

NATIONWIDE ECONOMIC BENEFITS OF THE WASTE-TO-ENERGY SECTOR

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SUMMARY OF ECONOMIC IMPACTS

Total economic contribution -- \$5.6 billion of gross economic sales output, encompassing nearly 14,000 jobs and nearly \$890 million of total labor compensation.

- Direct labor impacts—5,350 employees servicing 85 plants in the United States
- Direct labor earnings-- \$459 million in wages, salaries and benefits paid to WTE employees in the United States
- Job multiplier impact—8,557 additional full time equivalent jobs created in the U.S. sector outside the WTE sector. An estimated 1.6 additional jobs are supported by each direct waste-to-energy job
- Labor income multiplier effect—an additional \$429 million in wages, salaries and benefits received by workers outside the waste-to-energy sector

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INTRODUCTION: WASTE-TO-ENERGY IN THE UNITED STATES

Conversion of municipal solid waste (MSW) to energy (WTE) has been an important mode of waste management since the 1970s. During that time, the federal, state and local governments were confronting the dual realities of environmental damages caused by unregulated, sub-standard landfills and an energy crisis, caused by the Arab oil embargo. As a result, the federal and state governments enacted policies to both encourage the construction of waste-to-energy facilities and hasten the closure of sub-standard landfills. By the early 1990s, there were as many as 136 operating WTE plants. Due to economic and institutional issues, there are now 85 plants¹, which include one plant that is supplying pre-processed MSW to a dedicated boiler. These plants are processing about 30 million tons annually² or about 7% of the post-recycled refuse being generated in the United States.³

The 85 WTE plants are spread over 22 states. In 2010, they generated approximately 14.2 million megawatt hours of electricity and 14,840 Mlbs of steam for sale.⁴ This translates into nearly 1.3 million homes⁵ powered by energy generated from waste. In addition, at least 705,000 tons of ferrous metals and 25,000 tons of non-ferrous metals (mainly aluminum) are recycled either at the front end of a WTE plant prior to combustion or at the back end, sorted from the ash. Totals in terms of tons processed, energy produced, tons recycled, and direct jobs per state are shown in Table 1.

ECONOMIC IMPACTS OF WASTE-TO-ENERGY

This paper examines the national economic impact of the waste-to-energy industry. The sector serves three main functions: 1) it is a major method of disposal of residential and commercial post-recycled waste; 2) it serves as a large recycler of municipal post-consumer metals; and 3) it serves as power generator, providing baseload electric power to millions of U.S. residents and businesses. The revenues, employment, and labor earnings derived from these activities are the direct economic benefits of waste-to-energy. However, in addition, these activities generate indirect impacts (value of inputs purchased in the first and second round of spending by the WTE sector and in subsequent rounds of spending by supporting industries) as well as induced impacts (value of goods and services purchased by all workers whose earnings are affected by the direct and indirect WTE spending).⁶

¹ Eileen Berenyi. **Municipal Waste to Energy in the United States: 2012-2013 Yearbook and Directory**, Ninth Edition. (Westport CT: Governmental Advisory Associates, 2012).

² Ibid.

³ "State of Garbage in America", **BioCycle**, October 2010, vol. 51, no 10, p.16

⁴ Eileen Berenyi. **Municipal Waste to Energy in the United States: 2012-2013 Yearbook and Directory**, Ninth Edition. (Westport CT: Governmental Advisory Associates, 2012).

⁵ U.S. Energy Information Administration. Indicates an average consumption of 11,280kwh for an average American household. www.eia.gov.

⁶U.S. Department of Commerce, Bureau of Economic Analysis RIMS (Regional Input-Output Analysis Modeling System) II Handbook, p 5-3. Model produces multipliers used in regional economic impact studies to assess total economic effects of projects on a region. For this paper, statewide multipliers were used.

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Methodology

In order to estimate the indirect and induced impacts of the waste-to-energy industry, statewide multipliers developed by the Bureau of Economic Analysis, U. S. Department of Commerce were used. Specific data on WTE plant revenues and employment used in this study are based on a 2011 survey of WTE plants in the United States undertaken by Governmental Advisory Associates, Inc. An economic impact model (BEA RIMS II) was used to estimate the multiplier effects. In order to better estimate the multiplier effects of waste-to-energy, the sector was divided into its two major activities: waste processing and disposal and power generation. Recycling at the facility was included in the waste processing portion of the sector. For each state, waste disposal, recycling and energy revenues were aggregated and appropriate multipliers for the waste and utility sector were applied. A similar method was followed for number of jobs and labor earnings.

Table 1: Characteristics of WTE Plants in the U.S.

State	Number of Plants	Number of Employees*	Tons Per Year Processed	Net MWH	Mlbs Steam Sold	Tons Ferrous Metal Recycled	Tons Non-Ferrous Metal Recycled
Alabama	1	40.33	218,989		914	5,416	386
California	3	163.58	856,121	425,462		17,379	
Connecticut	6	426.87	2,329,243	1,276,479		57,947	400
Florida	11	901.37	5,581,254	2,857,434		121,104	7,690
Hawaii	1	134.45	542,674	319,656		19,088	2,500
Indiana	1	75.07	695,275	43,800	3,500	15,558	1158
Iowa**	1	16.81	38,706			2,400	110
Maine	4	261.05	692,558	409,807		21,157	279
Maryland	3	179.26	1,329,530	603,655	1,445	19,904	27
Massachusetts	7	552.36	3,180,168	1,731,726	206	94,939	4,826
Michigan	3	256.57	997,557	322,681	2,251	38,476	7
Minnesota	10	365.25	1,013,481	560,581	1,093	33,347	1748
New Hampshire	2	70.59	265,389	129,309		1835	
New Jersey	5	306.99	2,148,851	1,115,216		40,283	72
New York	10	577.01	3,861,248	1,842,166	3,028	85,677	2148
Oklahoma	1	43.70	202,466		1159	3874	
Oregon	1	42.58	189,408	86,532		4704	
Pennsylvania	6	392.14	3,198,273	1,647,646		64,658	1373
Utah	1	44.82	124,360	2628	383	3210	
Virginia	5	398.86	2,022,589	730,613	788	42,505	2315
Washington	1	44.82	281,813	141,498		9,113	
Wisconsin	2	56.02	87,065	7303	72	2,650	
TOTAL	85	5350.5	29,857,018	14,254,192	14,839	705,224	25,039

*Includes 575 overhead personnel allocated by state across the 22 states on basis of number of direct plant personnel
**Iowa plant uses RDF with coal in a coal fired boiler. Contribution of RDF to energy output is too small to calculate

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Total Gross Sales Output

Total gross sales numbers were used to approximate the economic output of the sector. Gross sales of the industry encompass revenues generated from: 1) tip fees—amounts paid to the WTE plant to dispose of refuse; 2) energy sales revenues; 3) recycling sales revenues. As can be seen in Table 2 below, total output (sales revenues) totaled \$3.2 billion. The total national economic impact of these revenues is \$5.6 billion, including the initial \$3.2 billion produced by the waste-to-energy sector directly. Every dollar of revenue generated by the waste-to-energy industry puts a total of 1.77 dollars into the economy through intermediate purchases of goods and services and payments to employees. Table 2 breaks down economic impacts by state.

Table 2: Effect of Output (Revenue) Multipliers by State for the WTE Sector

State	Total Direct Revenues (Million \$)	Total Indirect and Induced Revenues (Million \$)	Total Revenues (Million \$)	Multiplier
Alabama	\$28.61	\$18.54	\$47.15	1.65
California	\$74.93	\$64.91	\$139.85	1.87
Connecticut	\$247.88	\$180.17	\$428.04	1.73
Florida	\$575.37	\$422.17	\$997.54	1.73
Hawaii	\$89.00	\$54.41	\$143.41	1.61
Indiana	\$41.48	\$33.44	\$74.93	1.81
Iowa*	\$4.83	\$2.49	\$7.32	1.52
Maine	\$87.54	\$59.06	\$146.59	1.67
Maryland	\$109.38	\$73.65	\$183.04	1.67
Massachusetts	\$329.49	\$262.15	\$591.64	1.80
Michigan	\$108.12	\$77.27	\$185.38	1.71
Minnesota	\$111.25	\$81.86	\$193.11	1.74
New Hampshire	\$20.21	\$17.25	\$37.46	1.85
New Jersey	\$266.86	\$230.07	\$496.92	1.86
New York	\$421.71	\$305.15	\$726.86	1.72
Oklahoma	\$11.44	\$9.25	\$20.69	1.81
Oregon	\$18.12	\$13.73	\$31.85	1.76
Pennsylvania	\$299.84	\$286.29	\$586.13	1.95
Utah	\$5.07	\$4.55	\$9.62	1.90
Virginia	\$236.92	\$186.75	\$423.67	1.79
Washington	\$41.41	\$33.48	\$74.89	1.81
Wisconsin	\$9.22	\$6.55	\$15.77	1.71
TOTAL	\$3,138.66	\$2,423.20	\$5,561.87	1.77

Employment and Wage Earnings

In total, the waste-to-energy industry employs about 5,350 people nationwide. This number includes all workers at the 85 specific sites, as well as off-site employees of the several regional and national firms that own and operate waste-to-energy facilities and local government personnel dedicated to plant oversight and maintenance. For the analysis, employees were allocated to the waste or utilities portion of the business based on individual plant breakdowns of revenues derived from each of these activities.

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Table 3 breaks down WTE employment numbers by state. In addition to the 5,350 employees directly employed by the industry, the WTE sector creates an additional 8,600 jobs. Therefore, another 1.6 jobs are created for every employee hired by the WTE industry.

Table 3: Effect of Job Multipliers by State for the WTE Sector*

State	Total Direct Jobs	Total Indirect and Induced Jobs	Total Jobs	Multiplier
Alabama	40.33	68.24	108.57	2.69
California	163.58	339.71	503.29	3.08
Connecticut	426.87	625.47	1052.35	2.47
Florida	901.37	1469.90	2371.26	2.63
Hawaii	134.45	189.41	323.85	2.41
Indiana	75.07	121.70	196.77	2.62
Iowa	16.81	15.13	31.94	1.90
Maine	261.05	354.20	615.26	2.36
Maryland	179.26	279.16	458.42	2.56
Massachusetts	552.36	888.38	1440.74	2.61
Michigan	256.57	478.05	734.62	2.86
Minnesota	365.25	522.27	887.52	2.43
New Hampshire	70.59	103.75	174.34	2.47
New Jersey	306.99	514.58	821.58	2.68
New York	577.01	800.40	1377.40	2.39
Oklahoma	43.70	79.52	123.22	2.82
Oregon	42.58	72.99	115.57	2.71
Pennsylvania	392.14	751.55	1143.70	2.92
Utah	44.82	113.98	158.79	3.54
Virginia	398.86	611.31	1010.17	2.53
Washington	44.82	74.30	119.12	2.66
Wisconsin	56.02	82.99	139.01	2.48
TOTAL	5350.50	8556.99	13,907.49	2.60
*Includes 575 off site overhead personnel				

A waste-to-energy plant is a complex operation in which solid waste is received, processed and converted to energy through thermal, chemical, or biological treatment. For the plants that are currently in operation, there are in-feed systems, boilers and emissions control and ash management components. Therefore most employees at waste-to-energy plants are technically skilled, with many having to undergo periodic licensing and operations testing. Facilities are capital intensive, with employees compensated at a relatively high average wage. Table 4 shows earnings of WTE employees broken down by state and the multiplier impact of these earnings on individual state economies as well as the country as a whole. For the purposes of this study a national average salary of \$85,700 (inclusive

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of fringe benefits) was used.⁷ As shown in Table 4, employees in the waste-to-energy industry received about \$460 million in annual salary and benefits. The effect of this direct spending on employee compensation generated another \$429 million of compensation for workers across various associated industries. For every dollar paid to an employee in the waste-to-energy industry, another dollar of compensation was received by employees across various industries supplying WTE plants.

Table 4: Effect of Earnings Multipliers by State for the WTE Sector

State	Total Direct Earnings (Million \$)	Total Indirect and Induced Earnings (Million \$)	Total Earnings (Million \$)	Multiplier
Alabama	\$3.46	\$2.94	\$6.40	1.85
California	\$14.02	\$15.82	\$29.84	2.13
Connecticut	\$36.58	\$31.14	\$67.72	1.85
Florida	\$77.25	\$73.18	\$150.42	1.95
Hawaii	\$11.52	\$8.99	\$20.52	1.78
Indiana	\$6.43	\$5.95	\$12.38	1.92
Iowa	\$1.44	\$0.85	\$2.29	1.59
Maine	\$22.37	\$18.90	\$41.27	1.84
Maryland	\$15.36	\$12.64	\$28.00	1.82
Massachusetts	\$47.34	\$46.40	\$93.74	1.98
Michigan	\$21.99	\$20.50	\$42.48	1.93
Minnesota	\$31.30	\$28.04	\$59.34	1.90
New Hampshire	\$6.05	\$5.69	\$11.74	1.94
New Jersey	\$26.31	\$25.78	\$52.09	1.98
New York	\$49.45	\$43.11	\$92.56	1.87
Oklahoma	\$3.74	\$3.87	\$7.61	2.03
Oregon	\$3.65	\$3.45	\$7.10	1.95
Pennsylvania	\$33.61	\$38.25	\$71.86	2.14
Utah	\$3.84	\$4.50	\$8.34	2.17
Virginia	\$34.18	\$31.17	\$65.35	1.91
Washington	\$3.84	\$3.74	\$7.58	1.97
Wisconsin	\$4.80	\$4.09	\$8.90	1.85
TOTAL	\$458.54	\$429.02	\$887.53	1.94

Conclusion

The waste-to-energy sector provides significant economic value in the communities in which these facilities operate. In addition to the revenues generated by the sector, waste-to-energy facilities provide stable, long-term, well-paying jobs, while simultaneously pumping dollars into local economies through the purchase of local goods and services and the payment of fees and taxes. In addition to the

⁷ Todd Gabe. "Statewide Economic Contribution of Maine's Waste-to-Energy Sector". For Maine's Waste-to-Energy Working Group, October 2011. Number confirmed in conversations with personnel of Covanta Energy and Wheelabrator.

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opportunities to provide baseload renewable electric generation, recover metals for recycling, and reduce greenhouse gas emissions, these facilities significantly contribute to the green economy in the communities in which they operate.