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Assessment of Biomass Energy Potential in New Jersey

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NJBPU, Biopower Working Group Meeting, 7/23/13

Outline

- Summary of 2007 NJAES Study of **"Assessment of Biomass Energy Potential in New Jersey"**
- New updated version will be released in coming months
- Preliminary results from Version 2.0-2013
- Biomass energy opportunities and challenges
- Biomass Workgroup - EMP Recommendations

Rutgers NJAES Assessment of 2007:

- Was prepared for the New Jersey Board of Public Utilities
- Served as the first "**Biomass Assessment of New Jersey**"
- Had four major goals:
  - Assess the characteristics and quantity of New Jersey's biomass resources;
  - Assess technologies that capable of producing bioenergy, in the form of electric power and transportation fuels from New Jersey's biomass resources;
  - Develop the first statewide mapping of waste/biomass resources and bioenergy potential; and
  - Develop policy recommendation for moving New Jersey into the forefront of bioenergy innovation.

Study yielded six major findings about New Jersey's biomass resources:

1. New Jersey produces an estimated 8.2 million dry tons (MDT) of biomass annually.
2. Biomass is concentrated in the counties of central and northeastern New Jersey.
3. About 75% of New Jersey's biomass resource is produced directly by the state's population, much of it in the form of solid waste (e.g., municipal waste).
4. Agriculture and forestry management are also important potential sources of biomass, and account for the majority of the remaining amount.
5. A screening process was developed to estimate the amount of practically recoverable biomass. The results of this process indicate that approximately 5.4MDT (~65%) of New Jersey's biomass could ultimately be available to produce energy, in the form of power or transportation fuels.
6. New Jersey's estimated practically recoverable biomass resource of 5.4 MDT could deliver up to 1,124 MW of power, (capable of producing ~9% of New Jersey's electricity consumption) or 311 million gallons of gasoline equivalent (~5% of transportation fuel consumed).

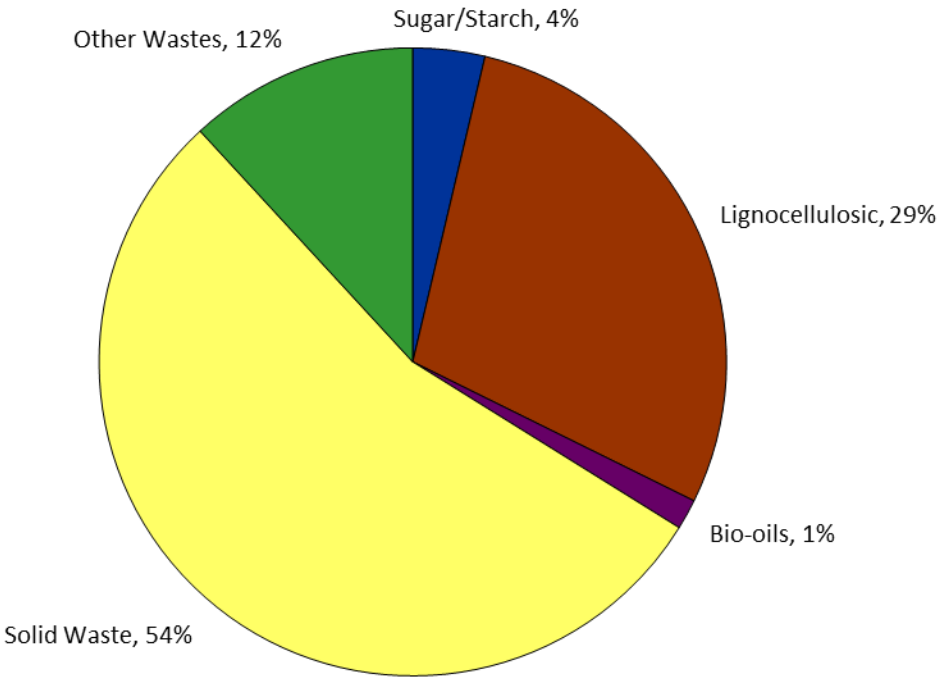
A range of biomass resources were examined; these were divided into 5 categories based on physical characteristics.

Feedstock Type	Definitions	Resources
Sugars/Starches	Traditional agricultural crops suitable for fermentation using 1st generation technologies Some food processing residues are sugar and starch materials	•Agricultural crops (sugars/starches) •Food processing residues (w/residual sugars)
Lignocellulosic Biomass	Clean woody and herbaceous materials from a variety of sources Includes clean urban biomass that is generally collected separately from the municipal waste stream (wood from the urban forest, yard waste, used pallets)	•Agricultural residues •Cellulosic energy crops •Food processing residues •Forest residues, mill residues •Urban wood wastes •Yard wastes
Bio-oils	Traditional edible oil crops and waste oils suitable for conversion to biodiesel	•Agricultural crops (beans/oils) •Waste oils/fats/grease
Solid Wastes	Primarily lignocellulosic biomass, but that may be contaminated (e.g., C&D wood) or co-mingled with other biomass types	•Municipal solid waste (biomass component) •Construction & Demolition (C&D) wood •Food wastes •Non-recycled paper •Recycled materials
Other Wastes	Other biomass wastes that are generally separate from the solid waste stream Includes biogas and landfill gas	•Animal waste (farm) •Wastewater treatment biogas •Landfill gas

"Assessment of Biomass Energy Potential in New Jersey" Version 2.0 -2013

- Currently being finalized
- Final report is due in October 2013
- Updates the county based data
- New section on GHG emissions reduction potential of New Jersey
- Updates on emerging technologies
- New Jersey's food waste-to-energy potential has been added as a category

Total Available Biomass Resources by Type (dry tons/yr)



Total= 7.4 million dry tons/yr

Biomass Waste in MSW (2010) (Tons)				
	% MSW	Disposed[4]	Incinerated[5]	Landfilled
Total MSW	100.00	5,917,468	1,463,537	4,453,931
Food waste[1]	15.82	936,143	231,532	704,612
Paper Waste[2]	19.45	1,150,947	284,658	866,289
Other Biomass[3]	26.93	1,593,574	394,131	1,199,443
Total Biomass	62.20	3,680,665	910,320	2,770,345

Sources

1 USEPA

2 Percentage given by Ray Worob of NJDEP

3 Municipal Solid Waste. EPA. Accessed 1 Feb 2013. http://www.epa.gov/epawaste/nonhaz/municipal/index.htm

4 2010 New Jersey Generation, Disposal and Recycling Statistics: By County. Solid and Hazardous Waste Management Program. NJDEP. Accessed 6 Nov 2012. http://www.state.nj.us/dep/dshw/recycling/stat_links/10disposalrates.pdf

5 Data given by Joseph Davis MPA, Data base Analyst 1 of NJDEP that was received 11/9/12

County Based Food Waste

County	Food Waste, Landfilled (tons/yr)
Atlantic	37,581.62
Bergen	86,443.55
Burlington	42,172.37
Camden	13,388.75
Cape May	14,397.67
Cumberland	18,000.79
Essex	16,021.37
Gloucester	4,014.98
Hudson	58,367.33
Hunterdon	7,762.36
Mercer	37,298.63
Middlesex	84,580.07
Monmouth	67,985.59
Morris	44,805.02
Ocean	61,948.43
Passaic	53,142.96
Salem	6,334.34
Somerset	31,571.00
Sussex	11,913.24
Union	4,518.67
Warren	2,363.06
New Jersey	704,611.81

Sources

2010 New Jersey Generation, Disposal and Recycling Statistics: By County. Solid and Hazardous Waste Management Program. NJDEP. Accessed 6 Nov 2012. http://www.state.nj.us/dep/dshw/recycling/stat_links/10disposalrates.pdf

County Based Landfill Gas

County	LFG Amount (mmscfy)	LFG Amount Utilized (mmscfy)	LFG Amount Available (mmscfy)
Atlantic	1,638.00	737.42	900.58
Bergen	1,194.16	0.00	1,194.16
Burlington	2,677.52	1,019.15	1,658.36
Camden	319.87	297.00	22.87
Cape May	803.06	70.64	732.41
Cumberland	890.10	699.90	190.20
Essex	450.53	0.00	450.53
Gloucester	2,709.59	0.00	2,709.59
Hudson	269.27	0.00	269.27
Hunterdon	0.00	0.00	0.00
Mercer	0.00	0.00	0.00
Middlesex	4,428.56	3,642.69	785.87
Monmouth	2,010.75	1,788.50	222.25
Morris	446.88	0.00	446.88
Ocean	3,153.60	2,242.74	910.86
Passaic	0.00	0.00	0.00
Salem	660.77	351.63	309.14
Somerset	0.00	0.00	0.00
Sussex	306.94	289.18	17.76
Union	0.00	0.00	0.00
Warren	276.53	182.89	93.63
New Jersey	22,236.11	11,321.74	10,914.37

Sources

County Officials from respective counties

NJDEP (2009 spreadsheet)

LMOP Database: New Jersey. U.S. EPA. 28 June 2012. Accessed 19 Sept 2012. http://www.epa.gov/lmop/projects-candidates/index.html #map-area

Emerging Technologies

- Anaerobic Digestion of food waste and other suitable organic waste into methane for:
  - Power generation
  - CNG, LNG applications
  - Green fertilizer
- Gasification of suitable biomass (and other available waste) into Syn-gas for:
  - Power Generation
  - Further treating syn-gas into transportation fuels
  - Conventional gasification, plasma gasification
- Pyrolysis of biomass (and other available waste) into pyrolysis oil for:
  - Transportation fuels production
  - Clean Chemicals production

Biopower Opportunities

- Biomass as a "Solution Candidate" to energy problem
- Underutilized feedstock availability
- Need for clean energy
- Interest for GHG emissions reductions for climate change mitigation
- Need for sustainability and resilience
- New emerging technologies
- Available incentives

Barriers for Bio-Energy

- Feedstock securitization
- Unverified technologies (combustion is the only known technology, need for other innovative technologies)
- Economic barriers : High CAPEX, less interest from funders, investors
- Regulatory Barriers:
  - Class II biomass does not get the sustainability determination
  - Need for proven technology
- Need for incentives in the transportation sector
- Public acceptance and collaboration

Biomass Work Group Recommendations for EMP, 2011

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Biomass Work Group

- **Graham Barker**, Air & Gas Technologies
- **Jeffrey Beach**, N.J. Department of Agriculture
- **Phil Cerria**, South Jersey Energy Solutions
- **Edward A. Clerico**, Natural Systems Utilities
- **Carol Coren**, Rutgers Food Innovation Center
- **Rocco D'Antonio**, Organic Diversion LLC
- **Chuck Feinberg**, Chairman, Clean Cities N.J
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- **Gail Richardson, Ph.D**., Energy Vision; BWG Co-Chair
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- **Robert W. Simkins**, Burlington County Resource Recovery
- **Gary Sondermeyer**, Bayshore Recycling
- **David Specca**, Rutgers EcoComplex; BWG Co-Chair
- **William E. Toffey**, Effluential Synergies LLC
- **Joanna D. Underwood**, Energy Vision
- **William E. Wells**, New Jersey Natural Gas

Recommendations

MAJOR RECOMMENDATION

- ***Biomass to Power & Fuels Initiative***: Target State resources to facilitate public-private partnerships to build and operate biomass-to-power & fuels plants in two to three years.

OTHER RECOMMENDATIONS

- Facilitate and incentivize pilot and small-scale biomass-to-energy demonstrations.
- Commission studies of key economic aspects of ag and rural feedstocks.
- Commission studies to fill data gaps for urban and industrial feedstocks.

RNG WORK GROUP ANALYSIS

- Renewable natural gas is a sustainable biomass-based fuel with an unmatched combination of economic & environmental benefits.

Waste-to Energy "REC" Designation: No Change Was Recommended

Based on a consideration of the economics of conventional RECs and of recent Legislative history, the Biomass Work Group found that an effort to modify the waste-to-energy REC definition would be ill advised and does not recommend it.

- A Class 1 definition for this sector wouldn't make any difference, in view of the bottoming out of regional REC markets.
- There appears to be little chance of changing the State-level policy position to retain waste-to-energy as a "Class 2" resource.
- There is value in exploring a market-based approach in the future, perhaps by creating a "Bio-REC" patterned after the SREC and OREC programs.

Thank You!

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