The Transition from Waste Management to Resource Management in North America

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Outline

- About SWANA
- Explain the Transition
- Product Stewardship, EPR and Zero Waste
- Recycling and Composting
- Waste-to-Energy
- Waste Conversion Technologies
- Resource Recovery at Landfills

About SWANA

- Not-for-Profit Professional Association
- Over 8,000 individual members
  - 65% from public sector
  - 35% from private sector
- 45 Chapters in US, Canada and Caribbean
- Professional development, education, training and advocacy

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SWANA's Mission

- Advance the practice of environmentally and economically sound management of municipal solid waste in North America.

SWANA Programs

- Policies and Legislative and Regulatory Advocacy
- Training and Education: In Person and On-Line
- Certification in Seven Disciplines
- Conferences, Symposia and WASTECON
- Seven Technical Divisions
- Applied Research and Development
- Scholarships, Internships and Awards
- Chapter Programs
- E-Library
- MSW Magazine, Member Newsletters

The Transition from Waste Management to Resource Management

- From a Traditional Waste Disposal Oriented Industry to a Comprehensive Resource Management Industry
- Suppliers of Raw Material and Energy Resources Rather than Managers or Disposers of Discarded Wastes
- Goal is to Produce High Quality, Reliable Supplies of Recycled Materials, Renewable Energy and Recovered Products

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Examples of the Transition to a Resource Management Strategy

- Product Stewardship: recognizing that discarded products are in fact potential material and energy resources,
- Zero Waste: understanding that waste generation represents an economic inefficiency,
- Recycling, Composting and WTE: recovering material and energy resources contained in waste discards,
- Conversion Technologies: deriving the highest resource value from waste materials,
- LFG recovery: recovering resources even after wastes have been disposed of.

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Product Stewardship in North America

- Started as Voluntary Industry Efforts
- Some Mandatory Programs at the Regional and Local Level are Emerging: EPR Extended Producer Responsibility
- Focus on Specific Products
  - Computers and Electronic Products
  - Mercury Containing Products
  - Carpets, Tires, Batteries, Beverage Containers
  - Pharmaceuticals

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Goal of Product Stewardship Efforts

- Fundamental shift in the waste management system for product waste,
- Away from solely government funded and ratepayer financed,
- Towards one that recognizes the producer's responsibility for managing product wastes:
  - Better product design and manufacture
  - Collect, process and recycle discarded consumer products

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EPR & Product Stewardship Initiatives in Canada

- Authority over solid waste generally rests with provinces
- Provinces support EPR approaches

Canada's EPR System

CPSC
California Product Stewardship Council

Funded by a grant from the Department of Resources Recycling and Recovery (CalRecycle)

Product Stewardship in British Columbia

- 1992 used oil take-back
- 1994 waste paints
- 1997 solvents, flammable liquids, pesticides, gasoline, pharmaceuticals and beverage containers
- 2002 Industry Product Stewardship Business Plan
- 2006 electronics and tires
- 2007 Ministry issued an extensive list of products to be addressed
- Soon to come: packaging and printed materials?

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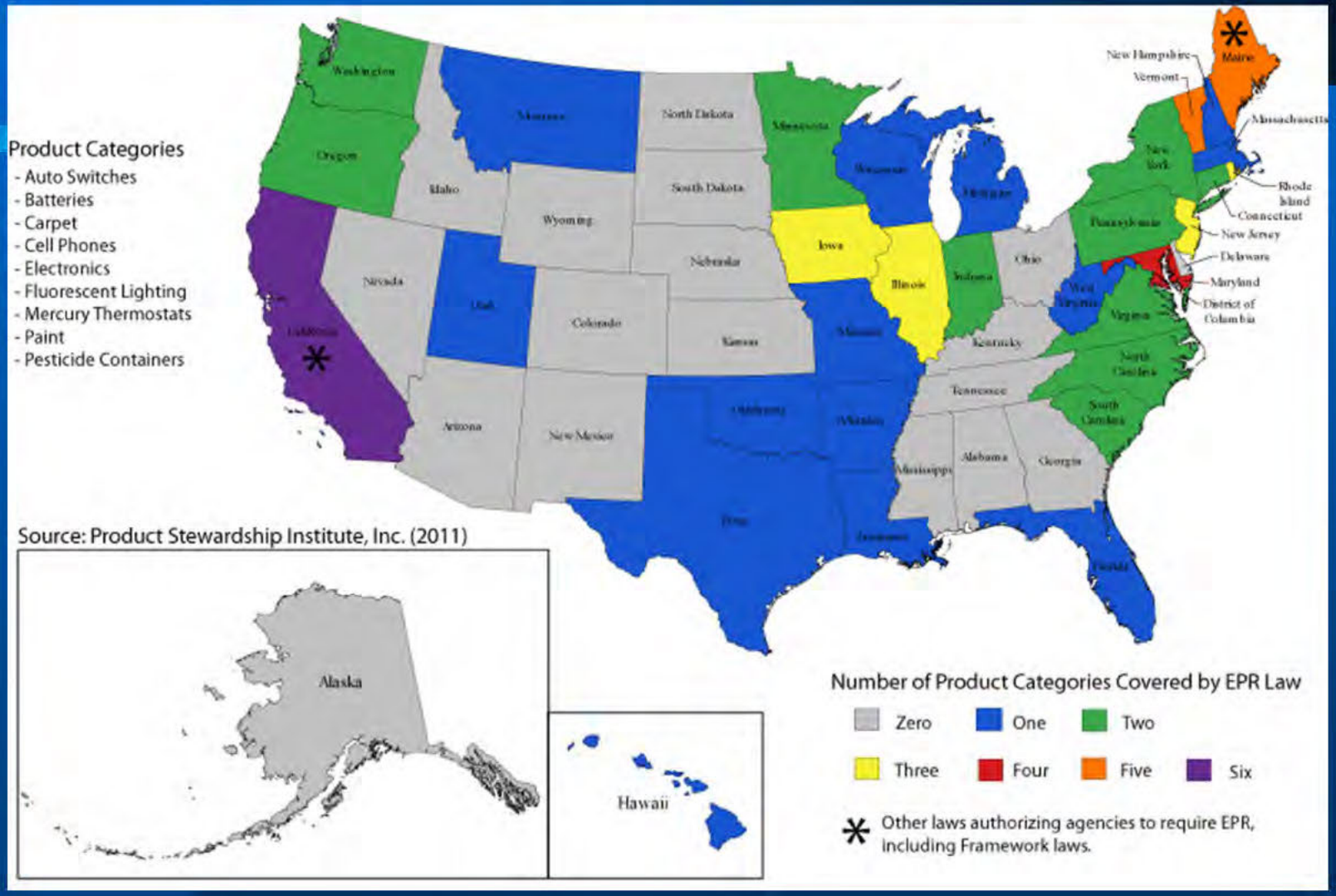
Product Stewardship Laws in the U.S.



Zero Waste in North America

- Zero Waste has gone Mainstream
- Many communities and industries have committed to Zero Waste and have developed Zero Waste Plans.
- "Designing and managing products and processes to avoid and eliminate waste and conserve and recover all resources, and not to burn or bury them." (ZWIA 2004)

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How to Get to Zero Waste

ZWIA:

- **Reduce, Reuse, Recycle**

Zero Waste to Landfills

- **All of the above plus Resource Recovery (WTE and Conversion Technologies)**

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ZWIA Zero Waste Definition

Contains both:

- Goals:
  - All wastes become resources
  - Eliminate harmful discharge
- A Process: one way of getting there
  - Reduce, reuse and recycle

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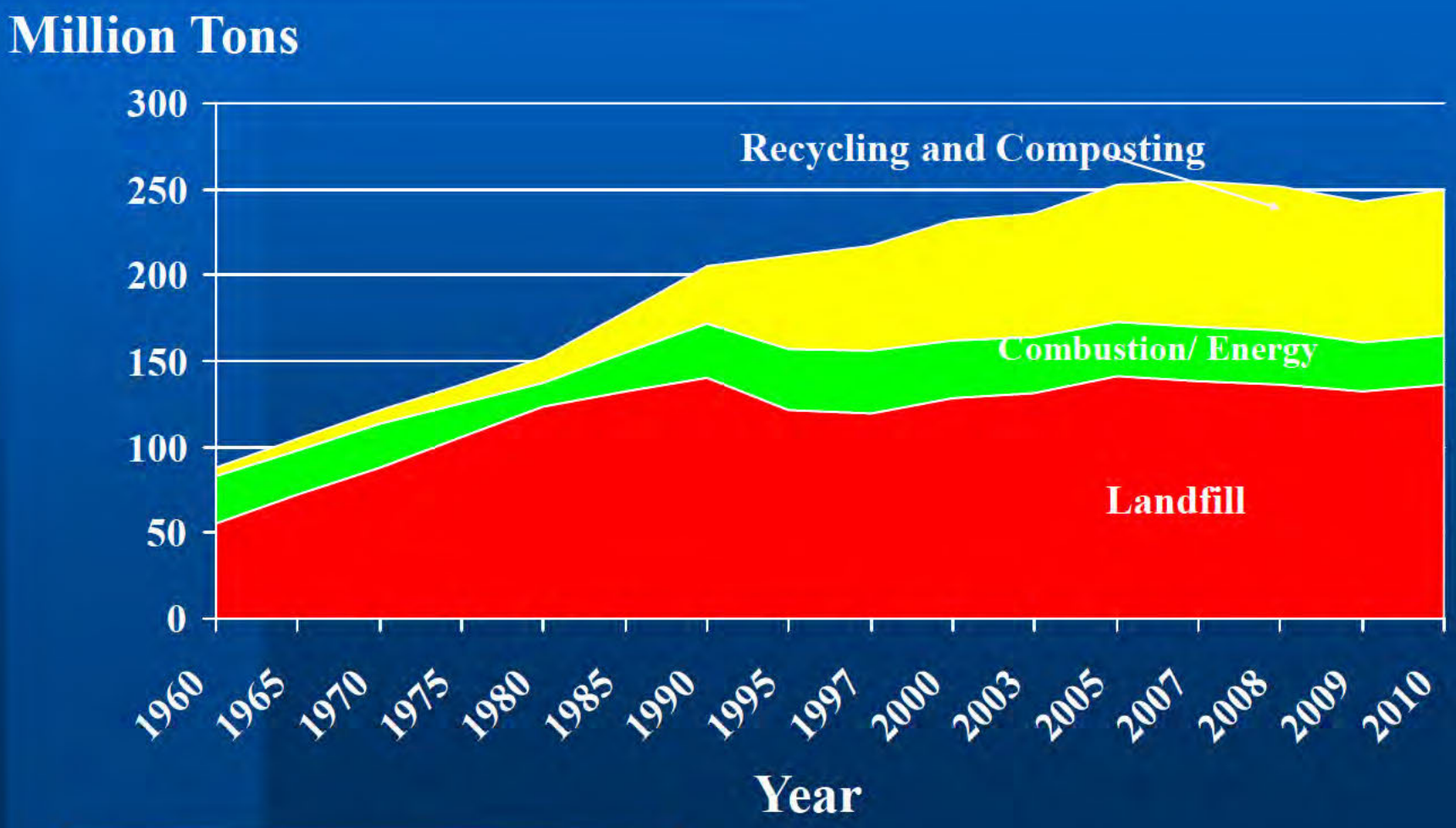
Are you for Zero Waste?

- I'm for the Goal
- And for the Process, but not exclusively
- But I also am for other Processes that can achieve the Goal

Recovery and Disposal of Municipal Solid Waste in the U.S.



The Landfill Disposal Index

- **"Waste management performance should be based on "tons landfilled" per capita (i.e. the fewer tons landfilled per capita the more sustainable the solid waste system.)"**

Dr. Nicholas Themilis, Columbia University

The Landfill Disposal Index (LDI)

- Defined as the tons of solid waste generated by a community that are disposed in landfills.
- Reported on an annual weight per capita basis (e.g., tons of waste landfilled per person per year).

WM's Altamont Landfill (Disposal Site for San Francisco's Non-Diverted MSW)

Per Capita Landfill Disposal Rates of Selected Communities

- San Francisco: 0.68 tons/person-year
- Seattle: 0.58 tons/person-year
- Sixty six WTE communities in 11 States:
  - Average: 0.38 tons/person-year
  - High: 0.68 tons/person-year
  - Low: 0.17 tons/person-year

Recycling and Composting in the U.S.

- 85 MT Recycled and Composted in 2010
- 34% National Recycling Rate
- Emerging Trends
  - Single stream recycling collection
  - Improvements in MRF performance
  - Food waste collection and recovery
  - Waste collection every two weeks

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Waste-to-Energy (WTE)

- Controlled Combustion of Post-Recycling Solid Waste in Modern Furnaces with State-of-the-Art Emission Controls
- Energy Recovered in the Form of Electricity and Steam
- Recycling of Ferrous Metals and Some Non Ferrous and Glass

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Waste To Energy in the US

- 86 Facilities operating in 24 states
- Process 29 million tons in 2010, 12% of waste generated
- Several decades successful experience with this technology
- WTE plants are cleaner than majority of coal fired power plants
- Considered renewable energy under federal and state law

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Environmental Benefits of WTE

- Capital investment in emission controls required by Clean Air Act
- U.S. EPA: "Clean, Reliable, Renewable Source of Energy"
- Renewable energy displaces fossil fuels
- Recycling of ferrous and non ferrous metals
- Ash tested and non-toxic, safe for disposal
- Reduce GHG Emissions on a lifecycle basis

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Renewed Interest in WTE

- Expansions of Existing Facilities
  - Hillsborough County, FL
  - Lee County, FL
  - Olmsted County, MN
  - Honolulu, HI
- New Facilities
  - Palm Beach County, FL
  - Durham, Ontario
  - 6 Others in Planning Stage

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WTE Growth Worldwide

- Europe (ISWA 2006)
  - 431 Facilities
  - 16 EU Countries
  - 50 M metric tons/year
- Worldwide (Pike Research 2011)
  - 800 Facilities
  - 40 Countries
  - $6 billion market today
  - Grow to $30 billion by 2022

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Conversion Technologies

- New Technologies to Convert Solid Waste into Industrial Chemicals and Fuels
- Gasification, Pyrolysis, Plasma Arc, Hydrolysis, Anaerobic Digestion
- Potential for Higher Values Fuels or Chemicals
- Most in Pilot Stage, Very Few Commercial Operations
- Several Larger Scale Projects Coming On-Line in the Next Year

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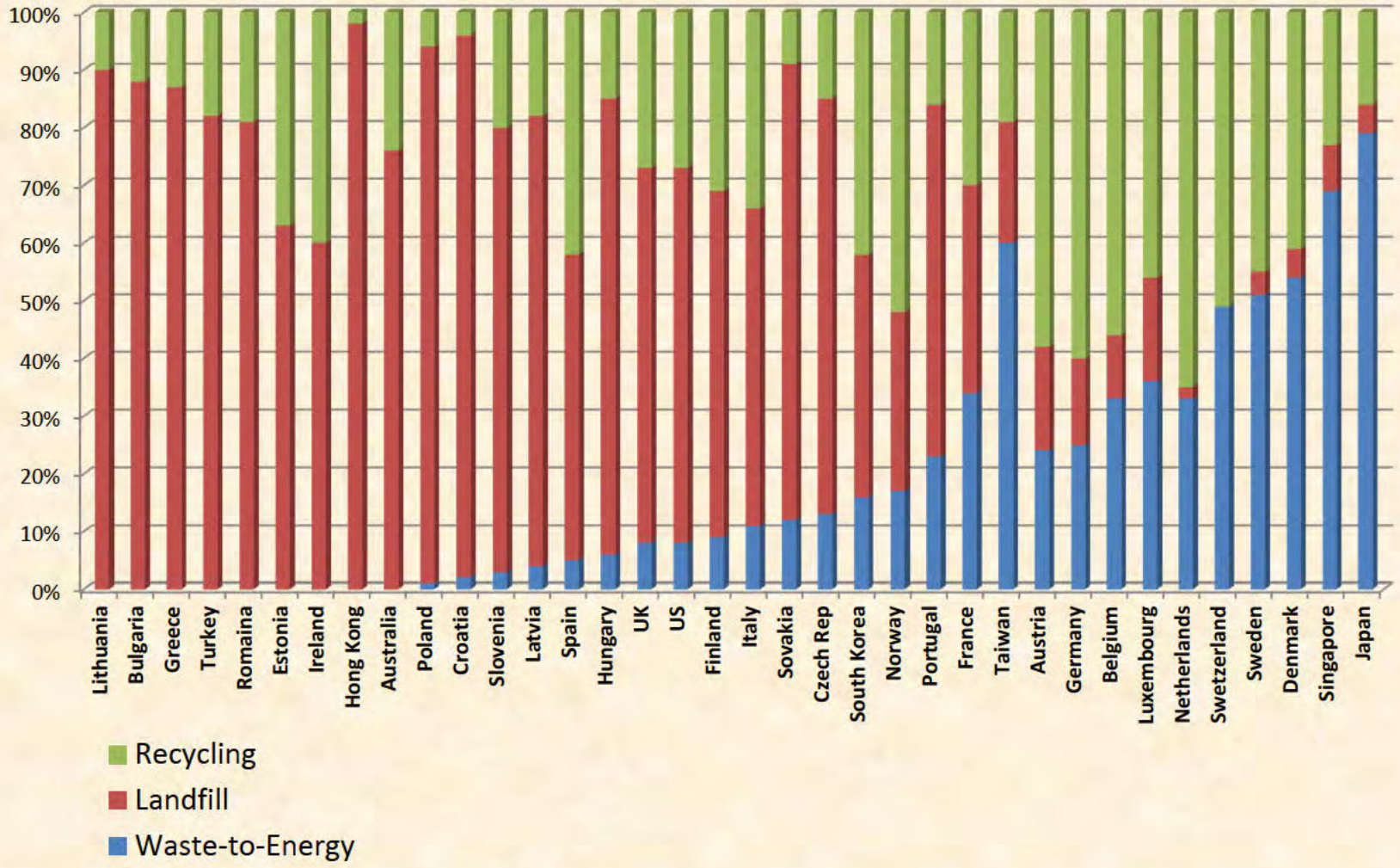
Recycling, WTE, and Landfills World-Wide



Sources: (1) Eurostat Analysis by M. Bauer and N.J. Themelis 5/25/09, (2) World Waste Survey, Veolia and Cyclope 9/06

WCTs- Commercialization Status

Technology	Pilot/ Demo	Contr. Negot.	Financing	Permitting	Constr.	Operation	Total
Gasification	2	1	3	2	3	0	11
Plasma Arc Gasification	2	0	3	3	0	0	8
Pyrolysis	1	0	0	2	0	0	3
Hydrolysis/ Fermentation	0	0	0	0	1	0	1
Anaerobic Digestion	0	0	1	0	1	0	2
Autoclave/ Mech. Processing	0	0	0	0	0	0	0
Total	5	1	7	7	5	0	25

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WCTs- Commercialization Status

Technology	Facilities Under Construction/Operation		
	U.S.	Canada	Total
Gasification	2	1	3
Plasma Arc Gasification	0	0	0
Pyrolysis	0	0	0
Acid Hydrolysis/ Fermentation	1	0	1
Anaerobic Digestion	1	0	1
Autoclave/ Mech. Processing	0	0	0
Total	4	1	5

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WCTs- Commercialization Status

Location	Edmonton, Alberta, CA	Vero Beach, FL	Storey, NV	Fulton, MS	Columbia, SC
Technology	Gasification/ Catal.Conv. Of Syngas	Gasification/ Ferment. of Syngas	Gasification/ Catalytic Conv. Of Syngas	Acid Hydrol./ Ferment. of Sugars	Anaerobic Digestion
Developer	Enerkem	INEOS Bio	Fulcrum Bioenergy	Bluefire Renewables	W2E Organic Power
Feedstock	Non-recycled MSW	Yard, vegetative, resid. waste	Post-sorted MSW	Wood Waste	Source-Sep. Organics
Throughput (TPD)	300	450	400	720	150
Energy Products	Methanol; Ethanol	Ethanol	Ethanol; Propanol	Ethanol	Electricity
Cost	$80M	$130M	$120M	$334M	$23M
Federal Grants/Loan Guarantees	$23.5M	$125M	--	$88M	--
Start Date	Fall 2012	June 2012	June 2013	June 2013	2012

Goals for Landfills as Part of a Resource Management Strategy

- Standards that Protect Human Health and the Environment
- Reduce Volumes of Waste Landfilled and Reduce Number of Landfills
- Apply New Landfill Technologies that:
  - Utilize LFG as a Renewable Fuel
  - Reduce Long Term Care Requirements
  - Increase Landfill Capacity
  - Provide for Beneficial Post Closure Use

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Landfill Standards in the US

- National Standards-Subtitle D RCRA
- Waste Screening and Inspections
- Liners, Leachate Collection and Covers
- Groundwater Monitoring
- Landfill Gas Controls
- Closure and Post Closure Care
- Financial Assurance

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Reduction in Landfilling in the US

- 136 MT tons landfilled in 2010
- A decline of 7% from 145MT in 1990
- We are landfilling less even though waste generation has increased by 25% over 20 years!

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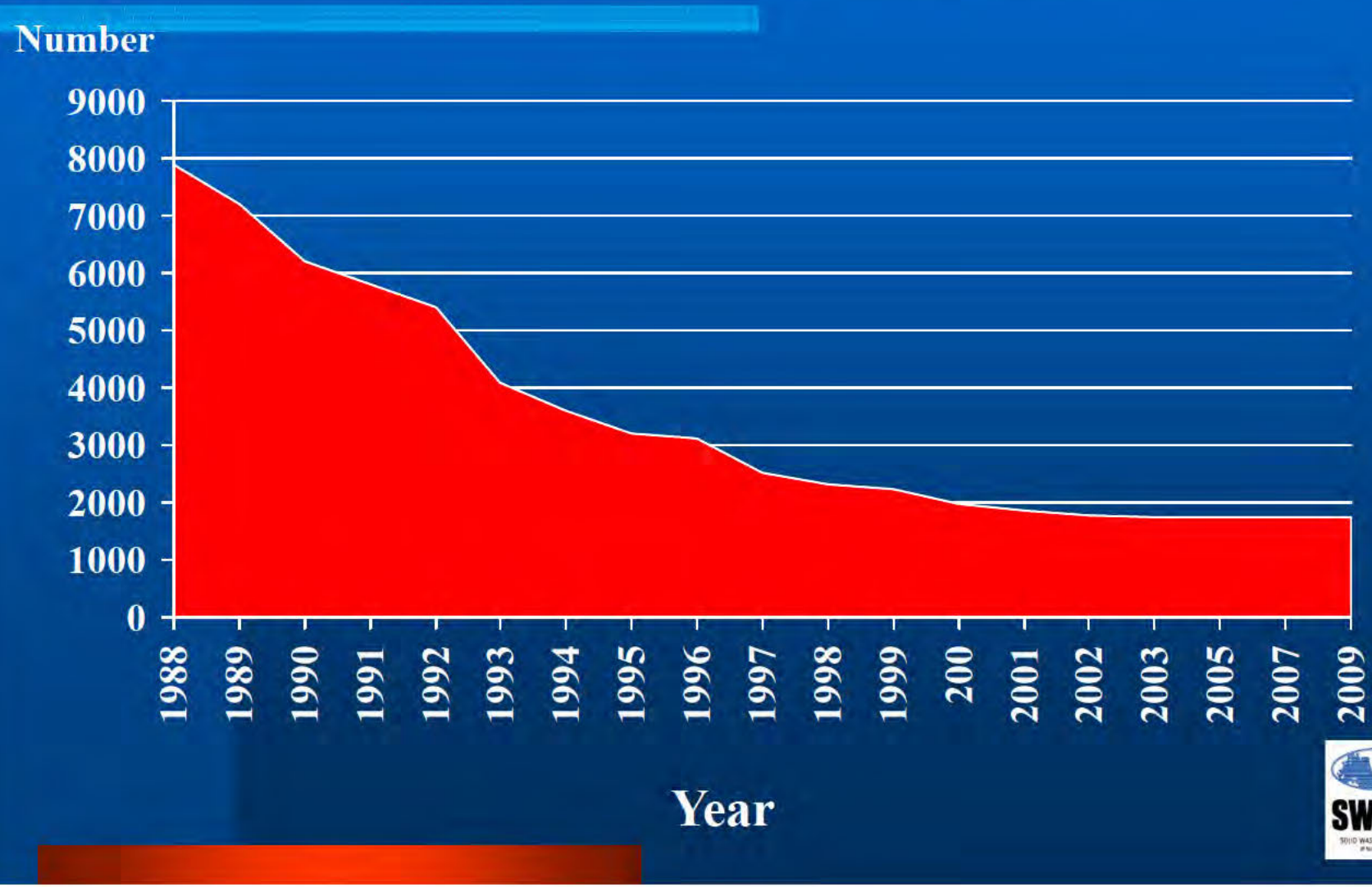
Reduction in the Number of Landfills in the US



Landfill Gas a Unique Renewable Resource

- LFG is 50 % methane
- Derived from Renewable Resources
- Over 550 active projects in the US, number could be doubled
- Used as boiler fuel, electricity generation
- Significant trends:
  - Conversion of LFG to CNG as a vehicle fuel
  - LFG clean up and processing to pipeline quality

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Bioreactor Landfills

- Accelerate decomposition through liquid addition and recirculation
- Controlled anaerobic or aerobic digestion
- Accelerate gas generation and recovery
- Reduce long term care requirements
- Dispose of more waste in existing cells
- SWANA ARF Report on Bioreactor Landfills

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Examples of Integrated Material Resource-Renewable Energy Facilities

- Wind turbines at landfills
- Solar landfill caps
- Solar panels on transfer stations and MRFs
- Recovery of waste heat from LFG combustion and WTE
- Geothermal landfill heat recovery
- Landfill mining
- Beneficial end use of landfills and restoration of ecological/community resources

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The Transition from Waste Management to Resource Management

- Applying a Full Suite of Technologies that Maximize Reduction, Recycling and Recovery of Material and Energy Resources,
- And Reduce Landfilling and Provide for Disposal of Residuals in an Environmentally Sound Manner,
- And also Continue to Provide Needed Waste Disposal Services.

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I'm for Zero Wasted

- Product Stewardship for waste reduction and recycling,
- Maximize reuse, composting and recycling to the extent feasible,
- Recover energy from post-recycling wastes through WTE facilities that produce renewable energy to offset fossil fuel use and recover additional metals for recycling,
- Landfill residuals in compliance with Federal environmental standards, recover landfill methane as a fuel to offset fossil fuels. Consider landfill mining of prior landfilled recyclables,
- Require long-term post closure care of landfills, and closure plans emphasizing restoration of ecological resources.