming Solution

- 249 Million tons of MSW is disposed of at landfills (5 Billion kwh generated), creating 20 kw hours of electricity per ton of waste
- 29 Million tons of MSW is combusted at WTEs (15 Billion kwh generated), creating 550 kw hours of electricity per ton of waste

# Conclusions

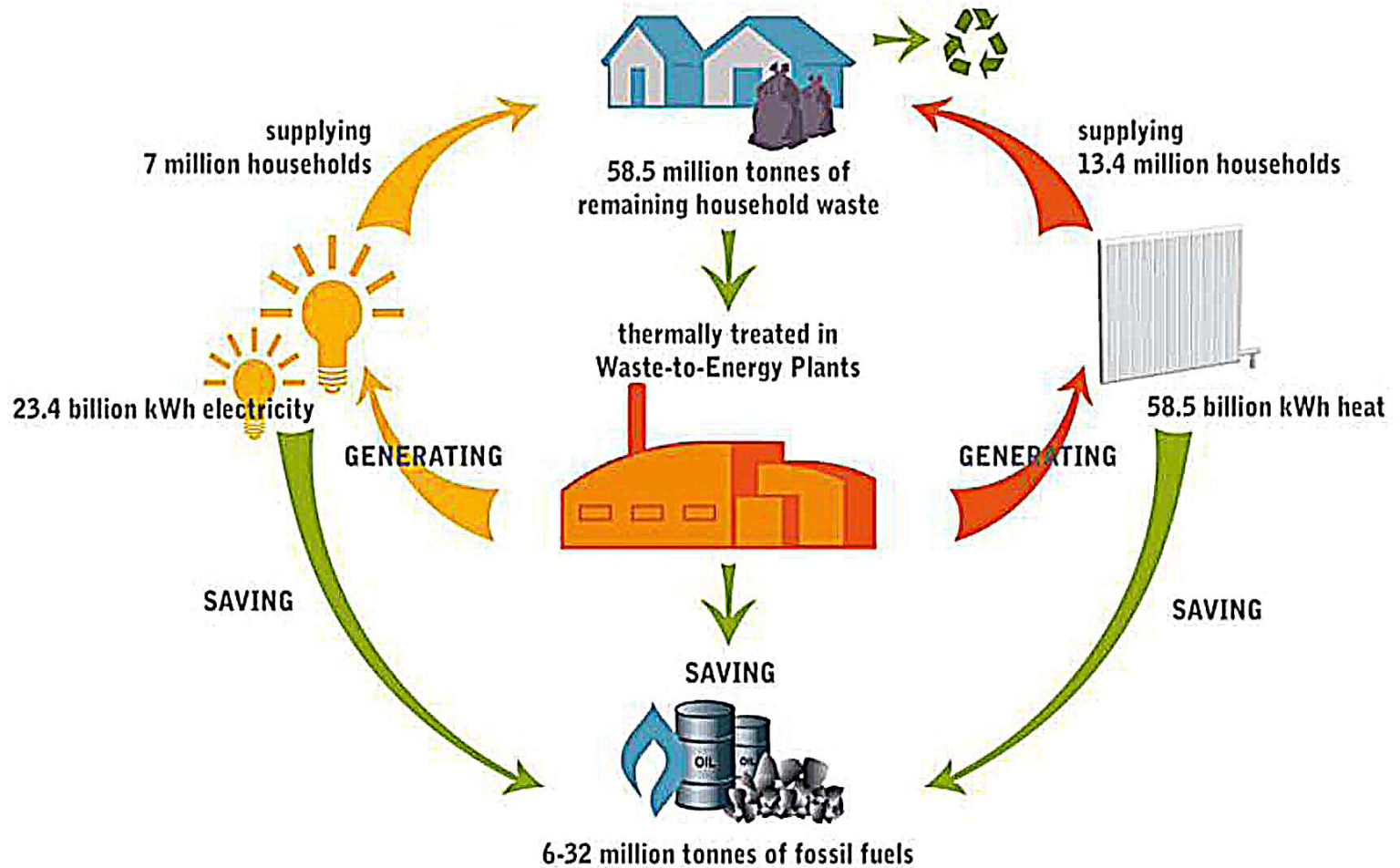


After the 3 R's....

WTE should be the preferred waste management practice

- Less pollution
- Less health impacts
- Lessens our dependency on fossil fuels
- Produces energy & other usable products

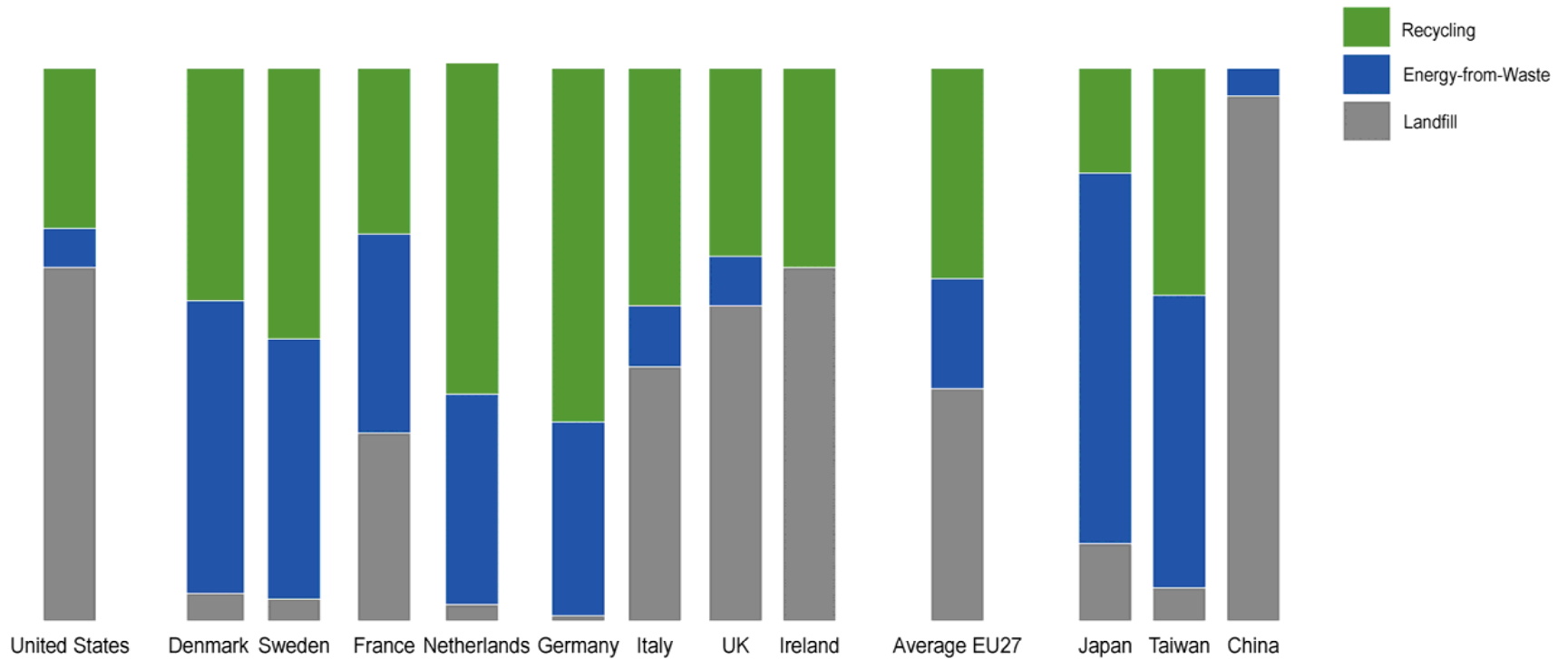
# EU Waste-to-Energy Cycle



**EfW 0.2 billion tons**

**Recycling 0.5 billion tons**

**Landfill 1.0 billion**



United States  
~ 90 EfW  
30 Million TPY

Western Europe  
~ 400 EfW  
65 Million TPY

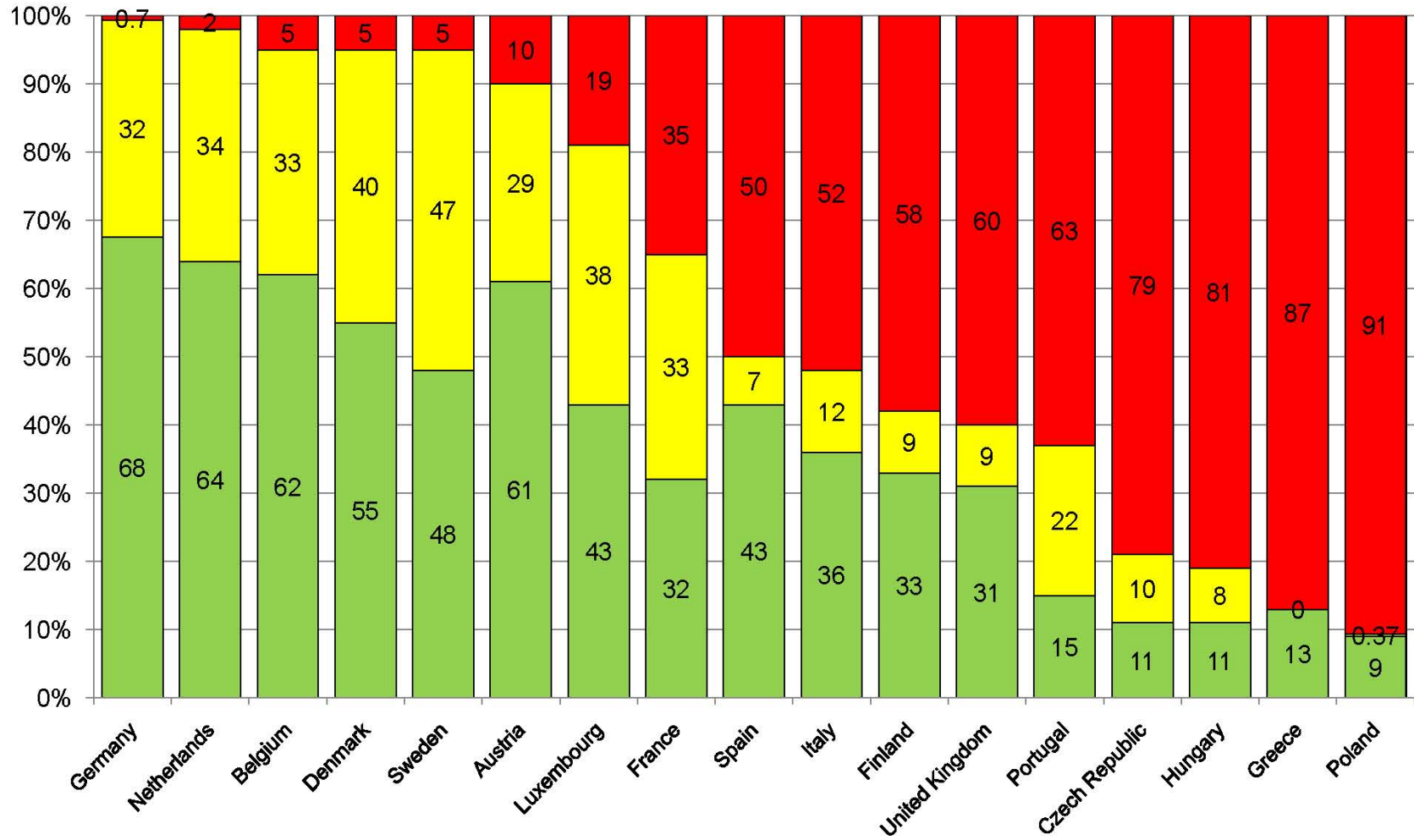
Asia  
~ 325 EfW  
55 Million TPY

# Treatment of MSW in the EU 27 in 2006

Source: EUROSTAT



■ Recycling (Incl. Composting)
 ■ Waste-to-Energy
 ■ Landfilling

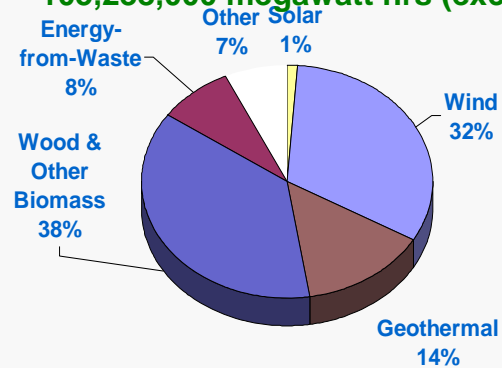




**SEMASS Resource Recovery Facility**  
**Rochester, Massachusetts**  
Developed by Energy Answers

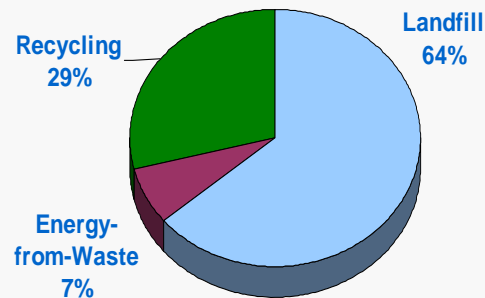
# Energy-from-Waste's (EfW) Vital Role in the United States

**Annual U.S. Renewable Generation = 105,238,000 megawatt hrs (excluding hydro)**



*Source: U.S. Department of Energy, Energy Information Administration 2008 Report*

**Annual U.S. Waste Generation = 413,014,732 Tons**



*Source: 2008 Joint Study by Biocycle and Earth Engineering Center of Columbia University*



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