

COVANTA

Powering Today. Protecting Tomorrow.

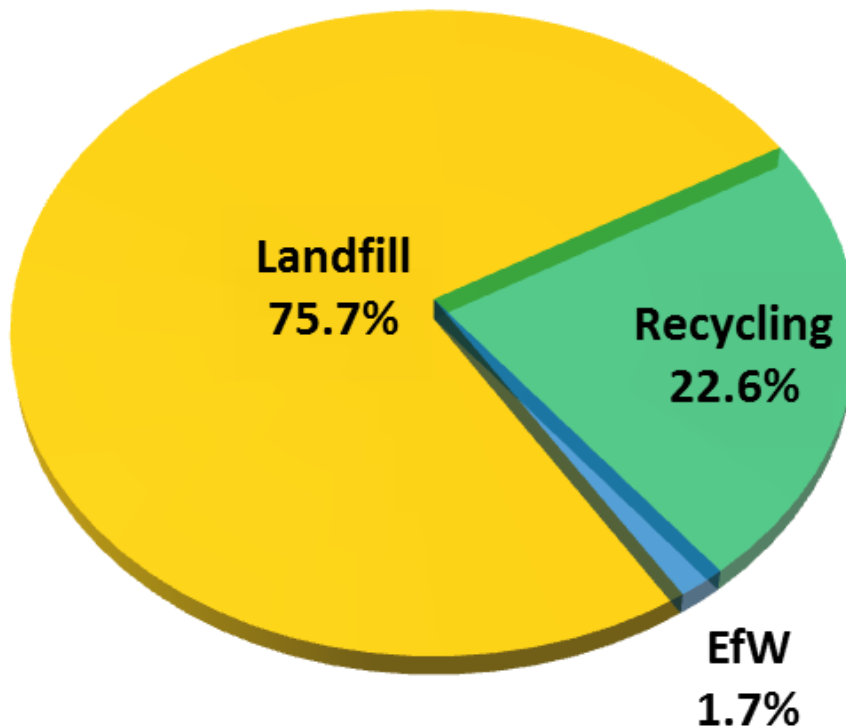


Sustainable Waste Management

The Role of Energy-from-Waste



Ontario: Current Picture

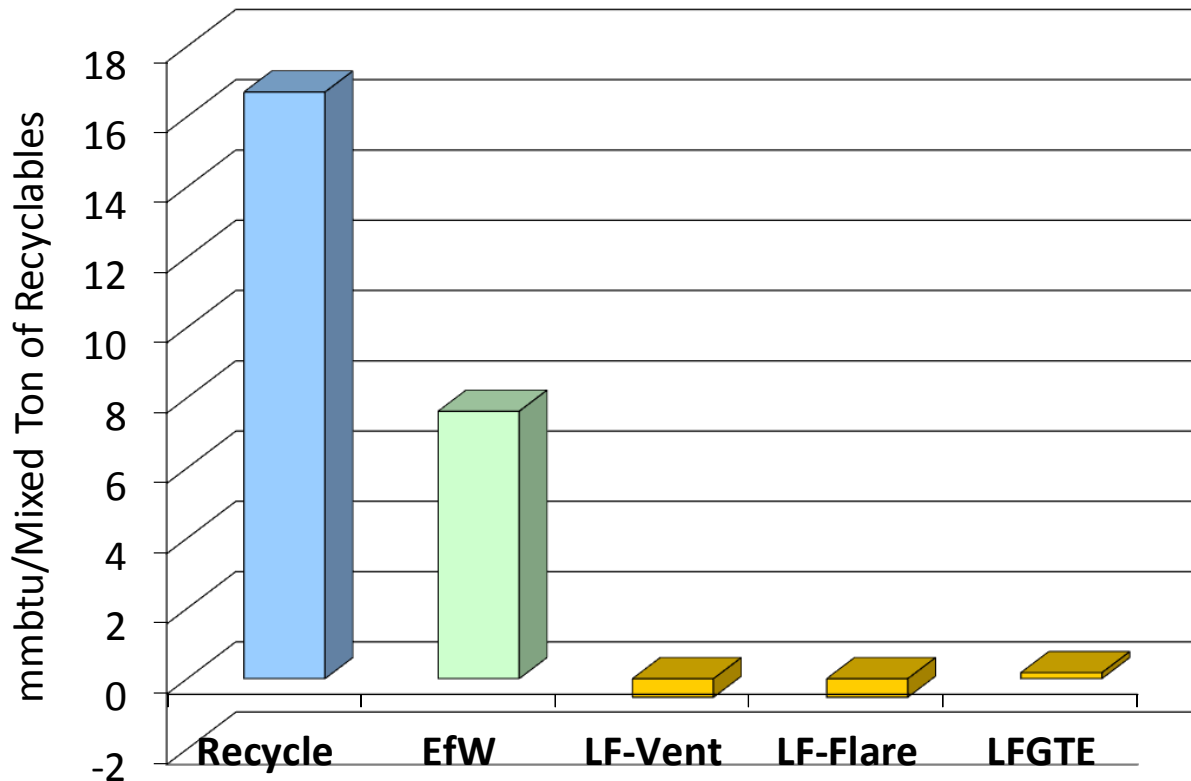


Landfilled & exported waste: A missed opportunity

- Additional truck traffic & fuel consumed
- Lost energy potential
- Greater GHG emissions from landfilling
- Lost economic benefit

Source: Statistics Canada (2008) Waste Management Industry Survey: Business and Government Sectors. EfW tonnage based on capacity of Algonquin & Elementa facilities

Energy: Waste is a Valuable Resource



Source: U.S. EPA Waste Reduction Model (WARM) Version 9 (October 2008)

The GHG Value of Recycling

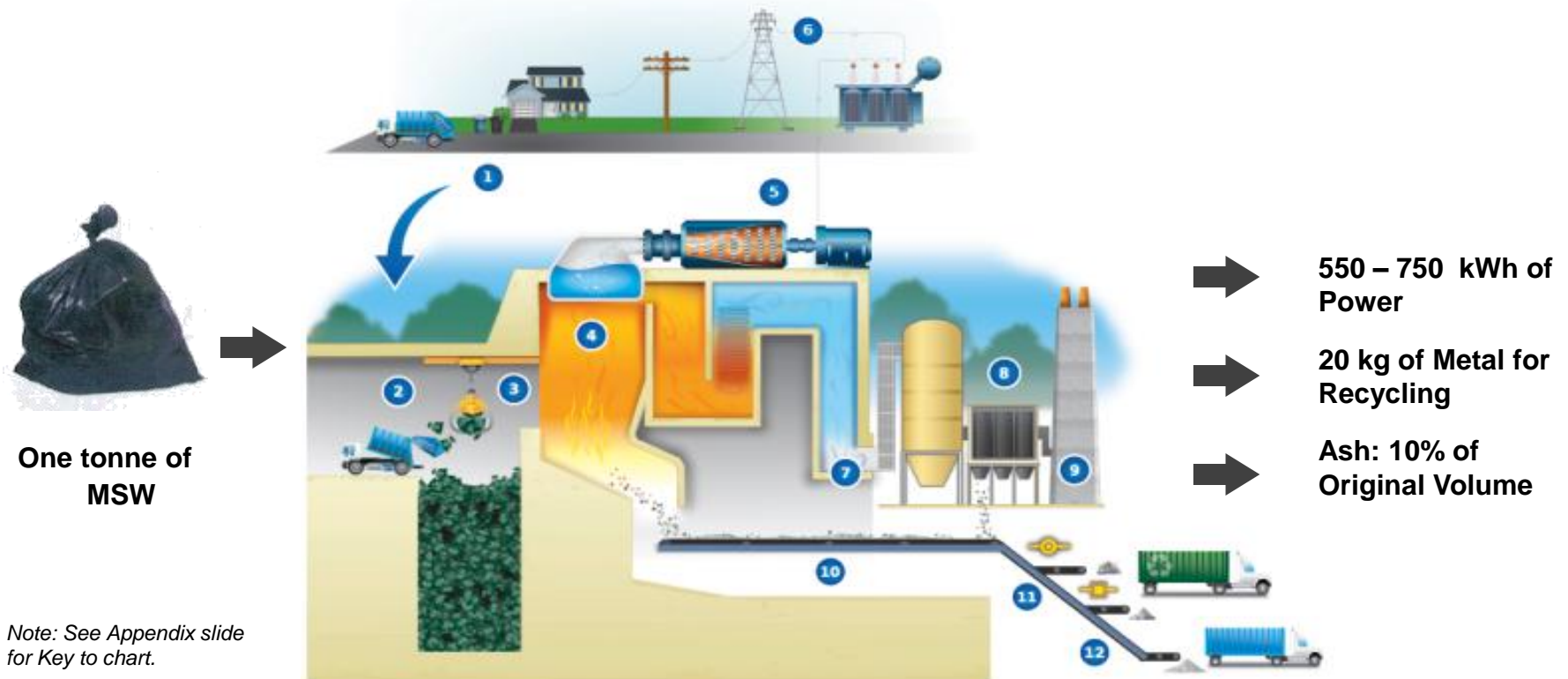
Recycle one ton of:	Reduce GHG emissions (tons CO₂e) by:
Aluminum	9.8 tons
Office Paper	4.4 tons
Newspaper	1.9 tons
Ferrous Metal	2.0 tons
HDPE	1.0 tons

Savings shown are relative to landfilling

Source: USEPA, Waste Reduction Model (WARM version 12)

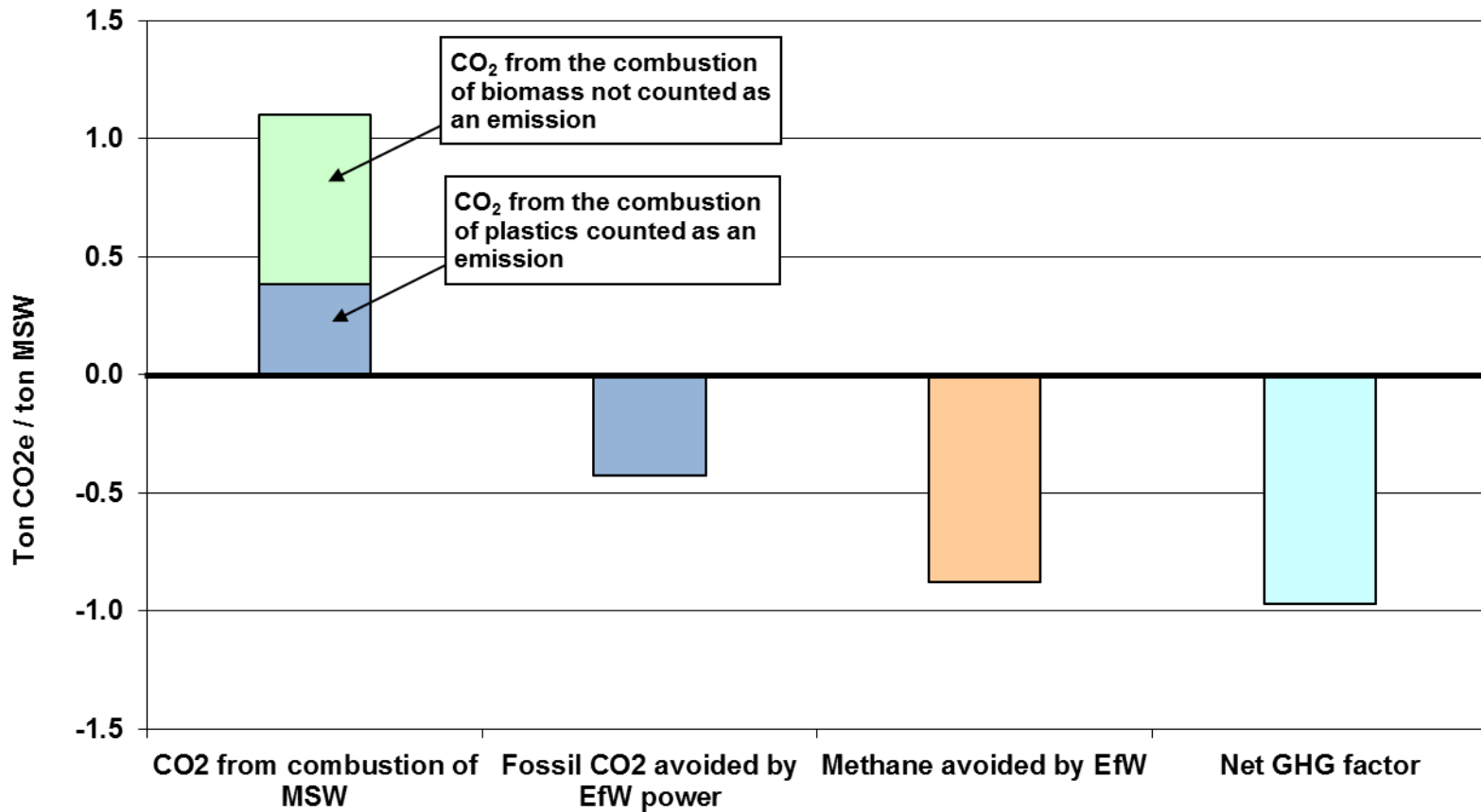
Energy-from-Waste Process

- Municipalities and others pay us to dispose of waste
- Technologically advanced facilities combust waste at high temperatures
- Resulting steam used to produce electricity for sale or sold directly
- Metals are retrieved from the process and sold to recyclers



Note: See Appendix slide for Key to chart.

The GHG Value of EfW



“... MSW combustors actually reduce the amount of GHGs in the atmosphere compared to landfilling. The savings are estimated to be about 1.0 ton of GHGs saved per ton of MSW combusted.”

New Focus on Methane Reduction

Scientific community calls for separate regulation

“...short- and medium-lived sources (black carbon, tropospheric ozone, and methane) must be regulated separately and dynamically”

Jackson, S., *Parallel Pursuit of Near-Term and Long-Term Climate Mitigation*
Science (2009) **326**: 526-527

“The case for developing parallel policy initiatives for near- and short-term climate mitigation is compelling.”

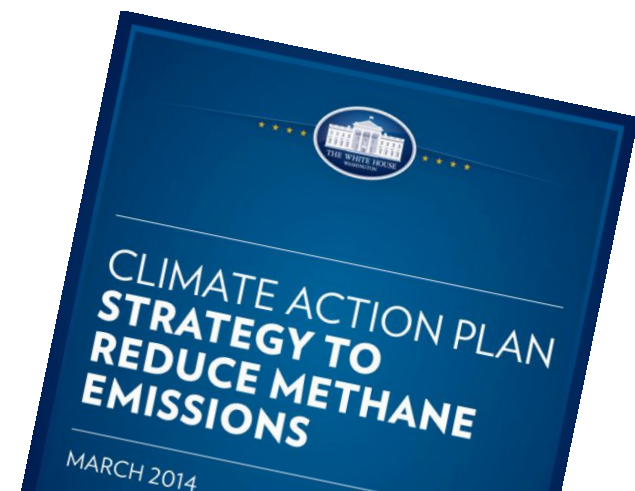
Weaver, A., *Toward the Second Commitment Period of the Kyoto Protocol*
Science (2011) **332**: 795-796

Climate and Clean Air Coalition

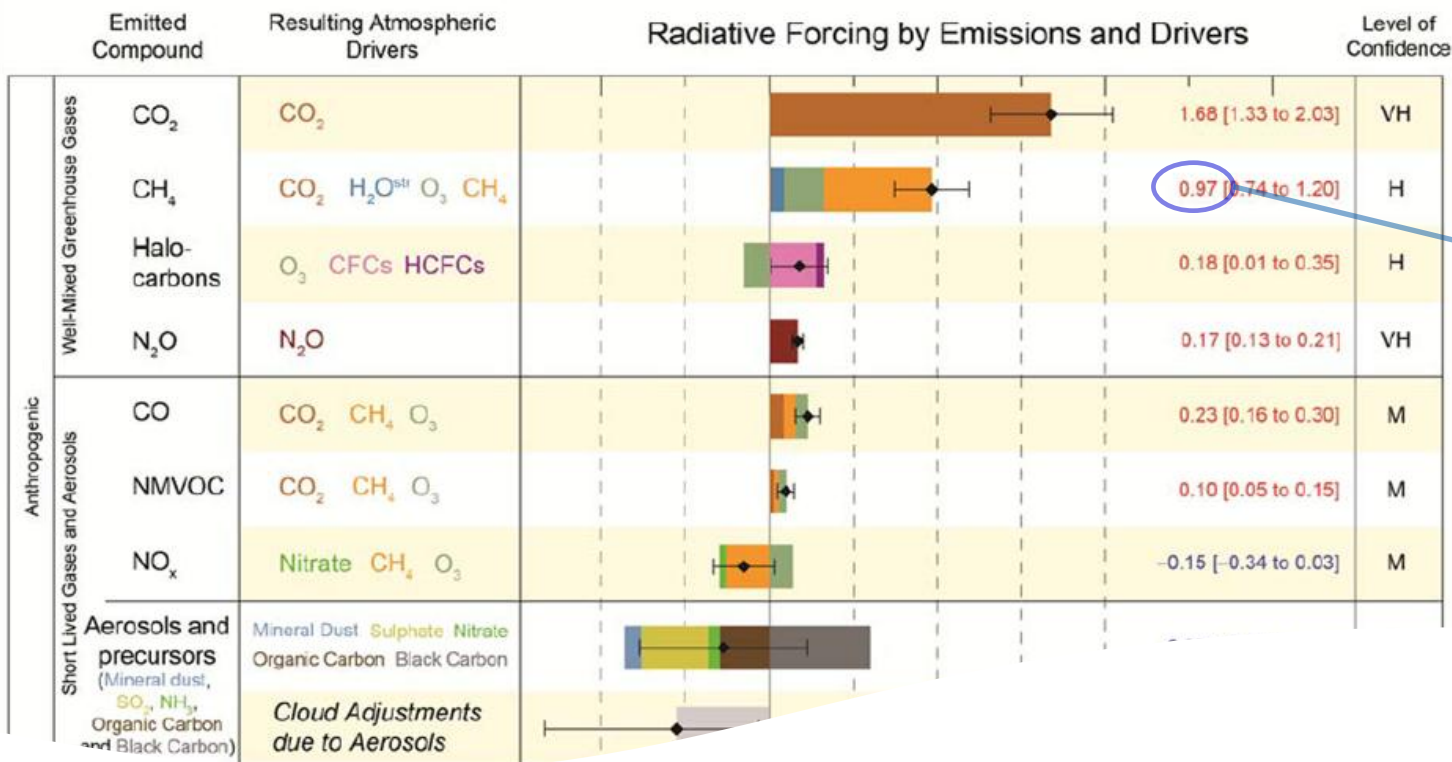
- Announced by U.S. Sec. of State Clinton in 2012
- Focus on black carbon, HFCs, and methane

White House Methane Strategy – March 2014

Focus on Landfills, Natural Gas & Oil Production & Distribution, Coal Mines, and Agriculture



Why? Methane bigger contributor than previously thought: 2013 versus 2007 IPCC reports



2013 Report
CH₄ Radiative Forcing (RF)
from Methane
= 0.97 W/m²

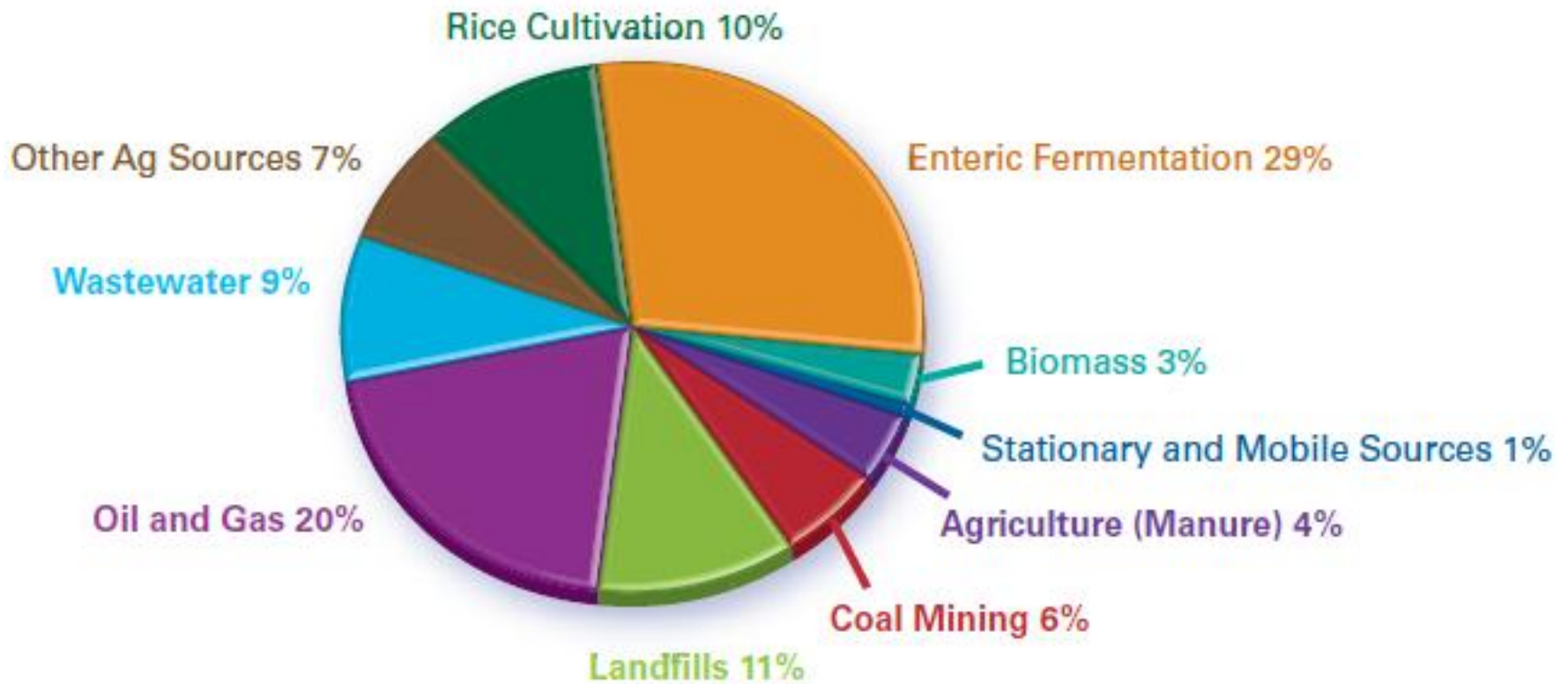
58% of CO₂'s contribution
42% of total net RF

Increasing Trend in Methane GWP

Source	Year	GWP	Time Horizon (years)
IPCC 2 nd Assessment	1995	21	100
IPCC 3 rd Assessment	2001	23	100
IPCC 4 th Assessment	2007	25	100
Shindell <i>et al.</i>	2009	34	100
IPCC 5 th Assessment	2013	28 / 34	100
IPCC 5 th Assessment	2013	84 / 86	20

Many still refer to the 17-year old GWP of 21

Figure 1: Estimated Global Anthropogenic Methane Emissions by Source, 2010

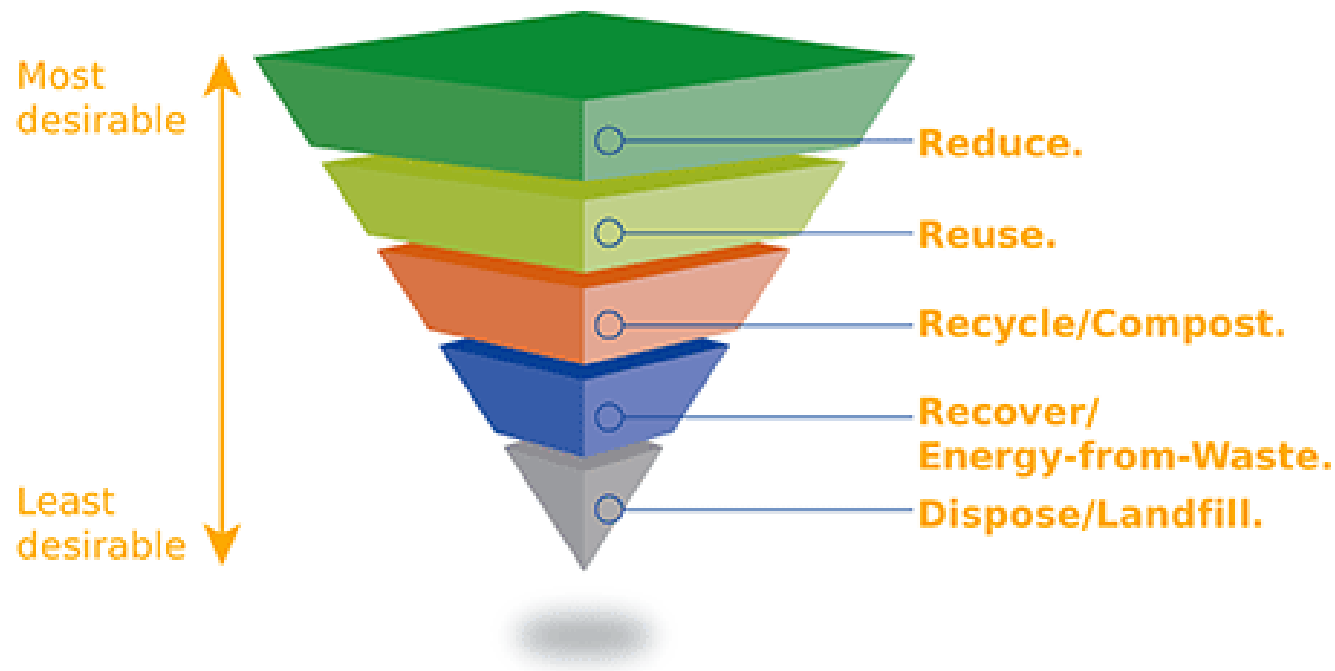


USEPA's Global Anthropogenic Emissions of Non-CO2 Greenhouse Gases

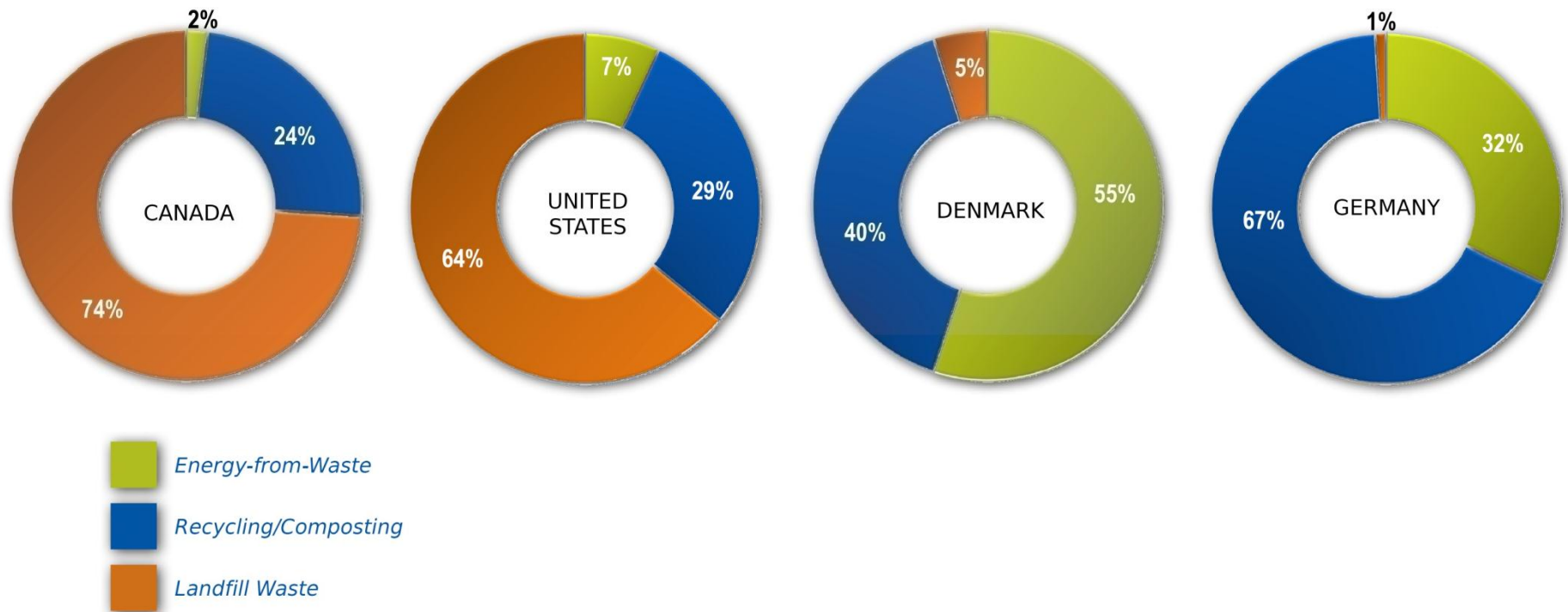
(EPA Report 430-R06-003)

Solid Waste Management Hierarchy

The European Union and the U.S. EPA have both concluded that following the waste management hierarchy generally maximizes energy savings and minimizes greenhouse gas emissions.



So How Do We Stack Up?



With over **450 plants**, WTE is widely used in Europe

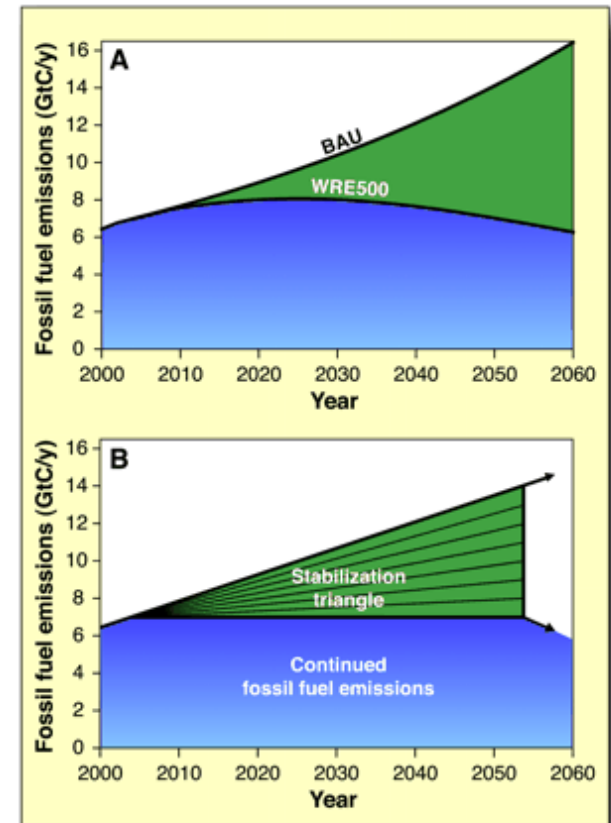


of WTE Facilities (2010)
Waste throughput (million tonnes)

Map Source:
Confederation of European
Waste-to-Energy Plants
(CEWEP)

Putting the Benefits into Perspective

- 2004 *Science* article by Drs. Pacala and Socolow (Princeton University) introduced the concept of the stabilization triangle
- 7 gigaton of carbon per year (7 GtC/yr) reduction needed by 2054 versus BAU
- Subdivided into 7 manageable wedges of 1 GtC/yr each
- Seven wedges together would *stabilize* world-wide greenhouse gas *emissions* at today's emission rate



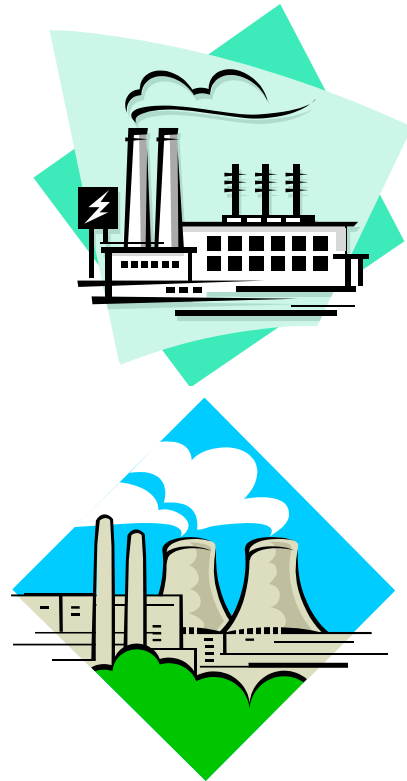
S. Pacala et al., *Science* 305, 968-972 (2004)

So, What If We All Followed the Hierarchy?

The Waste “Wedge”

The billion metric tonnes of carbon avoided is the equivalent of:

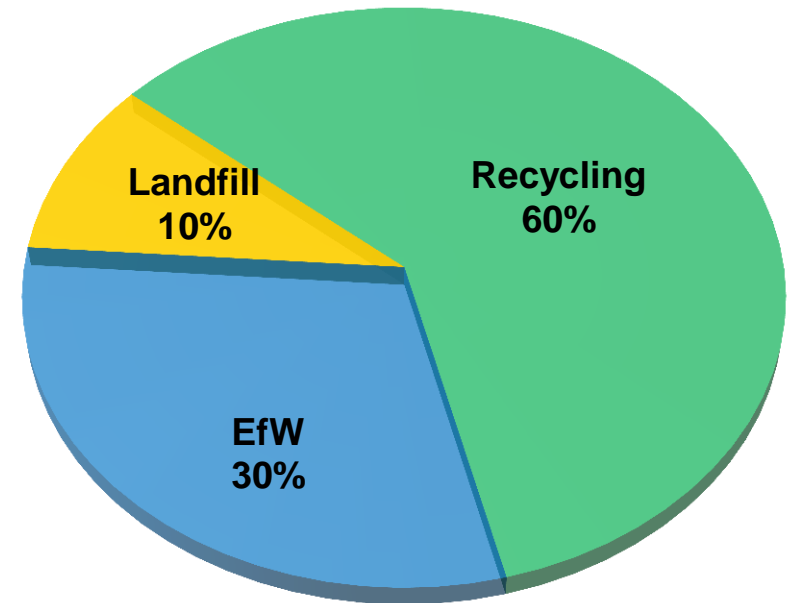
- Closing 1000 large coal-fired power plants
- Building 2 million 1MW wind machines
- Doubling our nuclear power plant capacity



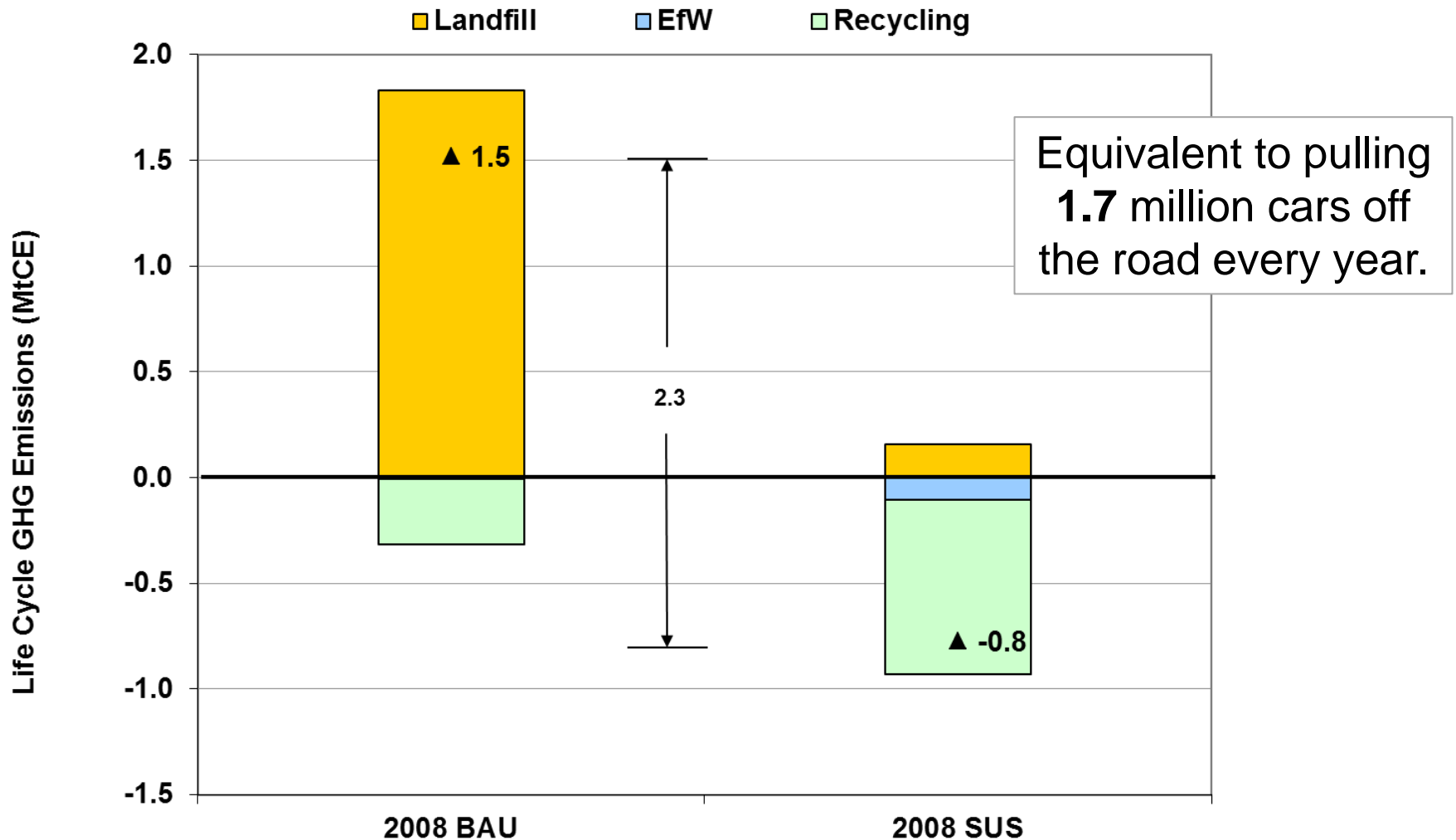
Ontario: The Potential

How much GHGs and energy could we save if:

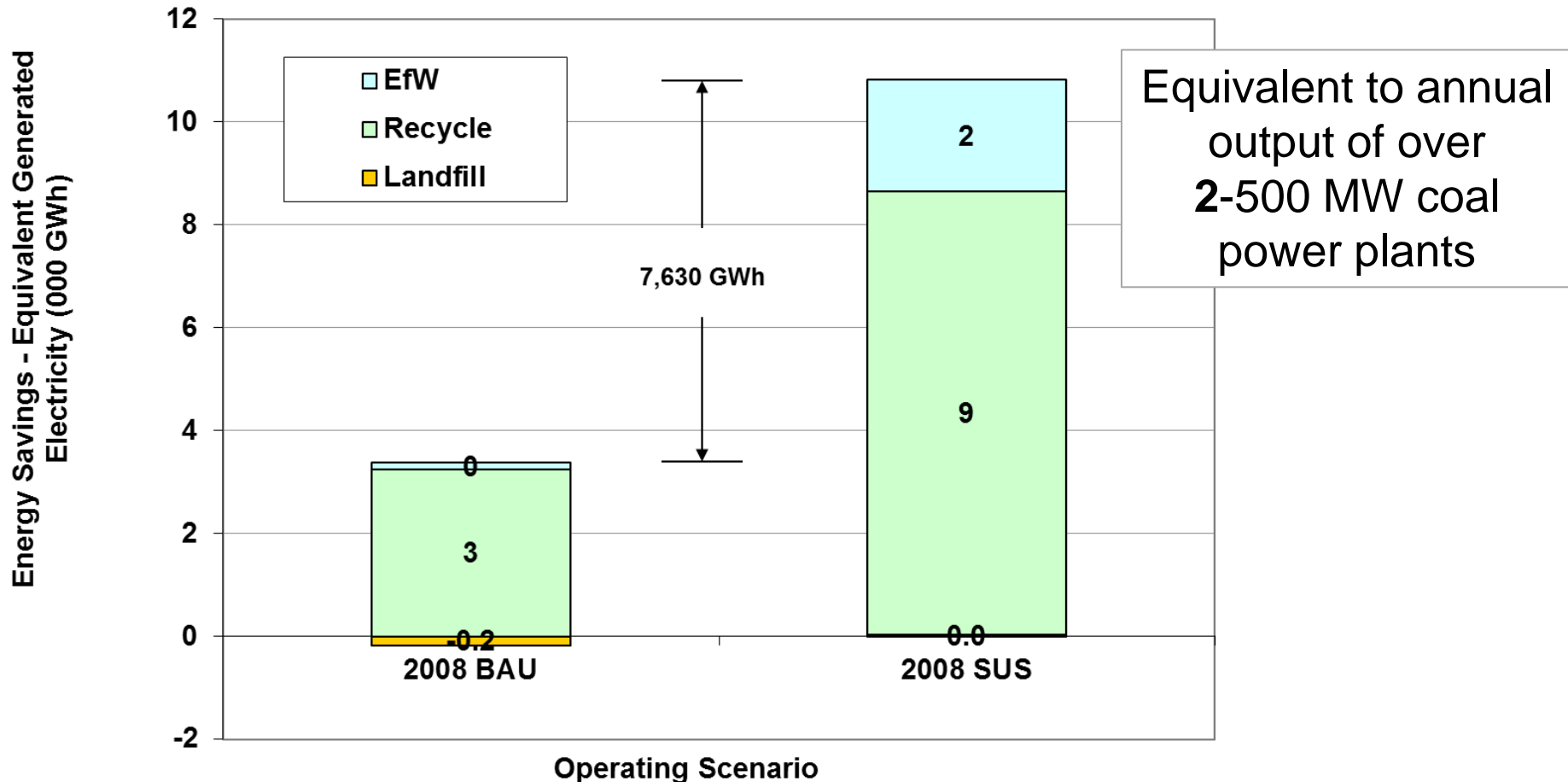
- We achieved recycling goal of 60%?
- Increased EfW to 30%?
- And only landfilled 10%?



Ontario “Wedge”

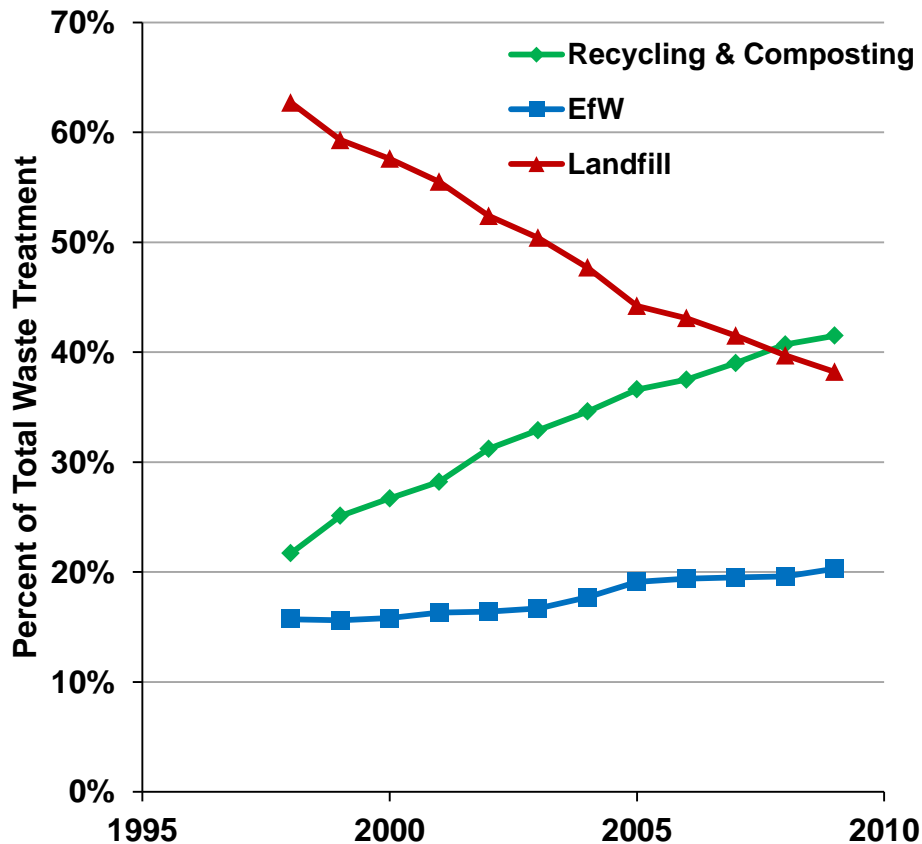


Ontario “Wedge”: Energy Savings



EfW: Compatible With Recycling

Waste Management Practices: EU 27



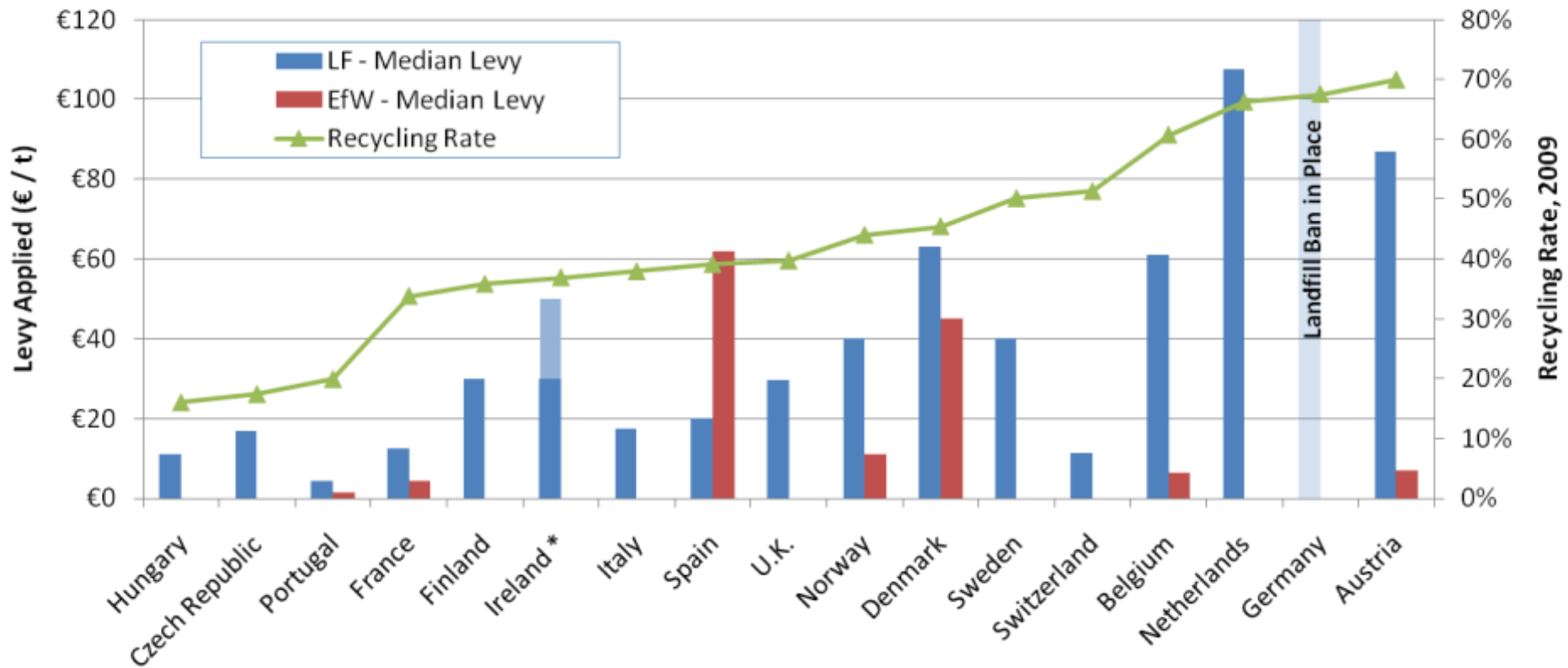
- In the EU, recycling and Energy Recovery have grown together because of policies that minimize landfills.
- The European Environment Agency says “there is no evidence to support” the argument that “incineration of waste with energy recovery hinders the development of recycling.”

Policy Tools: How Do We Get There?

- **Learn from the EU Success**
- **Beyond the 3 R's: Embrace the Full Waste Hierarchy**
 - Energy Recovery
- **Discourage Landfilling: The Least Preferable Practice**
 - Landfill levies
 - Biodegradable waste bans
- **Preferential electricity rates / Feed in Tariff**
 - WTE should be eligible
 - LFGTE, a less preferable process, is currently in
- **Accurate carbon / carbon offset policy**

Implementing the Landfill Directive

Comparison of European Landfill & EfW Levies with Recycling Rates



* Ireland landfill tax set to increase to €50 / t beginning Sept. 2011

Summary

- Ontario's current waste management represents a missed energy, GHG mitigation, and economic opportunity
- Ontario can achieve significant energy savings and GHG emissions reductions through implementation of the full waste hierarchy (4Rs)
- Ontario can learn through the experience of the EU
- Durham and York have blazed a path – others may follow

Durham York Energy Centre



Artist's Rendering - DYEC Visitor's Centre

- Publicly-owned facility
- 140,000 TPY EFW Facility
- Two 218 TPD Martin® combustion units w/ VLN™
- 17.5 MW electrical generating capability (11,000-14,000 homes)
- Most stringent emission standards
- Completion targeted for Q4 of 2014



THANK YOU

*Preliminary Architectural
Renderings of EfW Facility*



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Keys and information

COVANTA Energy - from - Waste process

- 1** Post-recycled municipal solid waste is picked up at your home or business.
- 2** Waste is delivered and temporarily stored in a bunker. We maintain the building around the tipping and bunker area under negative pressure and use this air in the combustion process to control odor.
- 3** The waste is fed into a combustion chamber and burned at extremely high temperatures in a self-sustaining process.
- 4** Heat from combustion boils water to create steam.
- 5** The steam turns a turbine-driven generator to produce electricity, or may sometimes be used directly for heating or industrial processes.
- 6** Electricity is distributed to the grid and used to power homes and businesses.
- 7** State-of-the-art air pollution control equipment is used to cool, collect, and clean combustion gases. This equipment operates under stringent state and federal standards.
- 8** We control emissions of particulate matter primarily through a baghouse (fabric filter).
- 9** Emissions and other operating criteria are continuously monitored to ensure compliance with state and federal standards.
- 10** Residual material from the combustion process is collected for processing and metals extraction.
- 11** Ferrous and non-ferrous metals are extracted for recycling.
- 12** Remaining residual materials are beneficially reused or disposed of in a landfill.