Presentation on Integrated Waste Management in the United States

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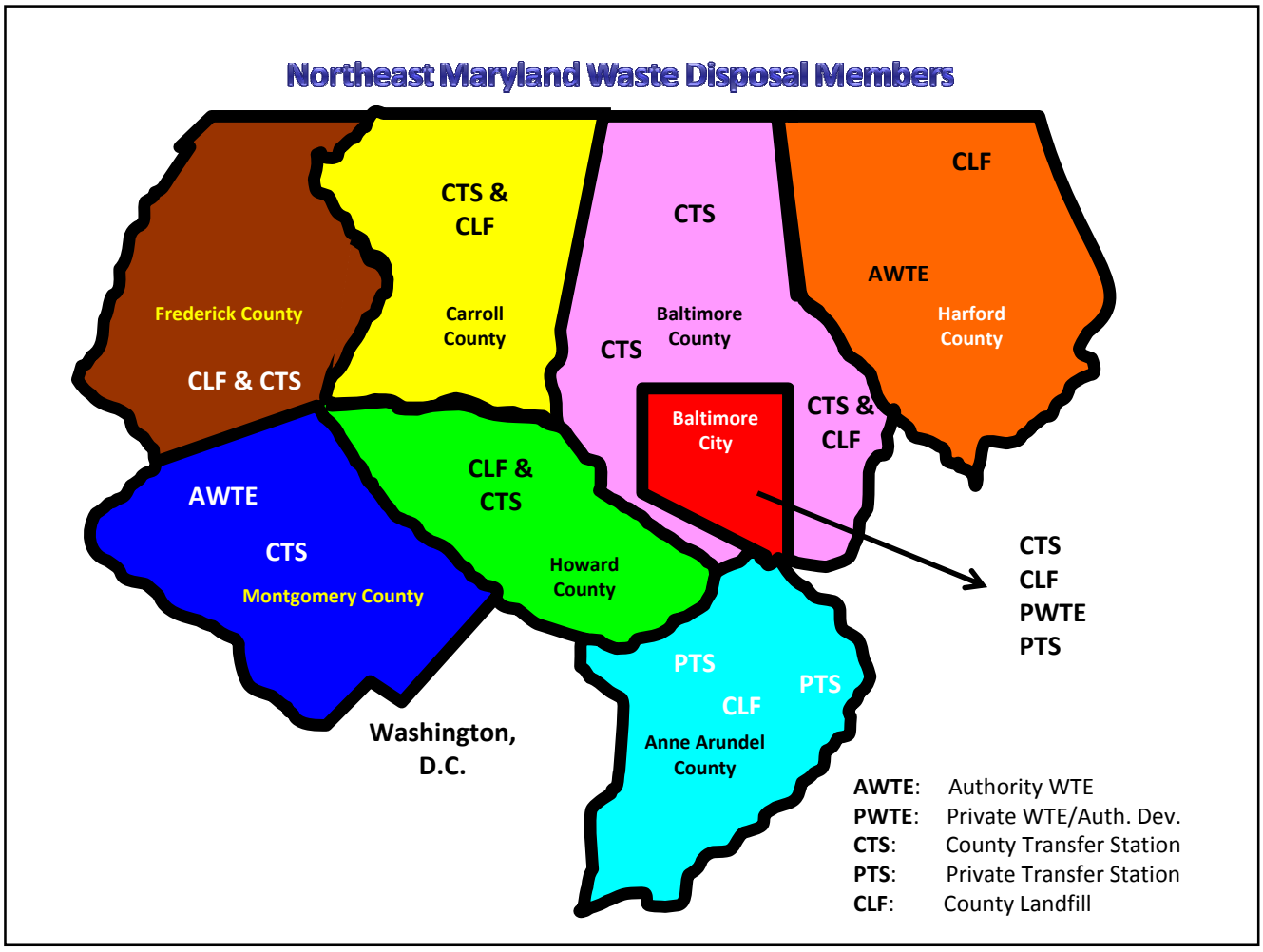
April 2010

BRESCO: 25 Years of Steam and Electricity

Introduction to Northeast Maryland Waste Disposal Authority

Authority Members
Population: 3.8 Million
Households: 1.3 Million
Area: 8,783 sq. Km


Northeast Maryland Waste Disposal Members
Frederick County
CLF & CTS
CTS &
CLF
Carroll
County
CTS
Baltimore
County
CTS
CLF
AWTE
Harford
County
Baltimore
City
CTS &
CLF
CLF &
CTS
Howard
County
AWTE
CTS
Montgomery County
Washington,
D.C.
CTS
CLF
PWTE
PTS
PTS
CLF
PTS
Anne Arundel
County
AWTE: Authority WTE
PWTE: Private WTE/Auth. Dev.
CTS: County Transfer Station
PTS: Private Transfer Station
CLF: County Landfill

Waste Management Hierarchy

- Reduce, Reuse, Recycle, Recover Energy, Dispose
- Recover: Only non-recycled waste is delivered to WTE facility

Separated Organic Waste

- Separated Yard and Food Waste Composting
- Organic Waste Decomposition
  - Aerobic decomposition
  - Anaerobic decomposition (landfills) are not efficient energy recovery facilities *[Sierra Club Review of LFGTE]*

Construction and Demolition Debris

- When C&D Debris is segregated, components can be recycled
  - Brick, block, asphalt, concrete, metals are recyclable
- Mixed C&D is not recyclable, not combustible so typically landfilled
- Gasification on a small scale works with C&D waste streams

Medical and Hazardous Waste

- Must be handled differently than MSW
  - Medical waste is autoclaved/landfilled or incinerated
  - Hazardous waste is incinerated or landfilled
  - These waste streams **are not accepted** at WTE facility.
  - Screening for Radioactive Waste at WTE is typical

Energy Recovery and Recycling

- These are compatible
- In both the EU and USA, local governments with the highest recycling rates also employ WTE *

Covanta, Section 7

WTE and Recycling

Country	Diversion (per cent of total)	Landfill (per cent of total)	Incineration (per cent of total)	Waste per capita (kg)
Netherlands	65	3	32	624
Austria	59	31	10	627
Germany	58	20	22	600
Belgium	52	13	35	469
Sweden*	44	5	50	464
Denmark	41	5	54	696
Luxembourg	36	23	41	668
Spain	35	59	6	662
Ireland	31	69	0	869
Italy	29	62	9	538
Finland	28	63	9	455
France	28	38	34	567
Canada**	24	74	2	1037
UK	18	74	8	600
Greece	8	92	0	433
Portugal	3	75	22	434

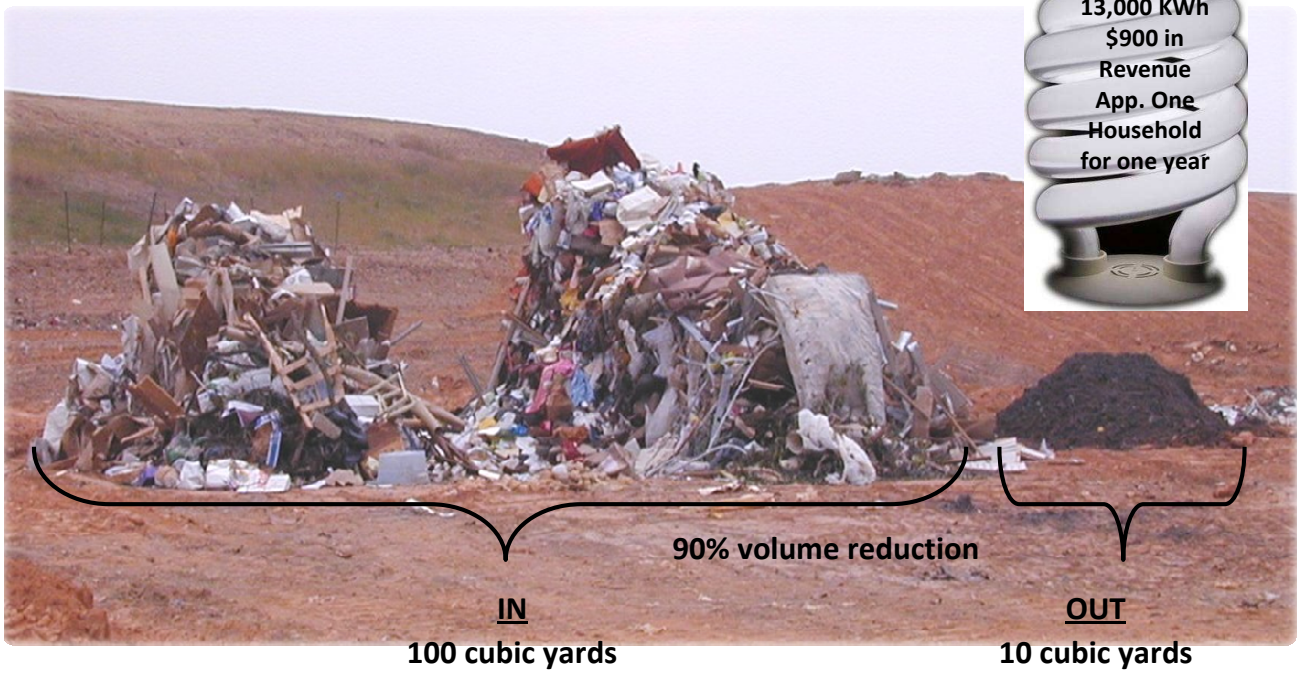
* From: Carl Lilliehöök, Waste & Recycling, Tekniska Verken AB, Linköping Sweden

** Source: Institute for Public Policy Research, base yr: 2003/4, Environment Canada (2004) * 2005

What to Do With the Leftovers?

- Very heterogeneous mix, difficult to store, changes seasonally, odors, vectors
- Includes some of the following:
  - Household/Commercial Mixed Waste
  - Tires on and off the rim
  - Treated wood waste, i.e., railroad ties, telephone poles, decking
  - Waste streams requiring secure destruction

Waste Volume Reduction/Energy Production



IN
100 cubic yards
of waste (20 tons)

OUT
10 cubic yards
of inert ash (6 tons)

MoCo and Australia

Montgomery County

- Land Area: 1,313 km2
- Density: 740/km2
- Population: 950,860
- Founded 1776

Perth

- Land Area: 5,386 km2
- Density: 289 km2
- Population: 1,602,599
- Founded: 1829

Melbourne

- Land Area: 8,806 km2
- Density: 1,566/km2
- Population: 4.0 million
- Founded: 1835

Montgomery County's Integrated Waste System

Typical Single Family Home: USD $261/year [AUD $284/year]

- Once/week trash collection
- Once/week recyclables collection
- Once/week yard debris collection (no plastic bags)
- Free bulky waste collection
- Free recycling carts (paper) and bins (containers)
- Free compost bins
- Free drop-off at transfer station
  - E-waste, household hazardous waste
  - Oil, fats, propane tanks, bicycles, books
  - Textiles, paint, etc.

Facility Ownership/Management

County owns:

- Materials Recycling Facility
- Homeowner Drop-Off Area
- Yard Waste Composting Facility
- Transfer Station
- No Landfill

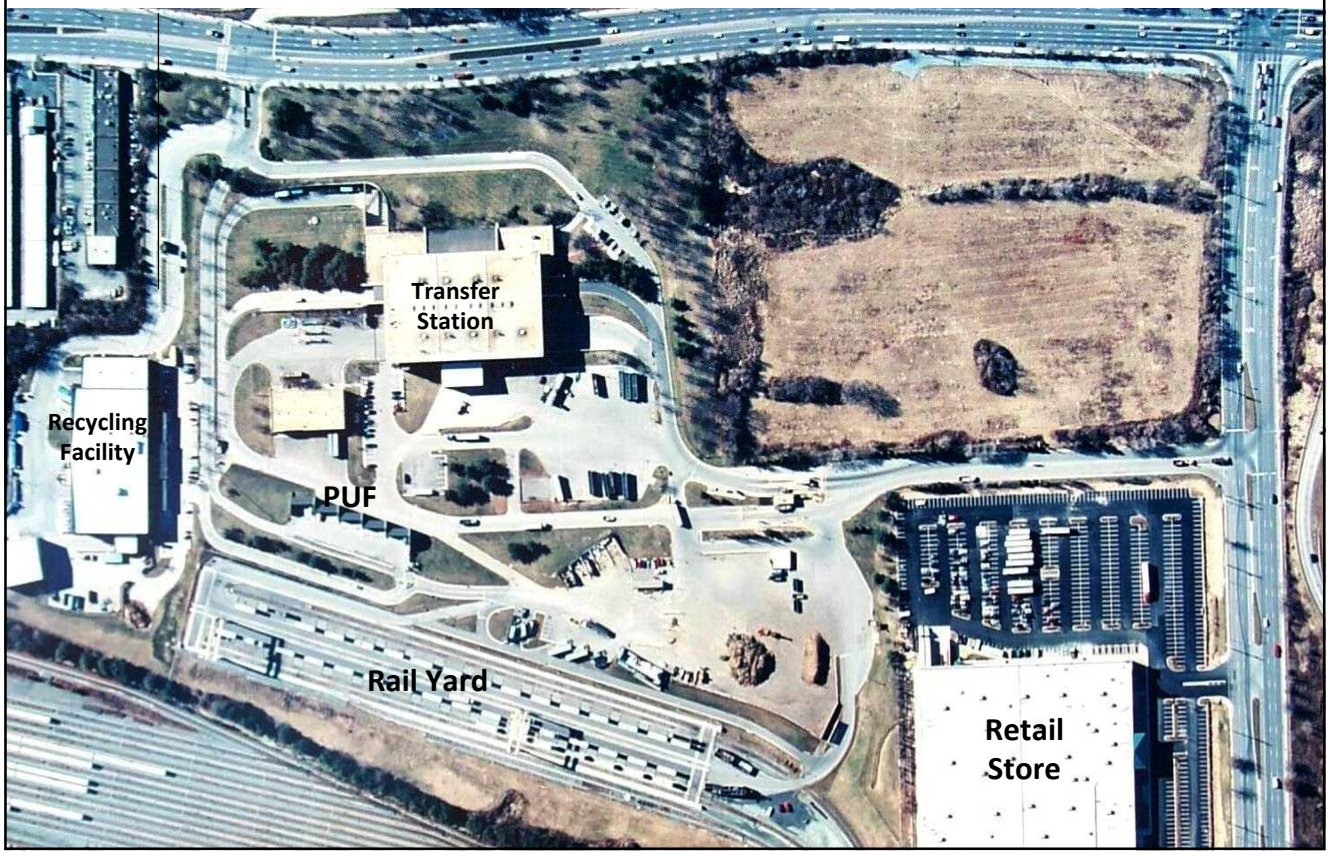
Authority operates:

- Transfer Station

Authority owns and operates:

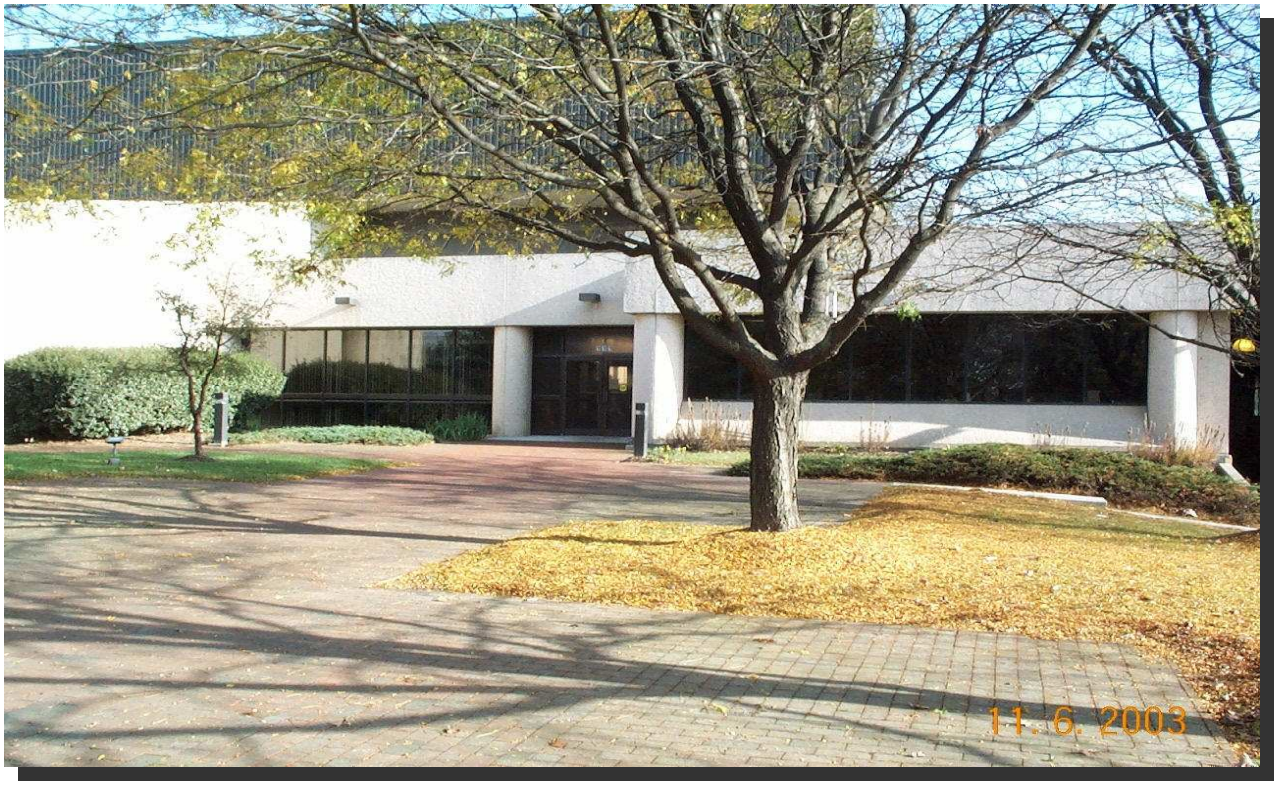
- Rail System for Trash/Yard Waste/Ash Residue
- Waste to Energy Facility

Montgomery County's Transfer Station, Recycling Facility and Public Unloading Facility in Derwood, Maryland



Main Transfer Station Building

County Offices In Transfer Station Building



Materials Recycling Facility (Dual Stream)

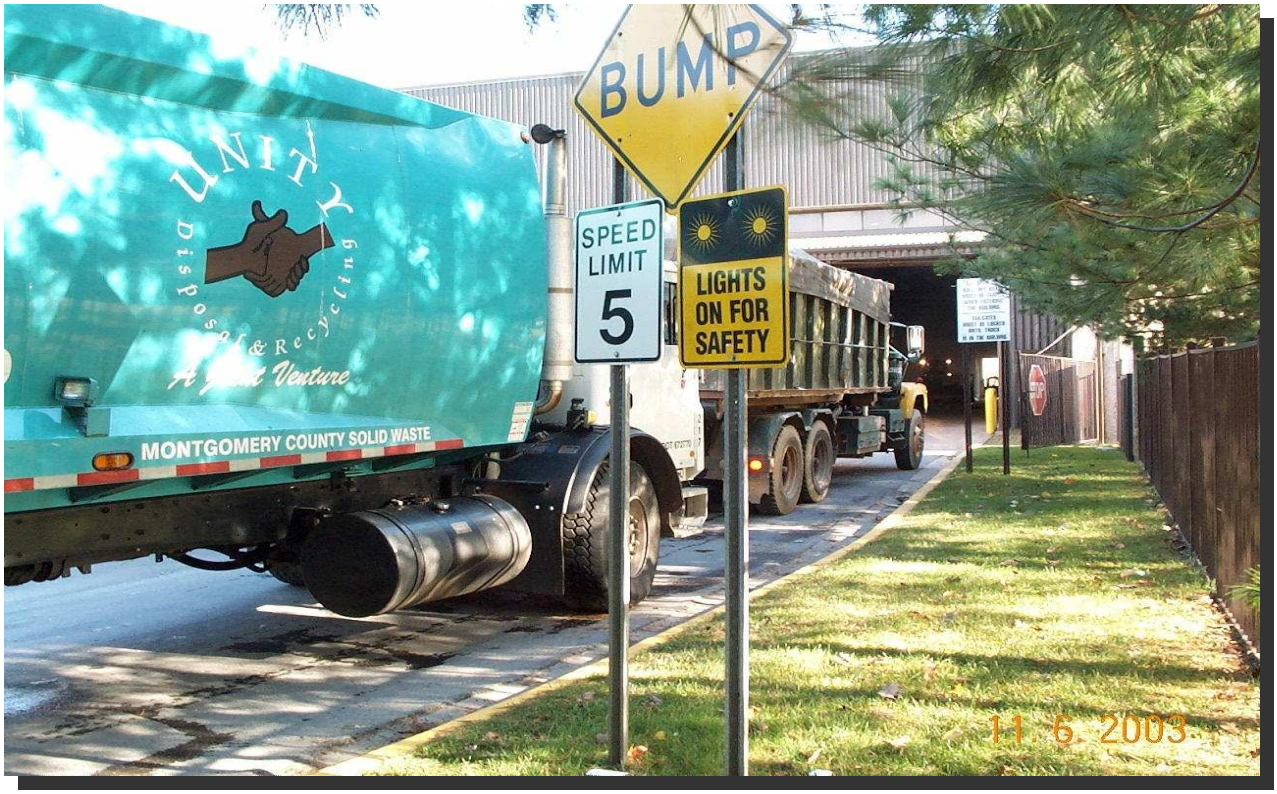
Public Drop-off

Containers for Public Drop-off

Construction and Demolition Debris Recycling Drop-Off, Reloaded to C&D Recycling Off Site

Truck Arrival at Transfer Station (Radiation Detector Prior to Scales)

Truck Line to Tipping Floor



Enclosed Tipping Floor

Exit of Tipping Floor

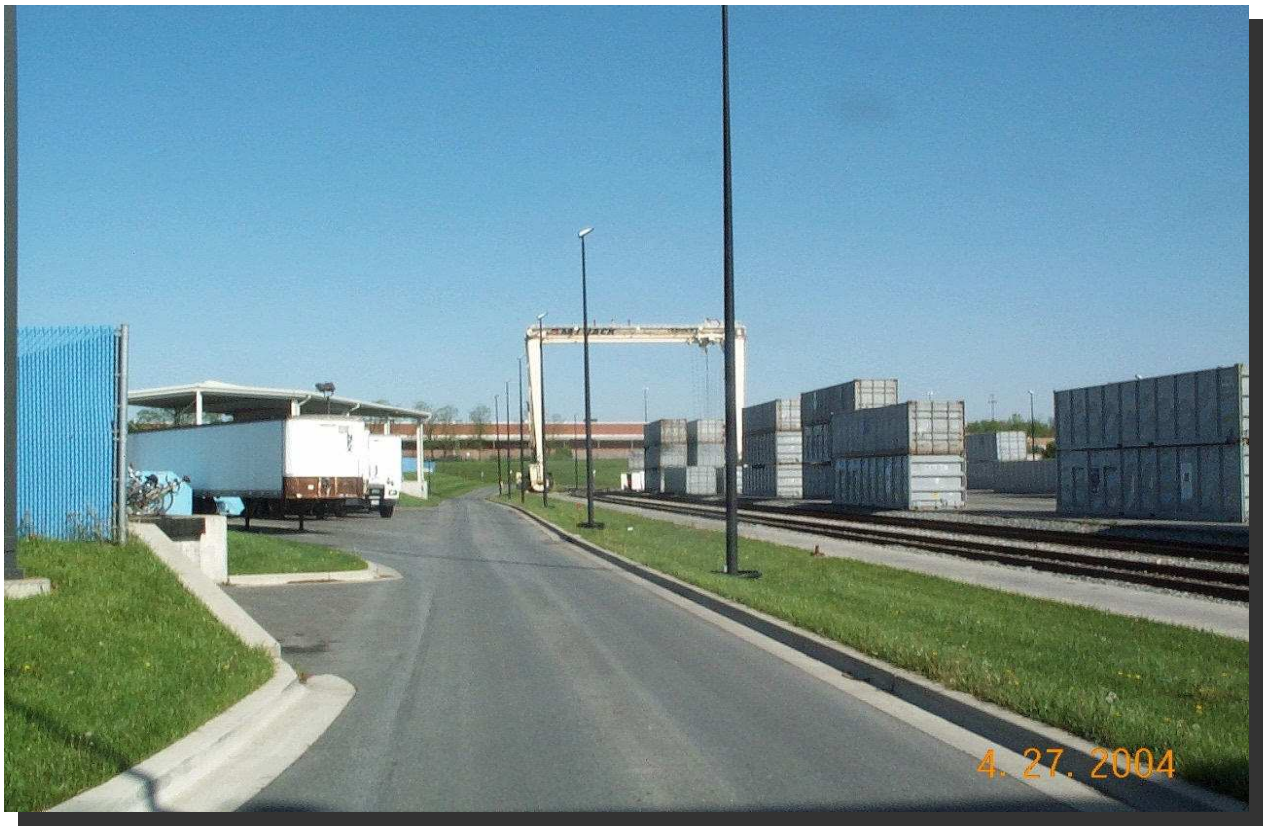
Entrance to Compactor 1 & 2

Compactor 1

Container Backing into Compactor

Rail Container Backing into Compactor

Rail Yard at Transfer Station

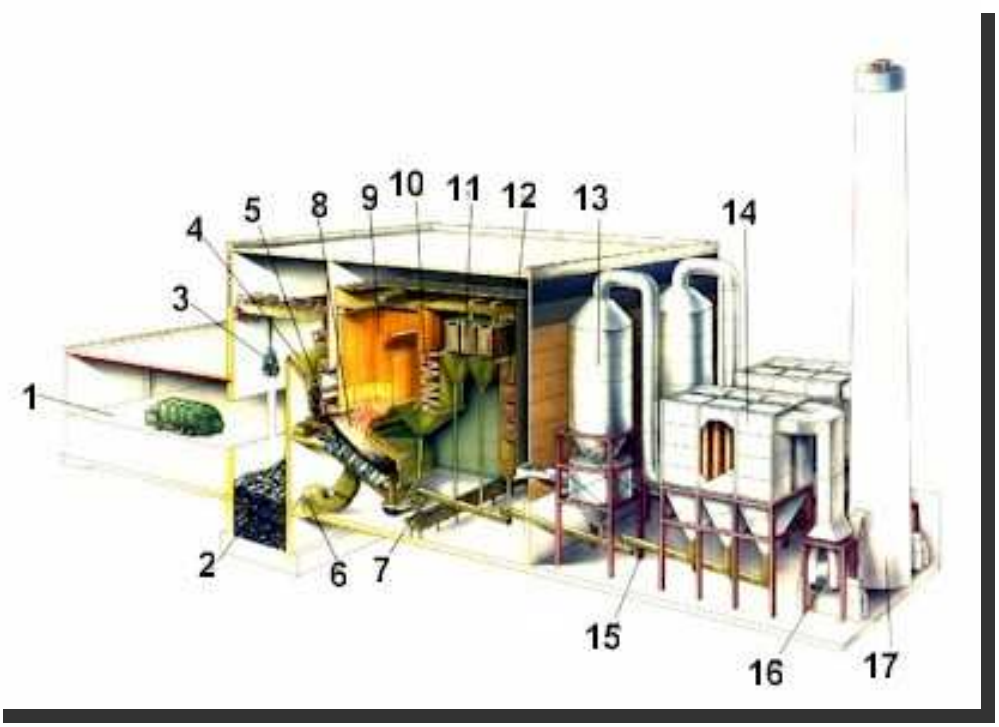


Rail Cars Arriving at Waste-To-Energy Facility

18 miles or 29 km

Waste-to-Energy Facility and Yard Debris Composting Facility

Mass Burn WTE Facility



Energy Sales

- Electricity 2009 USD $24 million
  - Hourly Market (Wholesale)
  - Multi-Year Contracts (Wholesale)
  - Direct Sale to Local Government (Retail)
- Capacity
  - Included in Electricity Price
- Renewable Energy Credits 2009 USD $450,000

Renewable Energy Premium in Australia

Accredited GreenPower %

12,263 kWh/year for Family of Four, 3 Bedroom Home

- 100%
- GreenPower Premium: 6.1 cents per kWh (included in cost & savings figures shown above)

Zone: SGY-SWIS-RES-WA (prices effective from Jan 7, 2009)		
Prices for Electricity A1 (peak)	Cost	Period
Fixed Charge	$29.50	Quarterly
Rate	22.01 ¢/kWh	01-Jan to 31-Dec

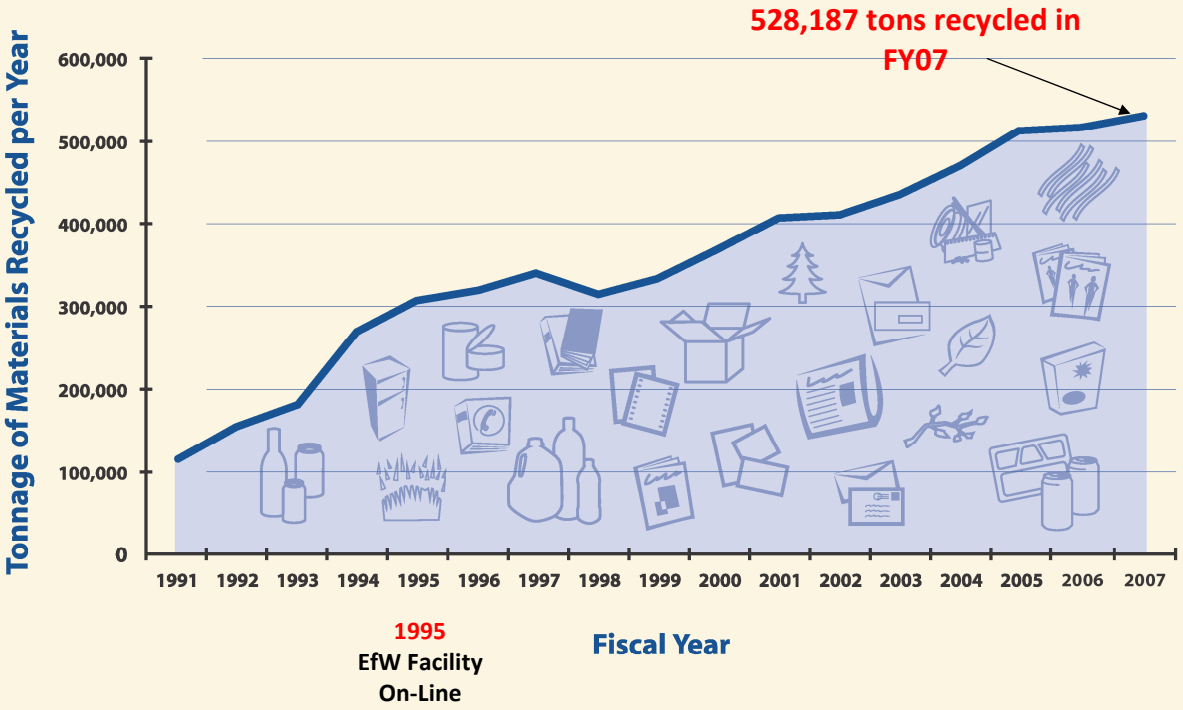
Environmental Assessment
Pre and Post WTE Operations

- Multiple Pathway Health Risk Assessment
- Non Air Media Sampling
  - Milk, hay, fish, pond sediment
- Air Media Sampling

In the compendium, and on Montgomery County's Website
http://www.montgomerycountymd.gov/swstmpl.asp?url=/content/dep/solidwaste/facilities/rrf.asp

Tonnage of Materials Recycled in Montgomery County

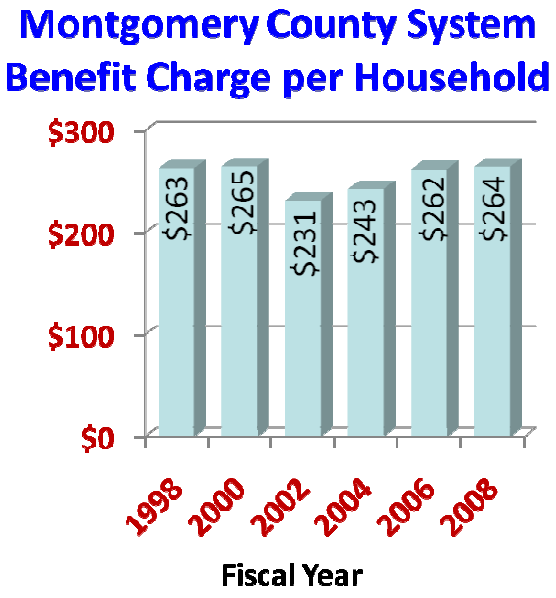
(Fiscal Years 1991-2007)



Montgomery County, MD Division of Solid Waste Services 10/17/07

Integrated Waste Management Controls Cost

- Stable Cost
- System Benefit Charge (SBC) paid by homeowners
- Businesses also pay SBC as well as tipping fees

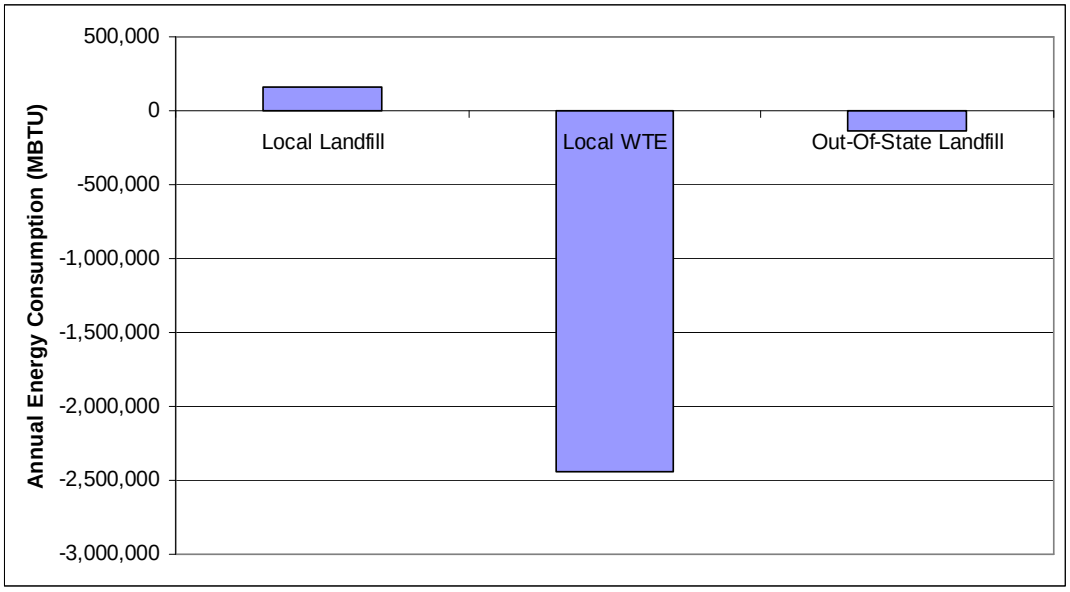


Frederick County
Environmental Comparison of Three MSW Management Methods

- Environmental analysis of waste management options:
  - Landfill in county (current practice for some waste)
  - Transport and landfill out of State (current practice)
  - New 1,500 tpd WTE facility shared with Carroll County and located in Frederick County
  - Results:*_RTI Study for Frederick County, Md._

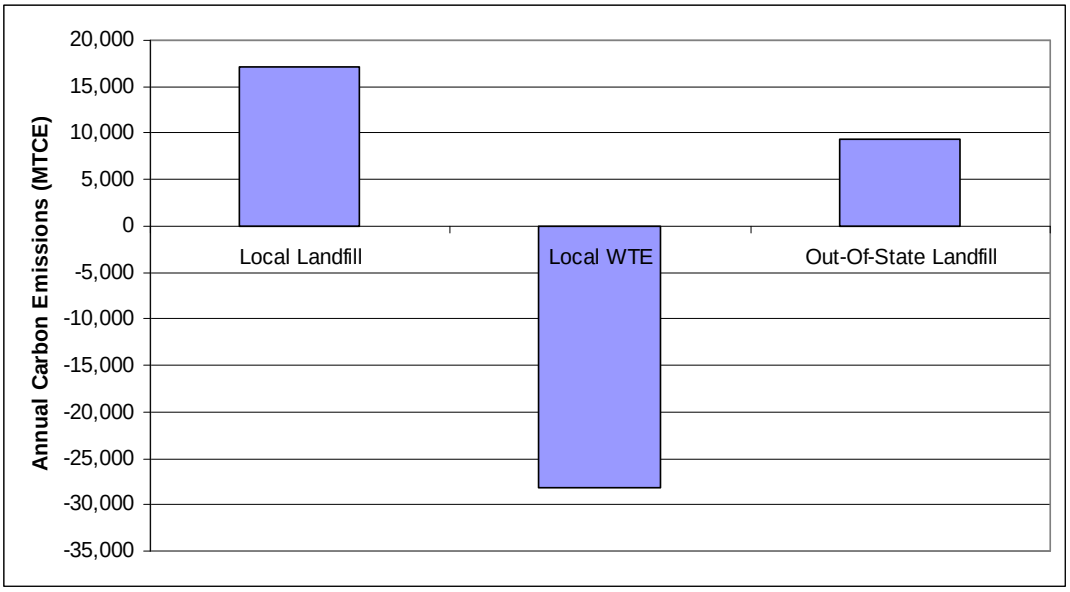
RTI International Solid Waste Modeling Support

Net Energy Consumption by Strategy



RTI International Solid Waste Modeling Support

Net Total Carbon Equivalent Emissions by Scenario



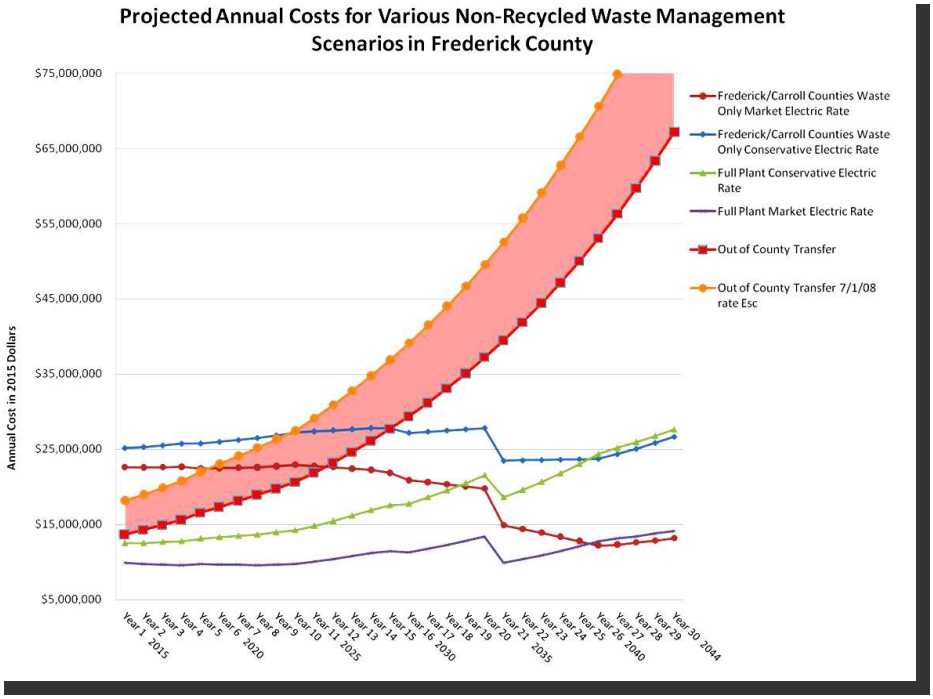
RTI International Solid Waste Modeling Support

Net Total Criteria Pollutant Emissions by Strategy

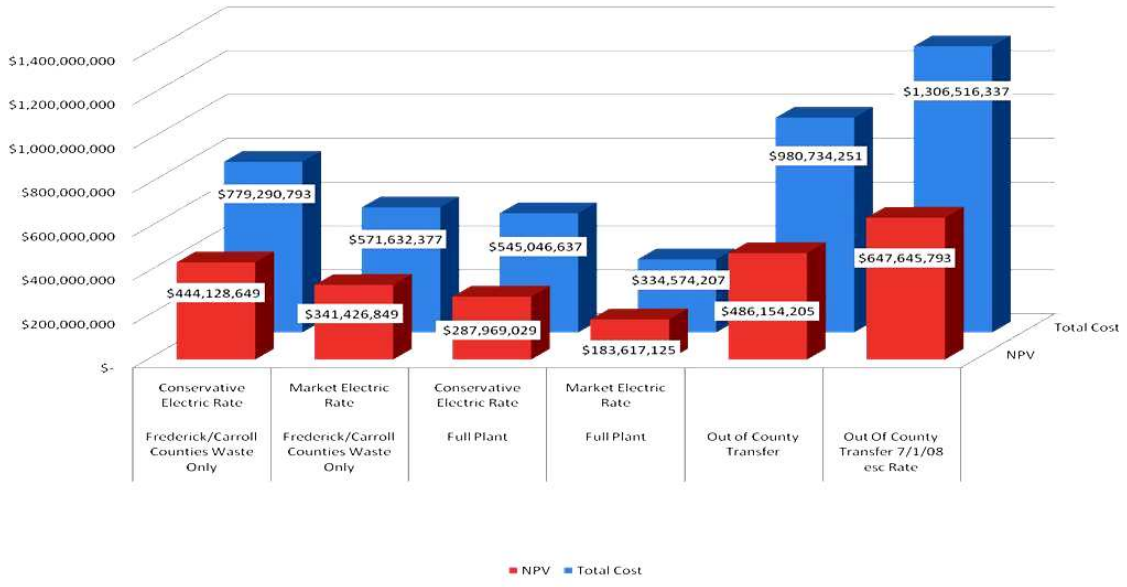
Frederick/Carroll Counties WTE Project Development

- European Study Tour: 7 Countries in 7 Days
- Site Selection
- Vendor Selection - Request for Qualifications
  - Qualified Companies
    - Thermoselect — Pioneer Plus
    - Von Roll — Stabilit
    - Martin — Keppel Seghers
    - Consumat — Steinmuller
  - Not Qualified
    - Barlow — Energy Recovery
  - Request for Proposals: 3 received
- Selected Vendor
- Currently in permitting phase

Life Cycle Economic Analysis



Final Life Cycle Cost Evaluations



Frederick County Plan

Category	Units	2009	2015
Total Waste	Tons	363,400	401,200
Recycled	Tons	98,600	111,000
Waste To Energy	Tons	0	295,650
Long Haul to VA and PA Landfills	Tons	225,000	0
County Landfill	Tons	39,800	40,400
Ferrous/Non-ferrous Recycled	Tons	0	8,870
Ash Recycled as Cover	Tons	0	88,000
Waste Diversion Rate	%	40%	60%
Electricity Produced	Homes	0	30,000
Carbon Savings	Tons		150,000

Frederick County's share of WTE facility only

Citizen Concerns: Environmental

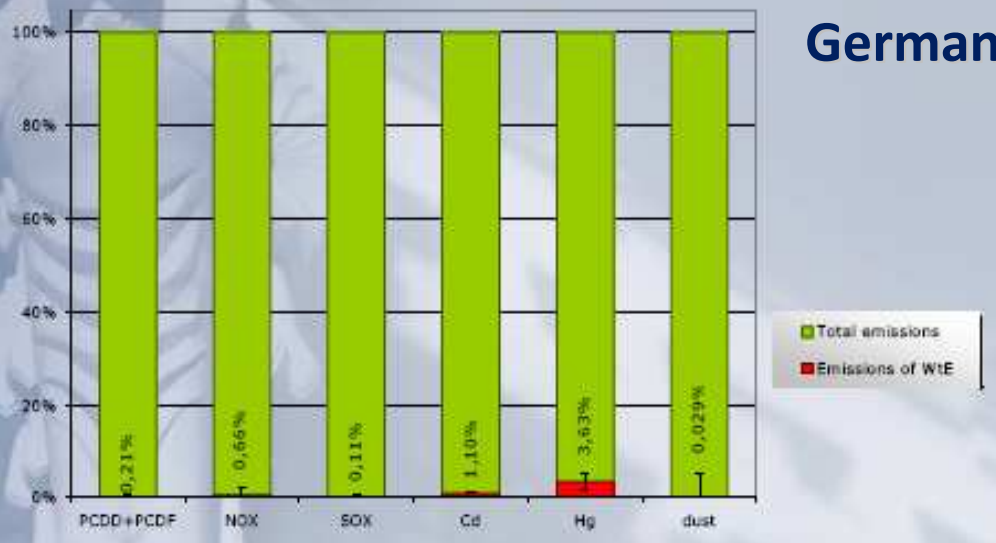
- “WTE facilities generate electricity with less environmental impact than almost any other source of electricity”: U.S. EPA
- Environmental groups forced EU and USEPA to develop stringent emission limits
- Montgomery County WTE: live continuous emissions monitoring data is posted on the County’s website

Citizen Concerns: Environmental

- Emissions
  - Ultrafine Particles: Emerging Research
    - Much lower than those produced from common household activities like stovetop cooking, grilling and frying
    - One day of typical traffic on a 3-km stretch of a highway (76,600 vehicles/day) would emit as much ultrafine particles as about 160 days of WTE operation.
    - SO_2 concentrations are correlated with nanoparticle concentrations. Controlling SO_2 is the key.

Contribution of WtE to national emissions

Emissions related to total national emissions
100% waste incineration



Germany

CEWEP - Congress 2006

CEWEP is a good source of information on EU WTE

Helmut Rechberger
Gerald Schöller

Comparing Fuels

- One ton of solid waste has the same heating value as 1/2 ton of coal and one barrel of oil. Each person generates about 1 ton of waste each year.
- There are 89 Waste-to-Energy facilities in the U.S. The energy they produce annually is equal to that of 1.2 billion gallons of crude oil.

Air Emissions of WTE and Fossil Fuel Power Plants (lbs/megawatt hour)			
Facility Type	CO_2	SO_2	NOx
Coal	2,249	13.0	6.0
Oil	1,672	12.0	4.0
Natural Gas	1,135	0.1	1.7
WTE	837	0.8	5.4

Citizen Concerns: Price

- Price is determined through open, competitive procurement
- Proposals must include performance guarantees, including:
  - Energy production, processing ability, maximum consumption of water and other consumables
- Firms must have financial strength to back up performance guarantees
- Price is determined through full cost accounting model, with proposer's guarantees.

Citizen Concerns: Aesthetics

- In the U.S., the facilities range from ordinary to tolerable
- In the E.U., they are modern, interesting, and creative

Zzzzzzzz…

Wow!

Citizen Concerns: Ash

- Actual monitoring of ash monofill over 12 years shows that the leachate meets drinking water standards (except for chlorides)
- Mixed ash is most common byproduct of WTE facilities in U.S., and recycled as daily cover at MSW (non-hazardous) landfills
- New WTE facilities will be able to separate ash streams, no ash will leave as hazardous material
- Some work has been done with recycling ash. The following slides are provided by:
  - Dr. Frank J. Roethel, Waste Reduction and Management Institute
  - Marine Sciences Research Center, Stony Brook University

Selected Marine Opportunities

Cement blocks to create new land (Bermuda) or prevent erosion

Embankment (rivetment) along James River, VA

Construction Opportunities

Boathouse, Stony Brook, NY

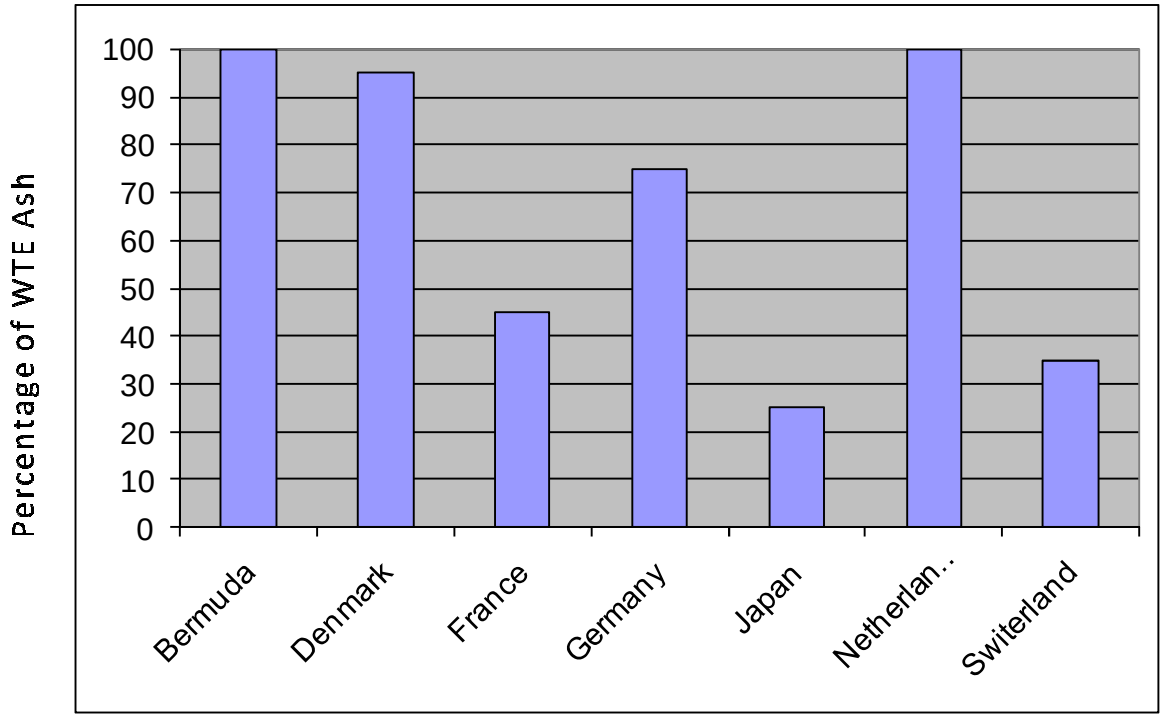
Aircraft Hangar, Brookhaven, NY

Construction Opportunities

Taxiway, Brookhaven, NY

Parking Lot, Farmingville, NY

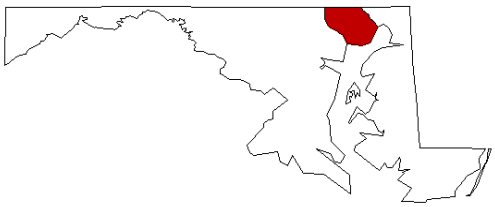
Utilization of Bottom Ash Abroad



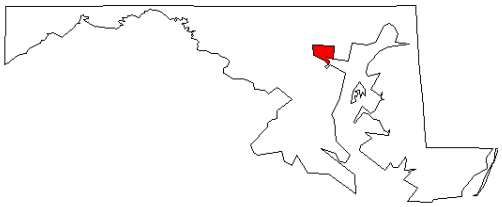
Other Authority Projects

- Harford Waste To Energy Facility (23 Years Old)
  - Supplies steam to an Army Base
- Baltimore City Sludge Composting Facility (21 Years Old)
  - Processes 100 tons per day sludge into Class A soil amendment (golf courses, lawns)
- Two Landfill Gas To Energy Facilities Operating (3 MW)
- One LFGTE Under Construction (3 MW)
- One LFGTE Under Development (3 MW)
- One Solar on Transfer Station Roof Under Construction
- One Solar on Closed Landfill Under Development (Elementary School)
- Provide E-Waste recycling to members
- Landfill maintenance and management
- Business to Business Recycling (**www.mdrecycles.org**)
- Market Electricity and REC's for Local Governments

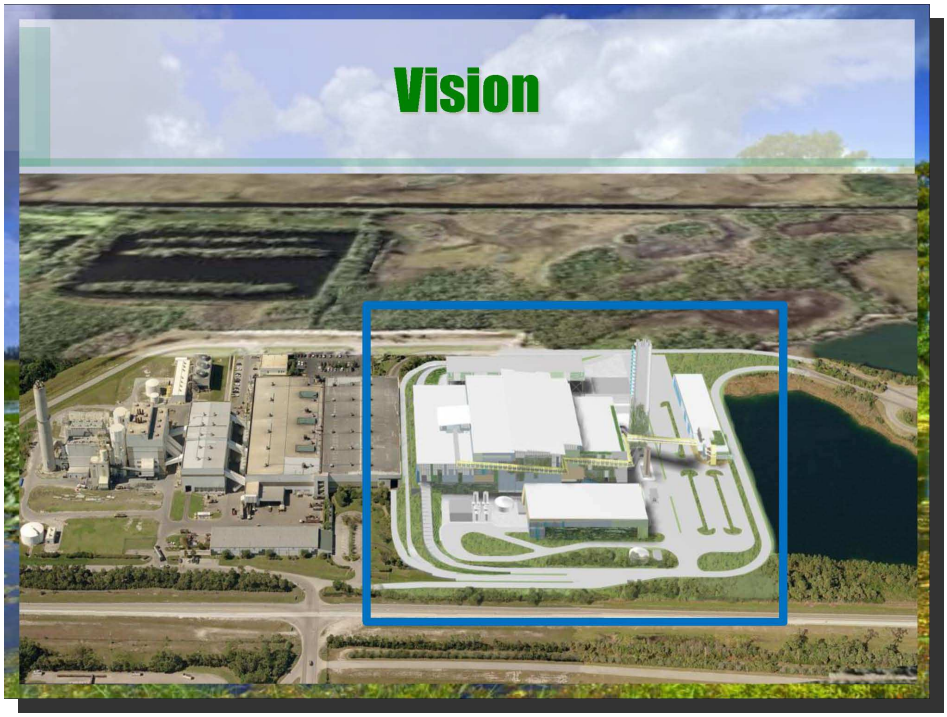
Harford WTE Facility
Provides Steam to Army Base



Sewage Sludge Composting Facility



Palm Beach Florida Expansion Plan



Robin and Maxine
February 2010

Over 100 centimeters of
snow in a 5 day period!

Thank you for your attention

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