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New Jersey Clean Air Council

January 10, 2018

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Introduction to Covanta

Business Overview

Headquarters – Morristown, NJ

Ownership – Publicly traded NYSE

Employees ~ 3,500

Energy from Waste Leader

Waste Disposal

- 45 Energy from Waste facilities (“EfW”)
- Process ~20 million tons of waste annually

Energy Generation

- 1,500 MW base load electricity capacity
- Over 10 million MWh annually
  - Enough to power 1 million homes

Metals Recycling

- ~400,000 tons of ferrous metal annually
- ~ 30,000 tons of non-ferrous metal annually

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Essex County Resource Recovery Facility

- Project Startup: 1990
- Technology: Mass Burn
- Waste Design Capacity: 2,800 TPD
- Electricity Capacity: 66 MW
- No. of Boilers: 3
- Full-time Employees: 76
  - VPP STAR Certified
  - Local 68

The facility serves the refuse disposal needs of 22 municipalities in Essex County, New York City and the surrounding region.

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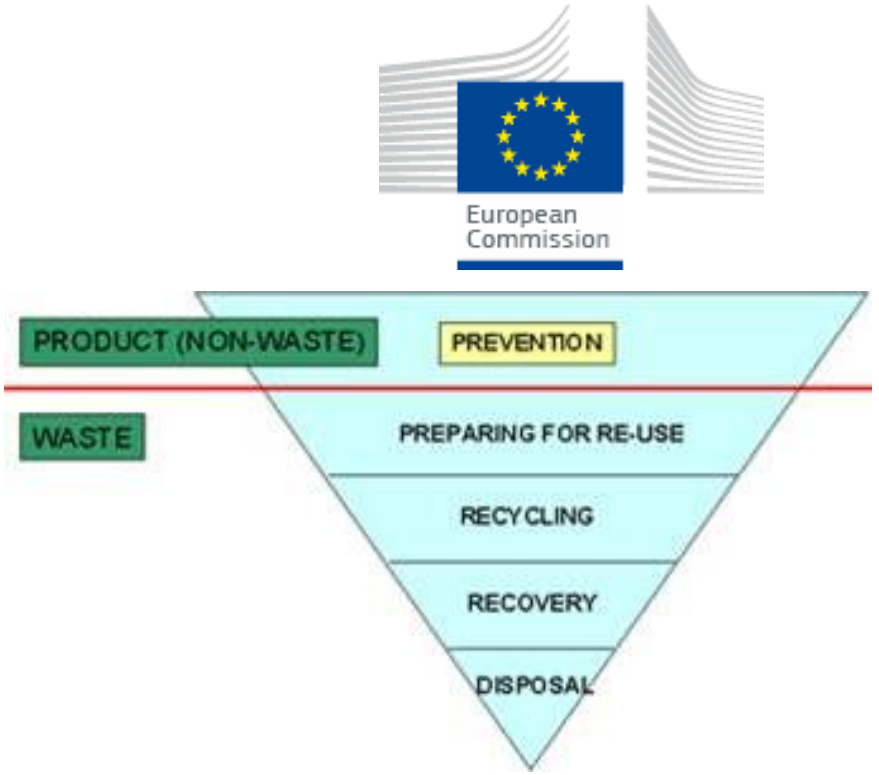
Covanta Essex in the Community

- Open house and community information night
- Partnered with a number of local groups including Newark's Ironbound Business Improvement District and the City of Newark to host a number of e-waste collection events collecting over 25,000 lbs. of electronics.
- Helped sponsor both the Holiday Lights Spectacular and the sea lion exhibit at the County's acclaimed Turtleback Zoo.
- Worked to improve the aesthetics and safety of the Raymond Boulevard/New Jersey Turnpike gateway entrance to the City of Newark.
- Sponsored the Lincoln Park Music Festival with over 50,000 people in attendance and collected/disposed of the waste.

Best use of waste

The EPA and the EU have ranked the most environmentally sound strategies for municipal solid waste management. Source reduction and reuse are the most preferred method, followed by recycling, energy recovery, and, lastly, treatment and disposal.

http://www.epa.gov/osw/nonhaz/municipal/hierarchy.htm



http://ec.europa.eu/environment/waste/framework/index.htm

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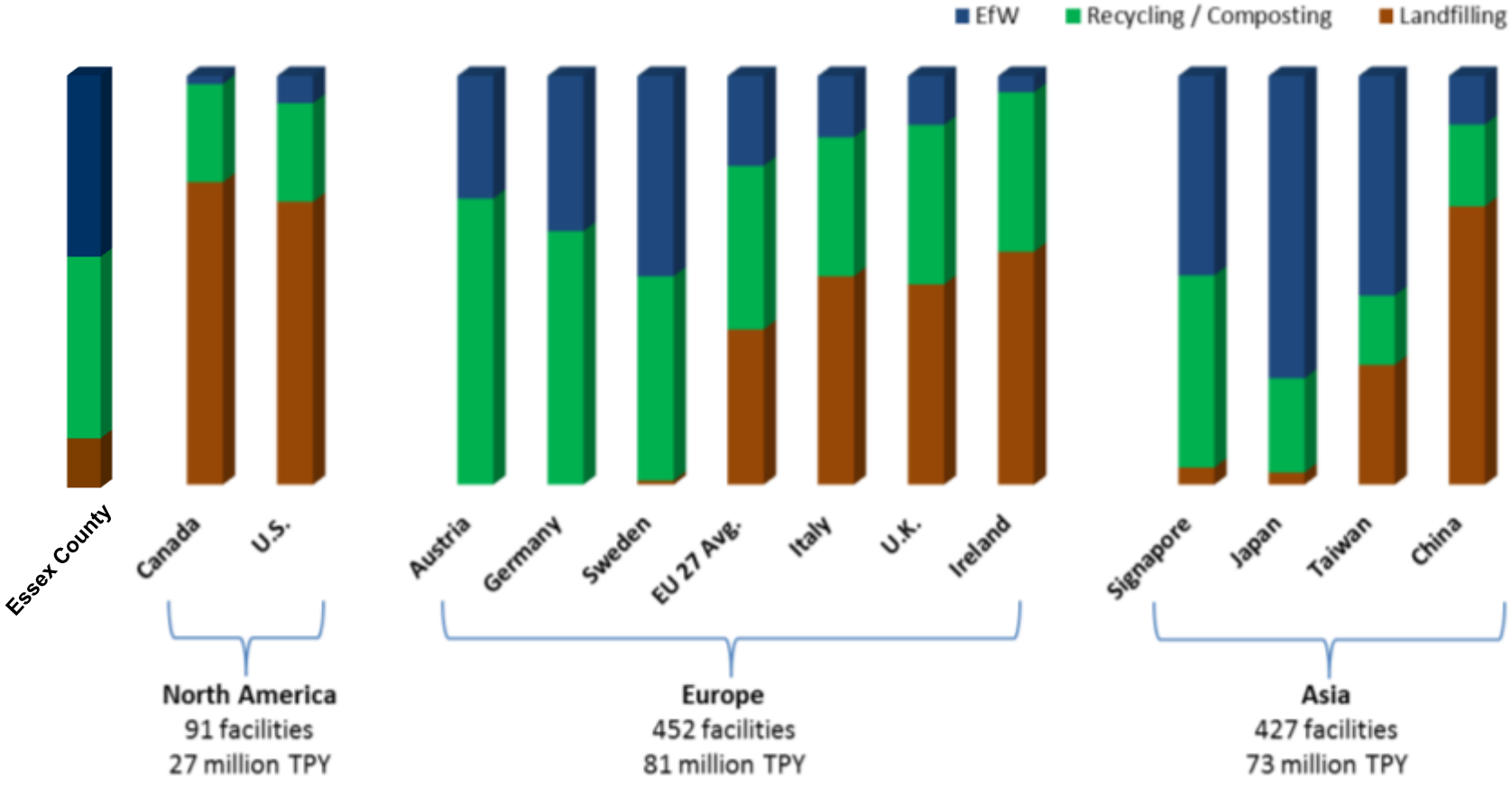
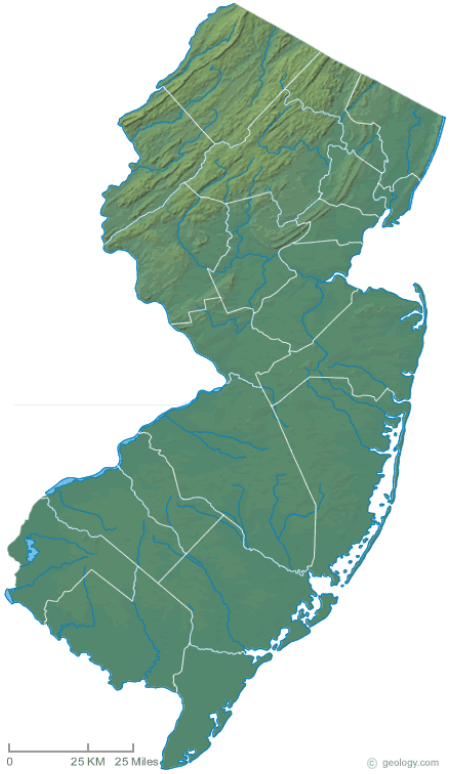
A Global Perspective

- **EfW is used extensively worldwide instead of landfills.**
  - Over 1,000 facilities; 180 million tons per year (TPY)



New Jersey's Waste Disposal

- **40% recycling rate or 3.9 million tons**
- **5.9 million tons remain after recycling**
  - 1.5 million tons to in-state EfW
  - 2.0 million tons to in-state landfills
  - 2.4 million tons exported out of NJ, mostly to landfills
- **4.4 million tons being landfilled or 75% of waste after recycling**
  - Renewable energy resource going to waste
  - Potential to reduce 4.4 million tons of GHG per year

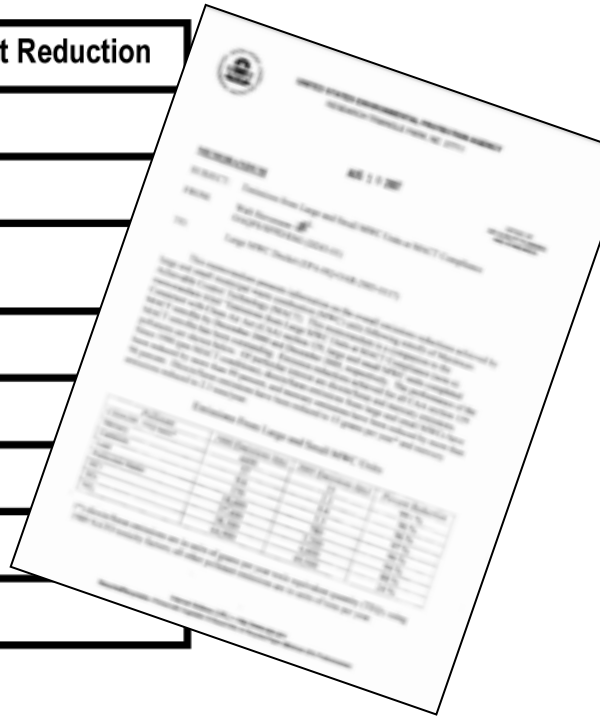


Sustainable Difference between EfW and Landfills

Energy-from-Waste		Landfills
Converts MSW to energy in 1-hour	vs.	100 years to decompose with potential leaks
Modern emission control & monitoring	vs.	No emission control; limited monitoring
Generate 550 – 750 kWh/ton	vs.	With landfill gas recovery 65kWh/ton
Avoids 100% of methane	vs.	Leading source of methane emissions
Recover and recycle metals	vs.	No metal recovery

"The performance of the MACT retrofits have been outstanding."

Pollutant	1990 Emissions (tpy)	2005 Emissions (tpy)	Percent Reduction
CDD/CDF, TEQ basis*	4400	15	99+%
Mercury	57	2.3	96%
Cadmium	9.6	0.4	96%
Lead	170	5.5	97%
Particulate Matter	18,600	780	96%
HC1	57,400	3,200	94%
SO_2	38,300	4,600	88%
NO_x	64,900	49,500	24%



Baghouse

- Agreement between
  - Covanta
  - NJDEP
  - Governor's Office
  - The Port Authority of NY & NJ
  - New York Department of Sanitation
- $90 million investment
- NJDEP issued permits October 27, 2013
- Three State-of-the-Art Baghouse units
- 9120 Bags (3040 per unit)
- 20 foot long

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Environmental Performance

Pre-Baghouse Project

Allowable -vs- Actual Emissions

	Permit Limit	2007 - 2011 Actual Results	% Below Limit
Mercury	28 ug/dscm7	9.16 ug/dscm7	▼67%
Cadmium	35 ug/dscm7	9.24 ug/dscm7	▼74%
Lead	400 ug/dscm7	122.39 ug/dscm7	▼69%
Particulate	25 mg/dscm7	9.14 mg/dscm7	▼63%
Nickel	8 ug/dscm7	4.08 ug/dscm7	▼54%

All concentrations corrected to 7% oxygen.

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New Baghouse Environmental Performance

Emission Reductions after $85 million Baghouse Retrofit

	2011-2015 Average Actual Results (with ESP)	2016 Actual Results (with Baghouse)	% Reduction of Actuals
Mercury (µg / dscm)	6.7	1.5	77.6%
Cadmium (µg / dscm)	5.1	0.13	97.5%
Lead (µg / dscm)	66.2	1.4	97.9%
Particulate (mg / dscm)	4.9	1.0	80.1%
PM-10 (lb / hr)	6.4	2.5	60.9%
PM-2.5 (lb / hr)	4.5*	2.4	47.8%

All concentrations corrected to 7% oxygen

* Average of 2014-2015 data. PM 2.5 not tested until 2014.

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New Baghouse Environmental Performance

Allowable -vs- Actual Emissions

	Permit Limit	Latest Test Results (2016 / 2017)	% Below Limit
Mercury (µg / dscm)	28	1.5	94.7%
Cadmium (µg / dscm)	35	0.13	99.6%
Lead (µg / dscm)	400	1.4	99.7%
Particulate (mg / dscm)	12	1.0	91.8%
PM-10 (lb / hr)	17	2.5	85.4%
PM-2.5 (lb / hr)	17	2.4	86.2%

All concentrations corrected to 7% oxygen
Units 2&3 tested in 2016; unit 1 tested in 2017

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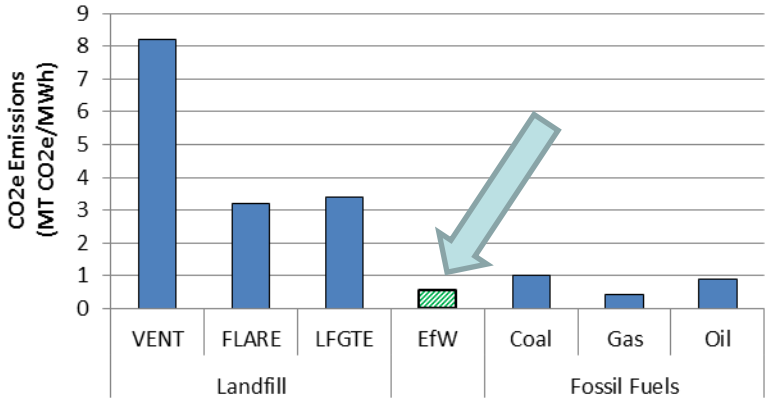
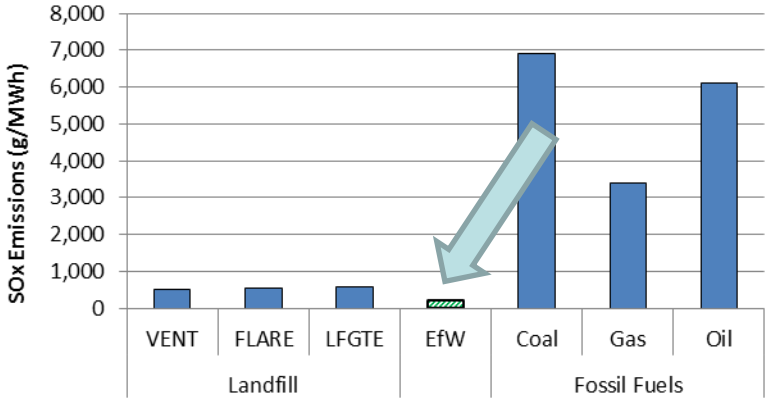
EPA Study: Lifecycle Energy Emissions

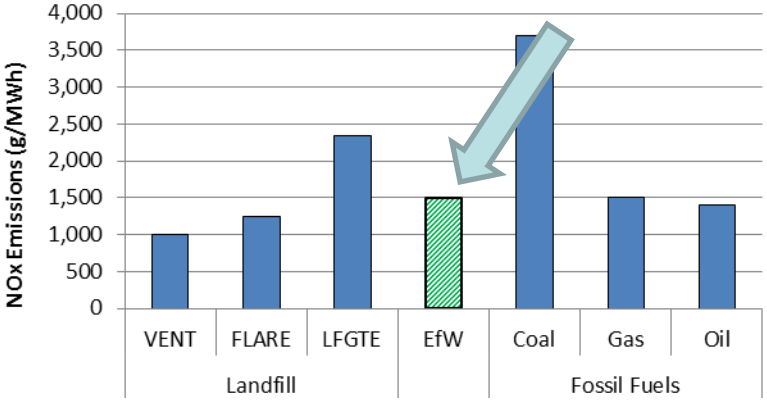
EfW is far below landfill gas to energy (LFGTE) in every category: CO_2, SO_x, NO_x, CO, PM



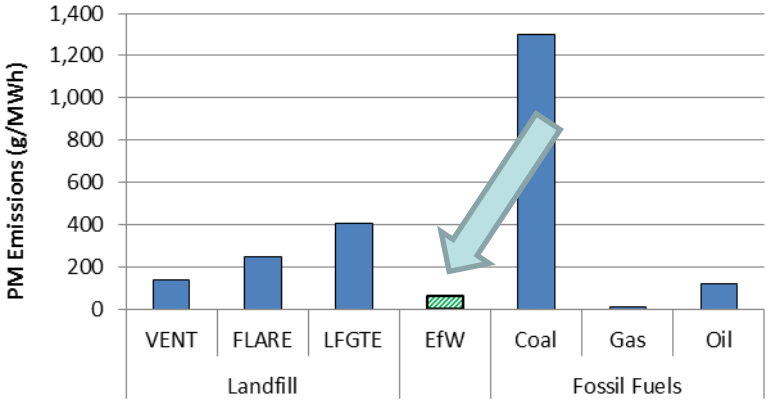
CO_2--EfW better than landfills, coal, oil, and on par with natural gas.



SO_2--EfW better than landfills, coal and oil.



NOx--EfW better than landfills & coal. On par with oil & natural gas.



PM--EfW better than landfills, coal and oil.

Source: Kaplan,P.O., J. DeCarolis, S. Thorneloe, Is It Better To Burn or Bury Waste for Clean Electricity Generation?, *Environ. Sci. Technol.*, 2009, 43 (6), 1711-1717

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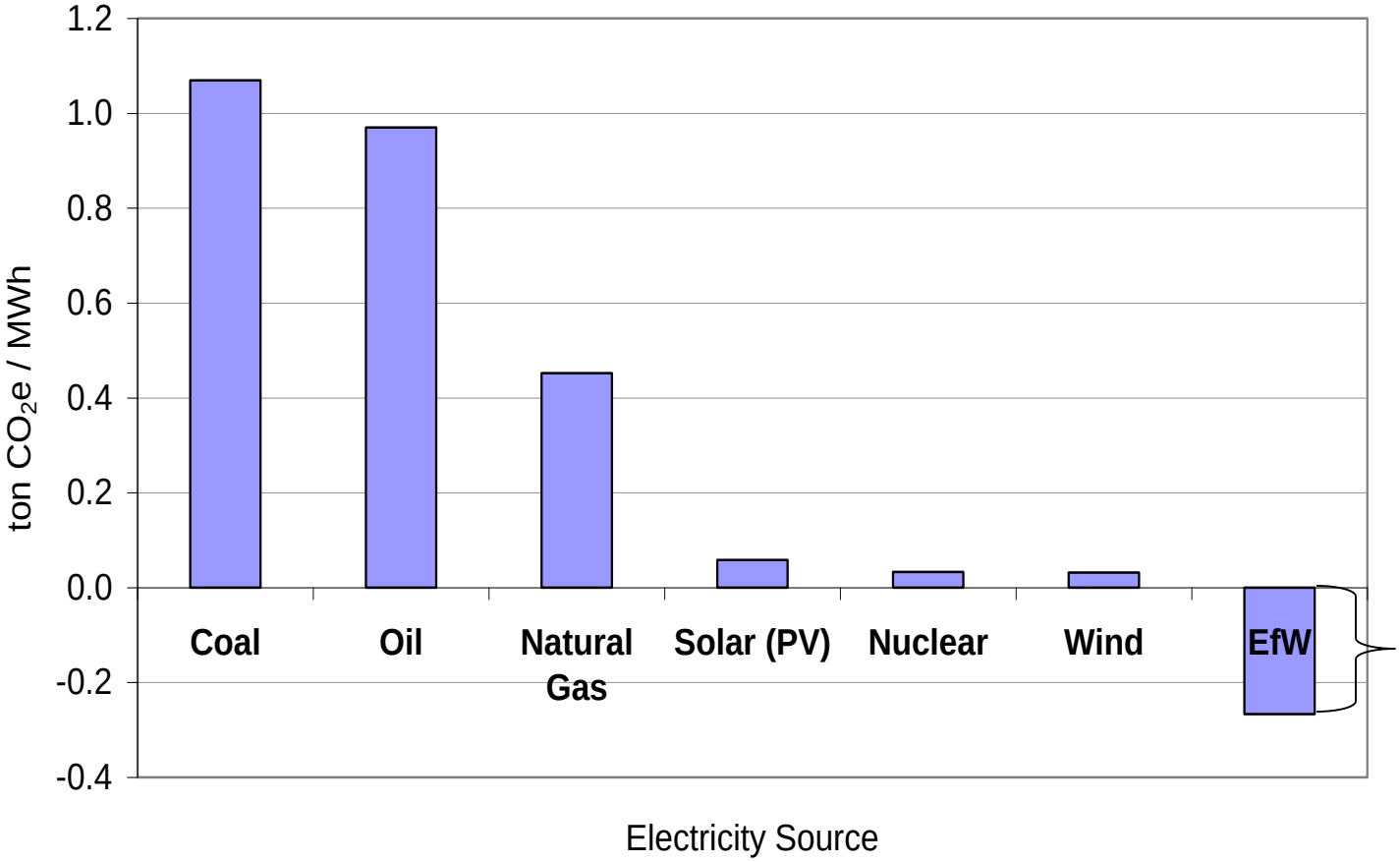
Electricity Sources: GHG Comparison



EfW reduces GHG emissions when including avoided CH_4 from landfills

Sources: WARM v10, U.S. EPA (2006), Hondo, Hiroki, 2005, Life cycle GHG emission analysis of power generation systems: Japanese case

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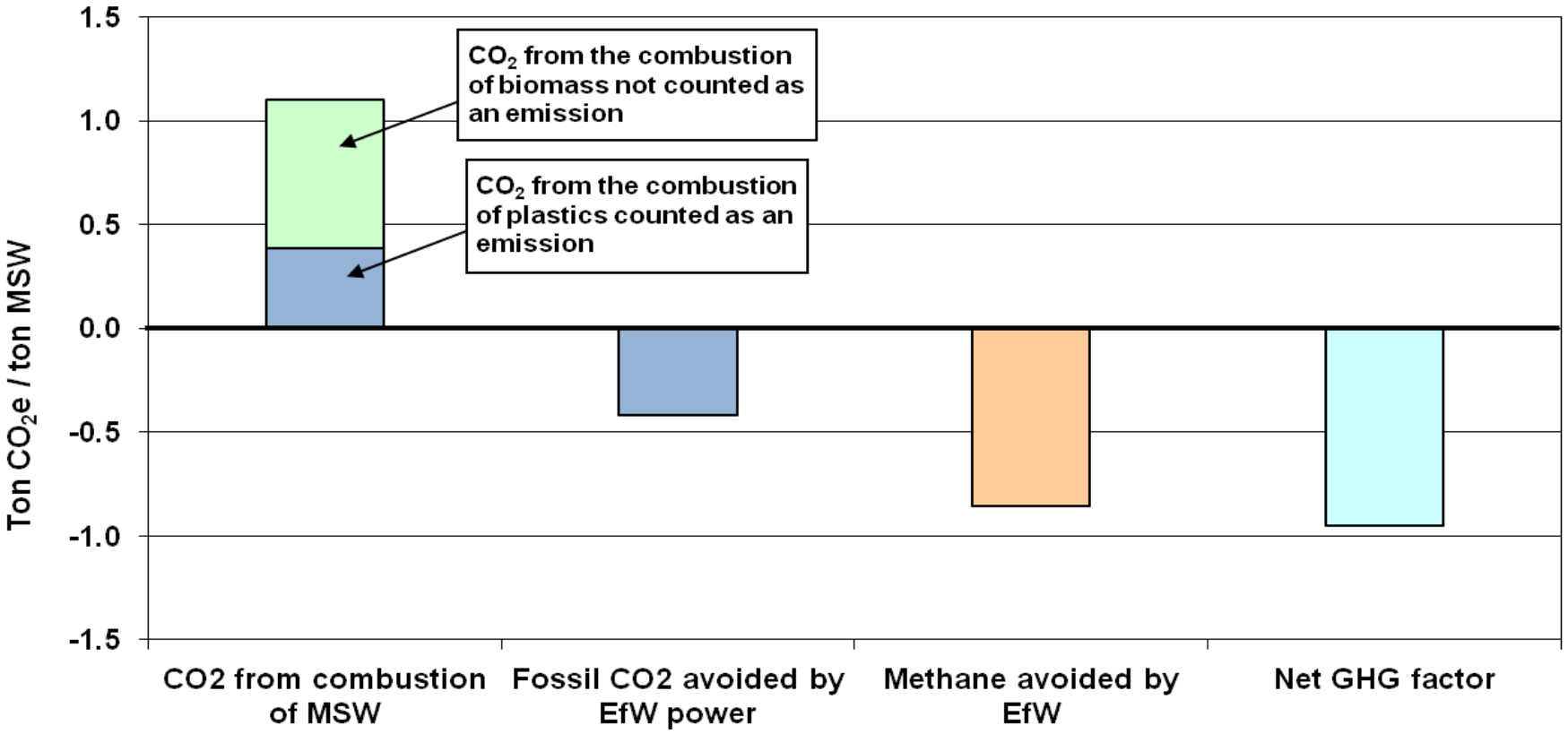
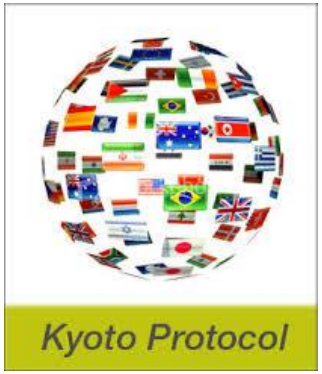
Energy From Waste – Climate Change

EfW is a Net Reducer of GHG

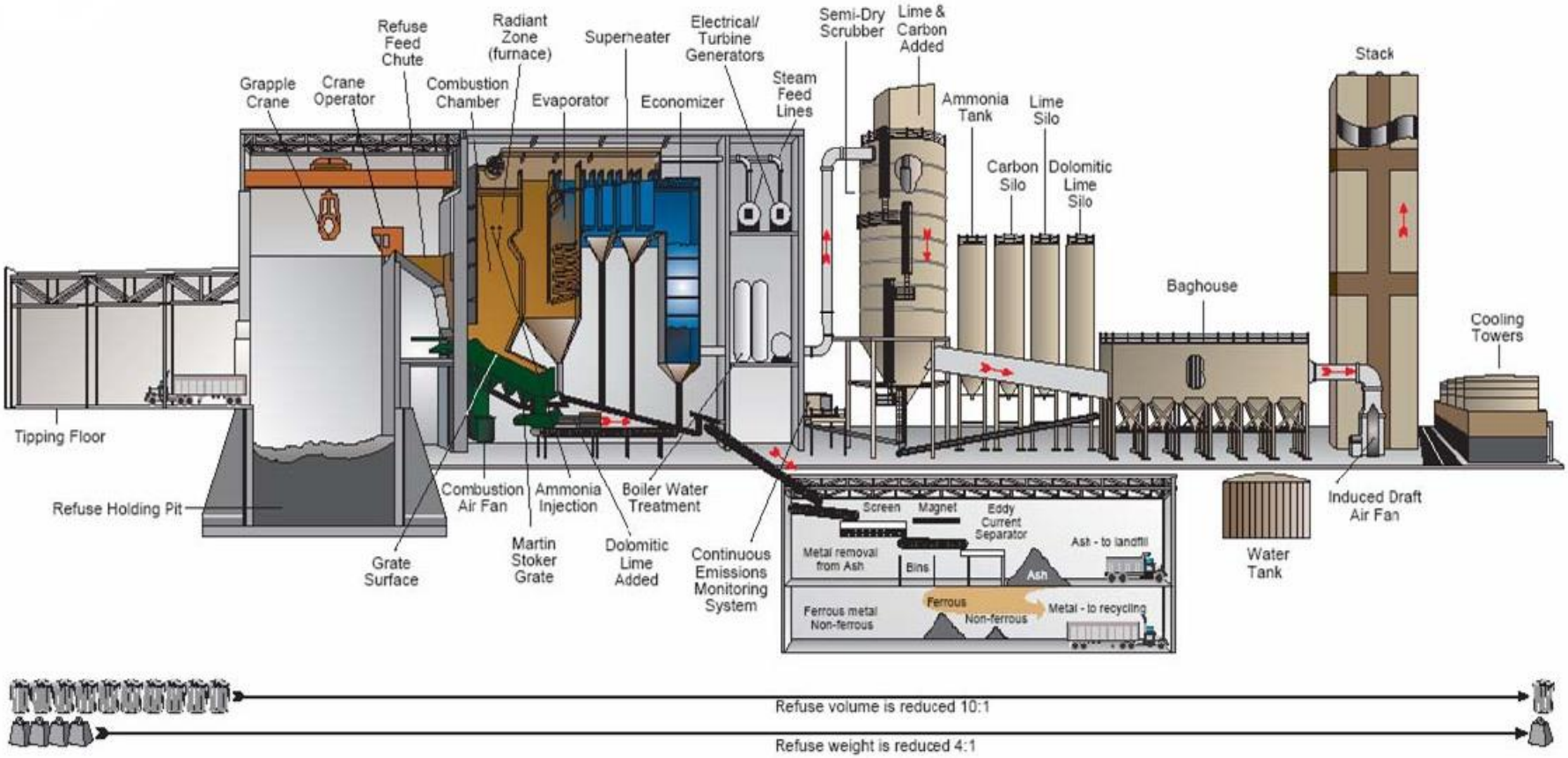


EfW Recognized as a Greenhouse Gas Reducer



Embrace of Sustainable Waste Management

EfW Process


Refuse Feed Chute
Radiant Zone (furnace)
Superheater
Electrical/ Turbine Generators
Semi-Dry Scrubber
Lime & Carbon Added
Grapple Crane
Crane Operator
Combustion Chamber
Evaporator
Economizer
Steam Feed Lines
Ammonia Tank
Lime Silo
Carbon Silo
Dolomitic Lime Silo
Stack
Baghouse
Cooling Towers
Tipping Floor
Refuse Holding Pit
Combustion Air Fan
Ammonia Injection
Boiler Water Treatment
Grate Surface
Martin Stoker Grate
Dolomitic Lime Added
Continuous Emissions Monitoring System
Screen
Magnet
Eddy Current Separator
Metal removal from Ash
Bins
Ash
Ash - to landfill
Ferrous metal
Non-ferrous
Ferrous
Non-ferrous
Metal - to recycling
Water Tank
Induced Draft Air Fan
Refuse volume is reduced 10:1
Refuse weight is reduced 4:1

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Thank you.