




*Today's Project Finance Markets
For Waste to Energy Projects*

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Waste Conversion Projects Workshop
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- Established in 1980
- Solid Waste Management and Technology Consultants
- Helping Clients Turn Problems into Opportunities




WASTE TO BIO:
ENERGY, FUELS, GAS & CHEMICALS

Renewable Energy from Waste



**RENEWABLE
Energy**
FROM WASTE
CONFERENCE



NOVEMBER 17-20, 2014 >> **SAN JOSE, CALIFORNIA**


Food Waste or Fuel Source?
DEPARTMENTS - CRITICAL THINKING

Harvey Gershman
OCTOBER 16, 2013

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Halvee...take out the garbage...it stinks! my mom used to remind me of my household chore growing up in Pawtucket, R.I., in the '60s. We had a 30-gallon can for food waste in the back corner of our lot waiting to be collected by the city and delivered to pig farmers for feed. Neighboring Providence did it a little differently: It had to be bundled in newspapers and set out for collection, eventually to find its way to pig farmers.

Fast-forward to the new millennium. We are serious about increasing recycling even more by going after organics. The U.S. Environmental Protection Agency reports that food waste accounts for approximately 21 percent of landfilled municipal solid waste (MSW), or around 35 million tons per year (TPY). This waste is a resource that can be used to produce biogas, for power production or



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GBB Waste Technology Services


- Economic, technical, and environmental reviews
- Markets development
- Process planning and design
- Waste characterization and sourcing
- Procurement and negotiation assistance
- Independent feasibility consultant
- Technology due diligence
- Acceptance testing and operations monitoring





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Outline

- Current waste to energy market in the US
- Project development
- Recent projects
- Where is the WTE finance market headed?




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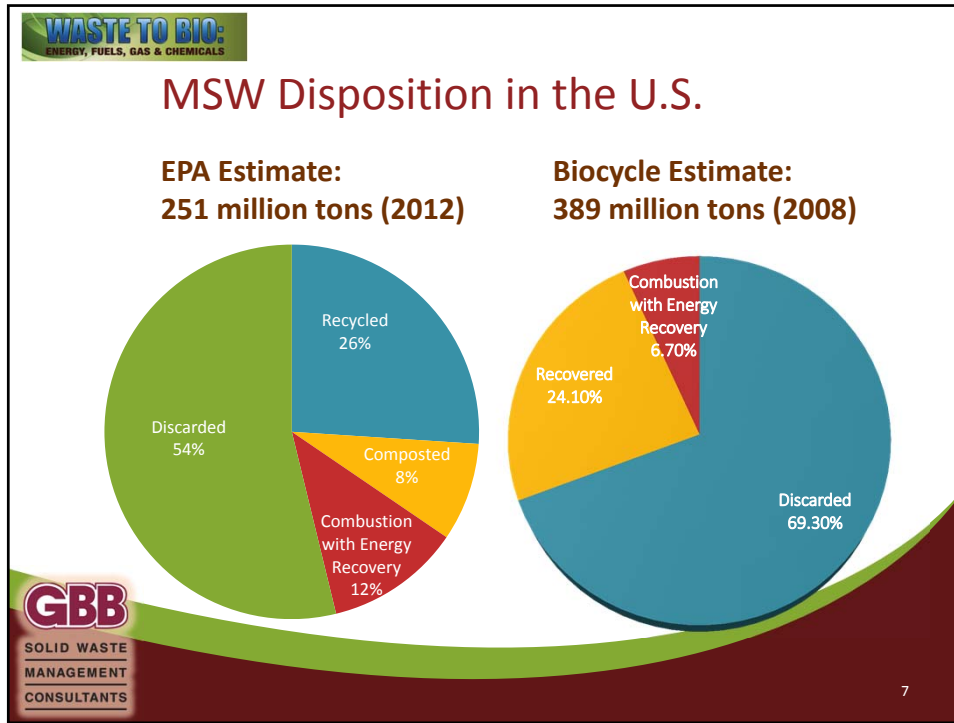
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WASTE TO ENERGY MARKET IN THE U.S.



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U.S. Waste Management Infrastructure

Technology	Number
Source Separation Collections	9,000
Material Recovery Facilities (MRF)	586
Composting	2,300
Mixed Waste Processing Facilities (MWPF)	51
Mass Burn WTE	65
Modular WTE	9
RDF -Processing &/ or Combustion	20
Anaerobic Digestion	19
Transfer Stations	3,350
Landfills	1,908


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Parameters Driving The WTE Market

1. State Regulatory Initiatives
2. Local Community initiatives
3. Landfill tip fees
4. Markets for the final products
5. Renewable energy incentives
6. Certain Federal and State Grant Funds




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Renewable Energy Incentives

- **Federal**
 - Renewable Electricity Production Tax Credit (PTC)
 - Corporate Tax Credit for commercial and industrial sector
 - 1.1 ¢/kWh of electricity generated
 - Business Energy Investment Tax Credit (ITC)
 - Corporate Tax credit for commercial, industrial, utility and agricultural sectors
 - 30% for PTC eligible projects (the project developer can choose between PTC and ITC)
- **State**
 - Feed-In-Tariff
 - Renewable Energy Portfolio Standards (January 2012 data)
 - 30 states and DC have mandated RPS
 - 7 states have voluntary
 - Potential for Municipal grants and loans




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State Regulatory Initiatives

- Types of initiatives:
 - Landfill Diversion Targets
 - Zero Waste to Landfill
 - Food Waste to Landfill bans
- Main reasons:
 - Increase overall recycling
 - Avoid significant disposal cost
 - Increase beneficial use of waste materials
 - Extending the lifetime of the landfills so they don't have to build new landfills
 - Certain locations don't want to build more Waste-to-Energy mass burn plants




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Increased Interest Worldwide in Renewable EfW Technologies

476 Technology/Project Development Companies	157 Commercial or Demonstration Facilities
<ul style="list-style-type: none">• 28 Aerobic Composting• 106 Anaerobic Digestion• 30 Ethanol Fermentation• 117 Gasification• 30 Plasma Gasification• 31 Pyrolysis• 63 WTE: mass burn, modular, dedicated boilers, and RDF• 69 Others (e.g., thermal cracking, hydrolysis, steam reforming, agglomeration, de-polymerization)	<ul style="list-style-type: none">• 70 Anaerobic Digestion• 57 Gasification• 10 Plasma Gasification• 12 Pyrolysis



Source: Gershman, Brickner & Bratton, Inc., June 2014

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Locations Advancing Processing/WTE Technologies

- Mass burn WTE expansions completed
 - Hillsborough County, FL - Covanta
 - Lee County, FL - Covanta
 - Olmsted County, MN – Olmsted County
 - Honolulu, HI – Covanta
- Mixed Waste Processing/AD Operating
 - Newby Island (San Jose, CA) – Republic/Zero Waste to Energy
 - Montgomery, AL- Infnitus /Zero Waste Energy
- Mass burn WTE facilities under construction
 - Durham York (Ontario CN) - Covanta
 - Palm Beach County, FL (SWAPBC) – B&W
- Advancing new facilities
 - Allentown, PA – Delta Thermo Energy Inc.
 - Baltimore, MD – Energy Answers
 - City of Cleveland, OH – to be determined
 - County of Hawaii, HI – to be determined
 - City of Houston, TX – to be determined
 - City of Los Angeles, CA – Green Conversion Systems
 - County of Maui, HI - Anaergia
 - Frederick County, MD (NMWDA) - Wheelabrator
 - Iowa City, IA – to be determined
 - Metro Vancouver, CN – to be determined
 - Prince William County, VA – LEEP
 - Puerto Rico – Energy Answers
 - Region of Peel, Ontario, CN – to be determined
 - Prince George's County, MD
 - Wicomico County, MD



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Locations Advancing Conversion Technologies

- Advancing new facilities with thermal technologies:
 - Three Rivers Solid Waste Management. Authority - Pontotoc, MS – Enerkem
- Anaerobic digestion specific RFPs issued:
 - Humboldt Waste Management Authority, Eureka, CA
- Anaerobic Digestion plants under development :
 - City of Newport News, VA - quasar
 - Town of Bourne, MA - Harvest Power
 - Town of Brunswick, ME - quasar and Village Green Ventures
 - City of Columbia, SC - W2E
 - City of Portland, OR - Columbia Biogas
 - Monticello, IN- Waste No Energy LLC
 - City of Charlotte, NC - Blue Sphere
 - Perris, CA - CR&R/Eisenmann
 - County of Santa Barbara, CA – Mustang Renewable Power Ventures
 - Prince William County, VA – to be determined



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PROJECT DEVELOPMENT & FINANCING



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Stages of a Project

- The dream
- The plan
- The procurement
- The negotiations
- The financing
- The groundbreaking
- Construction/start-up/acceptance
- Commercial operations



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Project Building Blocks

Regulatory impetus and incentives	Limited or high disposal costs	Waste Supply	Markets
Site with good logistics that can be permitted	Landfill for ash and by-pass	Contractor with resources and proven technology	Capital
Ability to pay service fees	Financeability	Compatibility with High Level of Recycling	Political Will

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Technologies and Risk

Alternative	Risks/Liability	Risk Summary
Processing for Recyclables and Fuel	Proven commercial technology	Low
Composting	Proven commercial technology	Low
Mass Burn Combustion	Proven commercial technology	Low
RDF Combustion	Proven technology; limited U.S. commercial experience	Moderate to Low
Anaerobic Digestion	Proven technology; limited U.S. commercial experience	Moderate to Low
Mixed-Waste Composting	Previous large failures; limited large-scale plants in operation; product quality issues	Moderate to High
Pyrolysis and Gasification	Previous failures at scale; no operating experience with large-scale operations in the U.S.; full-scale demonstrations nearing operation	High

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Source: Gershman, Brickner & Bratton, Inc. 2014

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Energy/Fuel Product Values Are Key

Converting MSW to...	Product	1 ton MSW Net yield	Value Per Production Unit	Revenue Per Ton
	Power	500-600 kWh	@ \$0.06 / kWh	\$30-\$36
	Synthetic Crude	1 barrels	@ \$80 / barrel	\$80.00
	Ethanol	80 gallons	@ \$2.50 / gallon	\$200.00

++ sale of chemical feedstocks, heat and/or recovered metals
System Capital Costs and O&M Costs impact the NET MSW costs!

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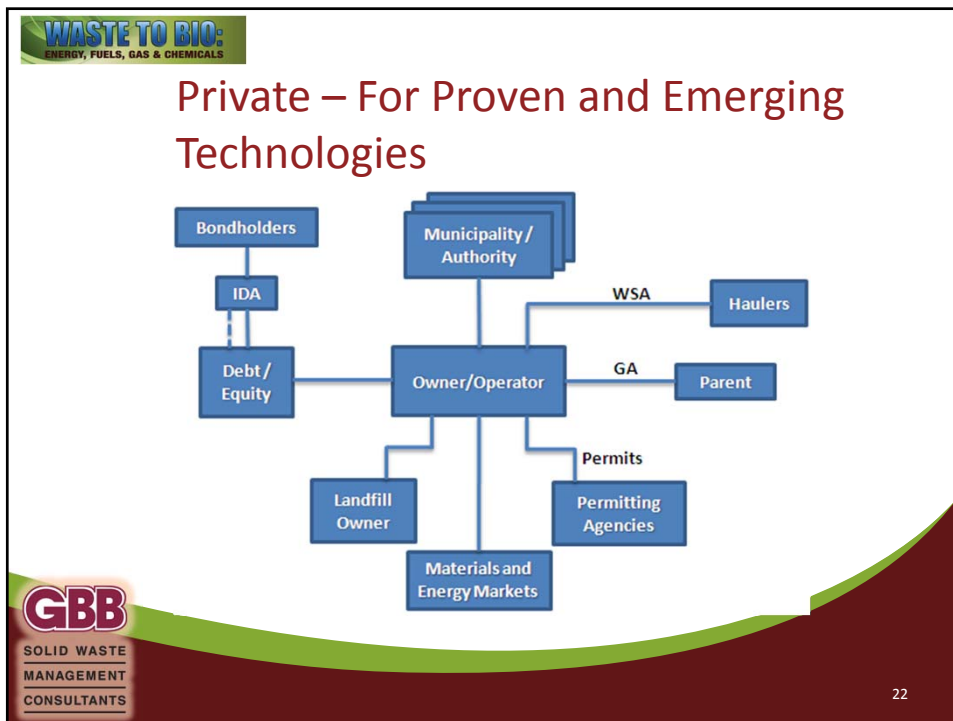
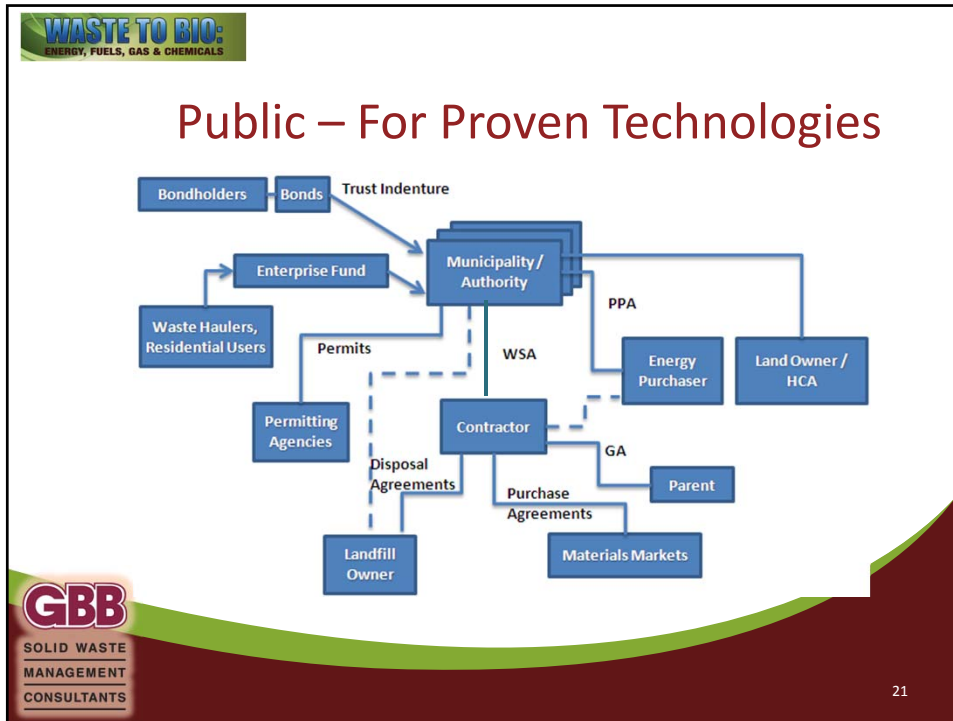
Additional Revenue Streams

- Green Tags (1MWh = 1 Tag)
 - Renewable Energy Certificate (RECs)
 - Green Certificates or Tradable Renewable Certificates
- White Tags (1MWh = 1 Tag)
 - Energy Efficiency Certificate
 - Represents the value of energy not used (conserved) at facilities
 - Created through the implementation of energy conservation projects - demand-side & Cogeneration
 - Principally electricity, but can be any energy supply
 - Mandated in CT, NV, PA, 9 other states evaluating
- Carbon Credits
 - Emissions off-set programs
 - Cap-and-trade

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Source: U.S. Dept. of Energy

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Financing Facilities: Public Finance

- Municipal or authority owner
- Private ownership
- Revenue bond financing
 - 100% debt
 - Construction and long-term
- Design-build-operate contractor
- Security: services agreement



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Financing Facilities: Payment Streams

- Service/tipping/user fees
 - Operating costs
 - Debt service/ROI
 - Reserves
 - Fixed with set escalation (e. g., CPI)
 - Pass-through costs
- Put-or-pay/ minimum put obligation
- Reopeners
 - Force majeure
 - Change in law
- Off-take contracts
 - Electricity
 - Steam/chilled water
 - Biofuels
 - Materials
- Merchant opportunities




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Risks Assignment


Risk Elements:	Assigned to:
Construction	
Capital costs overruns	Contractor
Additional capital investment to achieve required operating performance	Contractor
Additional facility requirements due to new state or federal legislation	Owner
Delays in project completion which lead to delays in revenue flow and adverse effect of inflation	Contractor
Operations	
Facility technical failure	Contractor
Excessive facility downtime	Contractor
Underestimation of facility O&M requirements (labor, materials, etc.)	Contractor
Insufficient solid waste stream	Municipalities
Significant changes in the solid waste composition	Owner/Contractor
Changes in state and federal legislation which affect facility operations	Owner
Inadequate facility management	Contractor
Underestimation of residue disposal costs	Contractor



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RECENT PROJECTS IN THE U.S.



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New Projects in the U.S.



SWAPBC



Newby Island (San José)



Quasar



Enerkem



Honolulu



INEOS Bio

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Gasification Featured Projects

Location	Edmonton, Alberta, CA	Vero Beach, FL	Blairstown, IA
Technology	Gasification/ Catal.Conv. of Syngas	Gasification/ Ferment. of Syngas	Enzymatic Fermentation
Developer	Enerkem	INEOS Bio	Fiberight LLC
Feedstock	Non-recycled MSW	Yard, vegetative, residential waste	MSW, other waste
Throughput (TPD)	300 (feedstock supply)	450	650
Energy Products	Methanol; Ethanol (future)	Ethanol	Ethanol
Cost	\$80M	\$130M	\$40 million for transformation and expansion
Federal Grants/ Loan Guarantees	\$23.5M	\$125M	\$25 million loan guarantee from USDA; \$2.9 million grant from Iowa Power Fund
Start Date	June 2014	June 2012	Late 2014

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Anaerobic Digestion Featured projects

Location	Lake Buena Vista, FL	San Jose, CA	Sacramento, CA
Technology	Anaerobic Digestion	Anaerobic Digestion	Anaerobic Digestion
Developer	Harvest Power	Zero Waste Energy	Clean World Partners
Feedstock	Food waste, biosolids, fats, oils, and grease	Commercial Organic Waste	Commercial and household food waste
Throughput (TPY)	130,000	90,000	Being expanded to 40,000
Energy Products	Biogas; Electricity	Electricity	Biogas; Electricity
Cost	Not Available	\$11.8M	\$12M
Financing	Private; municipal site; municipal feedstock supply and off-take agreements; ARRA Section 1603 Grant-in-Lieu of Tax Credit	Joint ventures; on municipal site; ARRA loan guarantees	- \$1.6M grant from CA Energy Commission -\$2 million loan from CalRecycle
Start Date	March 2014	December 2013	June 2012

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SUMMARY AND TRENDS FOR FUTURE

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What Public Sector Looks For

- Opportunity to become 'greener'
- Low risk
- Proven technologies that meet environmental standards
- Contractors with deep and financeable pockets
- Technology performing as expected
- Predictable economics
 - Avoided/marginal cost of disposal
- Community acceptance
(work with community; don't surprise them!)

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What Companies Look For

- Limited and High Alternative Disposal Costs, e.g. approaching \$100 per ton
- Enlightened elected officials
- Public sector development resources
- Waste Supply and Control for non-recycled materials
- Energy/Fuel and Materials Market(s)
- Capital from loans/grants to reduce need for private debt and equity
- Site
 - Permittable
 - Good logistics
 - Public acceptance

Landfill for ash and by-pass



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Opinion: Trends for the Future

- Many conversion projects advancing
 - AD development moving quickly
- AD developments coming in 2-3 years; thermal technologies will need 4-6 years to learn what works and all need to clarify their economics
- Continuation of public sector taking “Low Risk” attitude until “proven”
- Demand for more recycling/recyclables expected to continue (product quality and net pricing are issues)
- RNG a fantastic opportunity to coordinate between waste and transportation (R=renewable)



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Opinion of Trends for Future (Cont'd)

- More mixed waste processing (MBT is gaining interest)
 - Added recycling side-benefit
 - Most conversion technologies require pre-processing for feedstock preparation
 - Electric utilities may become a player for RDF
 - CNG from AD projects and municipal fleet use (City of Montgomery, AI project)
- “One-bin” approaches key to watch
- ‘Environmentalists’ and ‘Zero Waste’ proponents continue to fight WTE and Waste Conversion Technologies calling them all “incineration”
 - Less waste to manage is an excellent policy to embrace!




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Benefits of Long Term Partnerships

- Increased recycling and energy/fuel productions
- Contribution to need for renewable energy – a more energy beneficial integrated waste management system
- Nearby infrastructure with less dependence on landfilling
- Lowering long-term liability associated



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Questions and comments?

Thank you!

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