


Current Direction of Waste-to- Energy Deals in the U.S.

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Introductions **MSW in the U.S.** **Technology Review**



Deal in the US **Opinion & Trends**



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 **GBB Overview**



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

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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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RENEWABLE Energy FROM WASTE

INSIDE:
 Maximizing RDF Systemsp. 25
 A Financial Source for WTEp. 29
 Boiler Emission Rules Updatep. 32
 Biogas Heats Up in Wisconsin.....p. 35
 Fueling Fleets with Plastics.....p. 38

SERVING FUEL AND ENERGY PRODUCERS // SPRING 2012

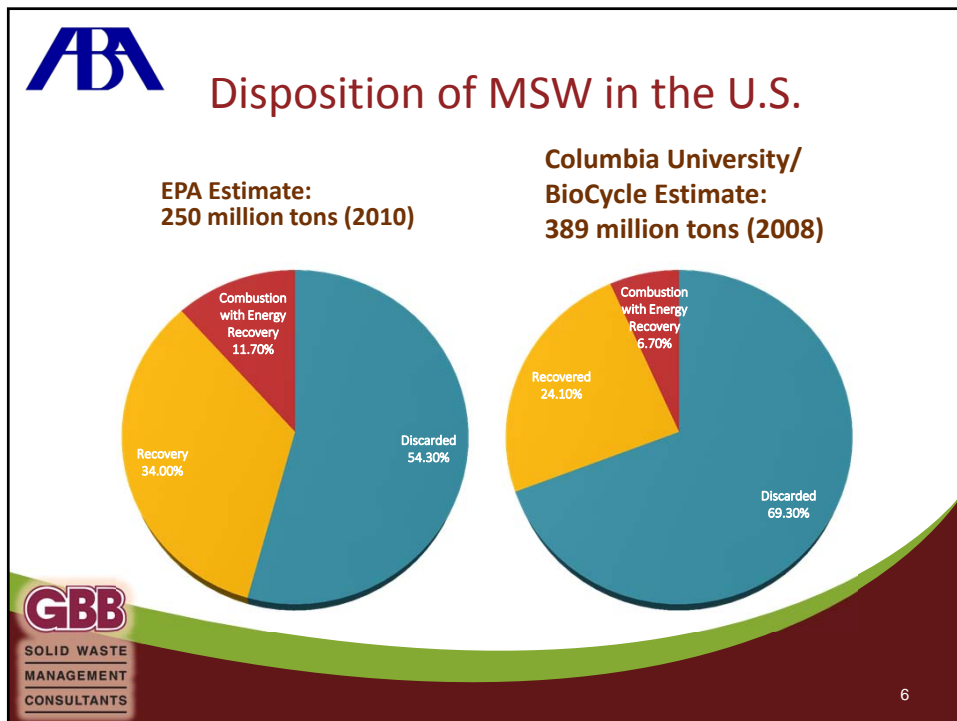
www.rewmag.com

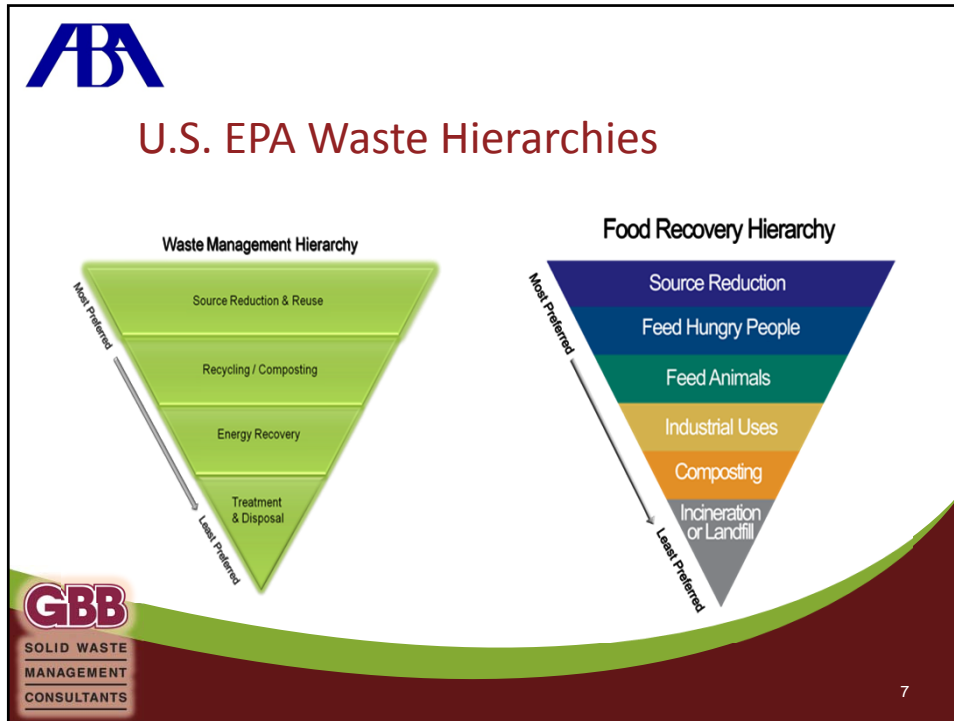
A WORKING MODEL

Greenwood Energy is producing market-friendly fuel pellets from waste in America's heartland.

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The slide features the ABA logo in the top left and the GBB logo (Solid Waste Management Consultants) in the bottom left. The title is 'What is Potential of Waste-to-Energy (W-T-E)?'. Below the title is a bulleted list of potential outputs per 1 ton of MSW:


- Potential Outputs per 1 Ton of MSW
 - For energy
 - Power: 600 to 750 kWh of electricity
 - Steam/chilled water: in cogeneration configurations
 - Ethanol: 60 to 100 gallons
 - For fuel: 10 million BTUs
 - Metals: up to 50-200 pounds of recovered ferrous and non-ferrous metals
 - Ash: 10% of the original volume; 25%-30% by weight

The number '8' is in the bottom right.



Technology and Project Developers

- 34 Aerobic Composting
- 100 Anaerobic Digestion
- 30 Ethanol Fermentation
- 174 Gasification
- 49 Plasma Gasification
- 69 Pyrolysis
- 59 WTE: mass burn, modular, dedicated boilers, and RDF
- 64 Others (agglomeration, autoclave, depolymerization, thermal cracking, steam reforming, hydrolysis)



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Source: Gershman, Brickner & Bratton, Inc., June 2013 2011

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Gasification Technology Offerors



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Technologies Processing Mixed Non-recyclable Plastics

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Technologies Processing Organic Waste


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Technology Commercialization Examples

Location	Edmonton, Alberta, CA	Vero Beach, FL	Storey, NV
Technology	Gasification/ Catal.Conv. of Syngas	Gasification/ Ferment. of Syngas	Gasification/ Catalytic Conv. of Syngas
Developer	Enerkem	INEOS Bio	Fulcrum Bioenergy
Feedstock	Non-recycled MSW	Yard, vegetative, resid. waste	Post-sorted MSW
Throughput (TPD)	300	450	400
Energy Products	Methanol; Ethanol	Ethanol	Ethanol; Propanol
Cost	\$80M	\$130M	\$120M
Federal Grants/Loan Guarantees	\$23.5M	\$125M	--
Start Date	2014	June 2012	2015




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WTE Facilities in the U.S. (BERENYI, 2012)

Technology	Number of Facilities	Average Tons Per Day	Total Tons Per Day
All Facilities	85	975	82,893
Mass Burn	65	1,023	64,452
RDF	15	1,128	16,926
Modular	7	216	1,515



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Locations Advancing “Proven” Technologies

- Example of Mass burn WTE expansions
 - Completed:
 - Hillsborough County, FL - Covanta
 - Lee County, FL - Covanta
 - Olmsted County, MN – Olmsted County
 - Honolulu, HI – Covanta
- Example of Locations advancing new facilities with ‘proven’ technologies:
 - Baltimore, MD – Energy Answers
 - Frederick County, MD (NMWDA) - Wheelabrator
 - Durham York (Ontario CN) - Covanta
 - City of Los Angeles, CA – Green Conversion Systems
 - Palm Beach County, FL (SWAPBC) – B&W
 - Puerto Rico – Energy Answers
 - Metro Vancouver, Canada – To be determined




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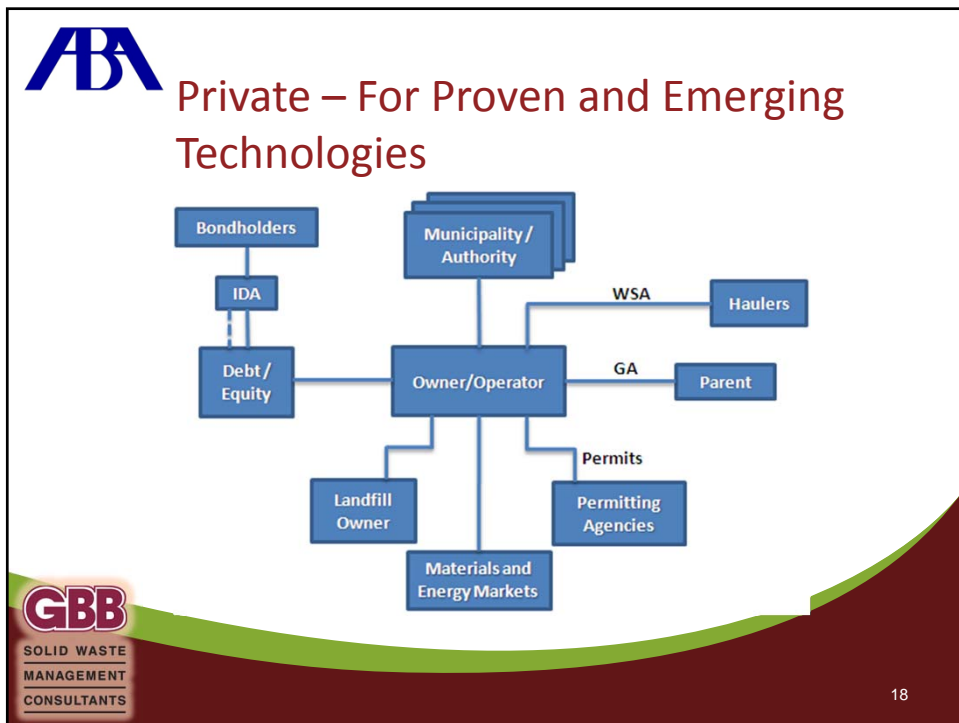
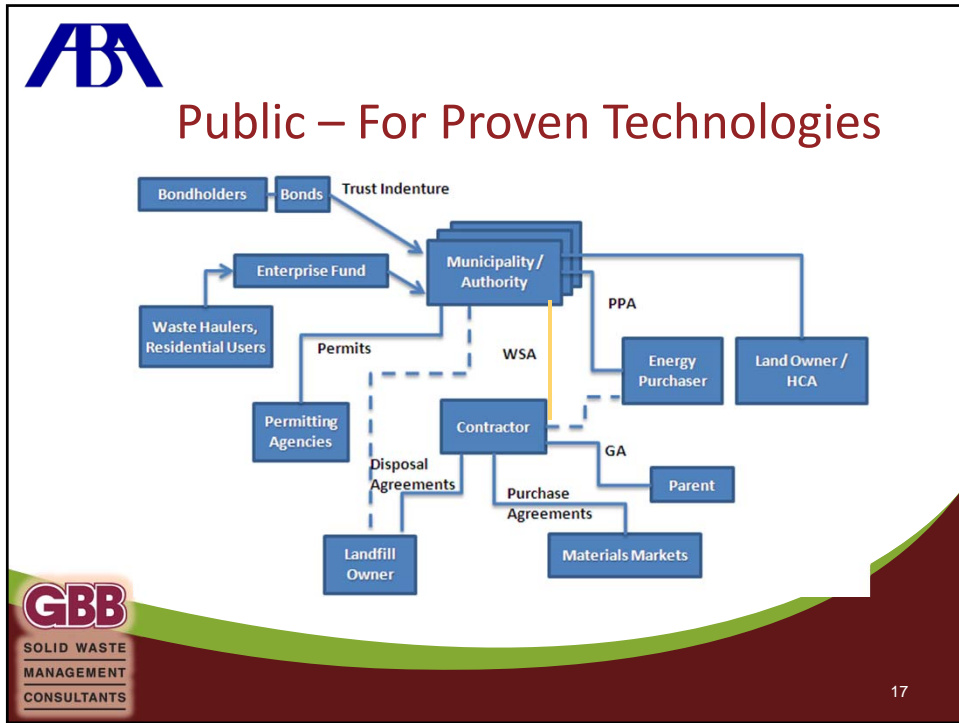



WHAT KIND OF DEALS ARE TRYING TO BE ESTABLISHED AND HOW WILL THEY BE STRUCTURED?



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Risks Assignment

Risk Elements	Private Ownership
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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Technologies and Risk

Source: Gershman, Brickner & Bratton, Inc. March 2012

Alternative	Risks/Liability	Risk Summary
Mass Burn/WaterWall	Proven commercial technology	Very Low
Mass Burn/Modular	Proven commercial technology	Low
RDF/ Dedicated Boiler	Proven commercial technology	Low
RDF/Fluid Bed	Proven technology; limited U.S. commercial experience	Moderate to Low
Anaerobic Digestion	Proven technology; limited U.S. commercial experience	Moderate to Low
Pyrolysis	Previous failures at scale, uncertain commercial potential; no operating experience with large -scale operations	High
Gasification	Limited operating experience at only small scale; subject to scale-up issues	High
Mixed-Waste Composting	Previous large failures; No large-scale commercially viable plants in operation; subject to scale-up issues	Moderate to high
Chemical Decomposition	Technology under development; not a commercial option at this time	High



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Opinion: Trends for the Future

- Many conversion projects advancing
- Will need 4-6 years to learn what works and their economics
- Continuation of public sector taking “Low Risk” attitude until “proven”
- Demand for more recyclables expected to continue at attractive pricing
- More mixed waste processing systems [again]
 - Many conversion technologies require MSW pre-processing... for feedstock sizing and inerts removal
 - Electric utilities may become a player for RDF
- ‘Environmentalists’ and ‘Zero Waste’ proponents will continue to fight WTE and Waste Conversion Technologies calling them all “incineration”



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A Realistic & Ultimate Goal:

Fully Integrated and Efficient Waste Management System with Significant Diversion (Recycling) and WTE-WCT
...in a 50-50 partnership!
...for more jobs, better environment, and energy independence!



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Thank you!!

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