

RECYCLING AND BIOMASS ENERGY

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Material which is now going to landfill or a waste to energy facility could be used differently in several ways. It could be recycled as material, composted, used as feedstock for chemicals, or burned for energy. This paper explores the factors which may interest the Department of Energy as it explores the possibilities of using biomass in furtherance of Executive Order 13134.

POSSIBLE OPPORTUNITY

The MSW Characterization Report for 1997 (data for 1996) showed about 47 million tons of paper still disposed of in landfills or waste to energy facilities. Corrugated, office paper, and newspaper are about 19 million tons and the rest is about 28 million tons.

Table 1: Waste Paper Generation Recovery and Disposal
(Thousands of Tons, 1996)

Waste Stream and Material	Generated	Recovered	Disposed
Corrugated, Office Paper, and Newspaper	47,970	29,180	18,790
All other Paper included in MSW	31,960	3,430	28,530
Total	79,930	32,610	47,320

Tellus makes the point that, unlike corrugated, office paper, and newspaper which fetch \$50 per ton and up, other paper, for example mixed residential as reported in Waste News, frequently costs as much as \$30 per ton for disposal.

Wood in construction and demolition waste is another source which now costs money for disposal. Over 25 million tons could be used to replace coal.

Table 2: C&D Wood Waste
(Thousands of Tons, 1996)

	Generated	Recovered Or Unavailable	Available
Construction	4,207	474	3,733
Renovation	23,142	9,417	13,725
Demolition	16,506	9,496	7,010
Total	43,854	19,386	24,468

Land clearing debris is another source of wood. About 16 million tons may be available for replacing coal.

Table 3: Waste in Urban Wood Waste
(Thousands of Tons, 1996)

	Generated	Recovered	Available
Commercial Tree Care	9,628	2,449	7,179
Utilities	1,232	313	919
Land Clearance Contractors	735	187	548
Lawn/Garden Landscapers	9,871	2,510	7,361
Total	21,465	5,459	16,006

POTENTIAL IMPACT ON ELECTRIC GENERATION

Paper and wood currently going to disposal from MSW, C&D, and land clearing waste is shown in

Table 4 along with millions of kilowatt hours it could produce. 125 billion kWh is 6.7 percent of the electricity generated using coal in 1996.

Table 4: Electric Generation Possible by Co-firing Available Paper and Wood with Coal

Waste Stream and Material	Available Waste (Thousands of Tons)	Electricity (Millions of kWh)
MSW		
Paper	40,340	51,340
Wood	10,350	15,060
Wood from C&D Waste	24,470	35,590
Wood from Land Clearing Debris	16,010	23,280
Total	91,170	125,270

AT WHAT PRICE?

Relative to the Btu value of paper and wood, coal fired utilities could be expected to pay **between \$8 and \$16** per ton of wood or paper delivered to their utility. That compares with a fee at a landfill. In essence, one can offset processing and delivery costs by \$8. Utilities can replace up to 2 percent of coal with paper or wood without major retrofitting.

WHAT ABOUT YARD TRIMMINGS AND FOOD WASTE?

Yard trimmings and food waste have about a third the Btu value of wood and paper. They are

Table 5: Properties of Waste Materials

Waste Material	Heating Values (Btu/lb)	Moisture Content (%)
Paper	7,000	6

Wood	8,000	20
Food Waste	2,000	70
Yard Trimmings	2,800	60

unlikely to be used as long as paper and wood are available.

WHAT'S IN IT FOR RECYCLING?

Suppose a MRF or a transfer station could be assured of a floor price for paper or wood of 8\$ compared to a penalty of \$30 for “unmarketables”. A MRF could then add a shift to process mixed residential paper and, for material with a better price, sell it, while being assured of a floor price for everything else. A transfer station could accept wood or paper loads from commercial customers knowing that the worst they would do was a sale at \$8 a ton. In essence, encouraging coal fired utilities to burn paper and wood would create a low risk environment for expanded recycling opportunities.

ENVIRONMENTAL IMPACT OF REPLACING COAL WITH PAPER OR WOOD

Emissions of carbon dioxide and sulfur would be reduced. Nitrogen oxides would also be reduced but particulates would increase. Organics would be reduced in landfills and indirect effects of mining coal would decrease. An initiative to replace 1 percent of coal usage with paper and wood would

Table 6: Emissions Reductions Due to Co-firing

	Carbon Dioxide (MMTCE)	Sulfur Dioxide (Gg)
Emissions Reduction Due to Co-firing	30.7	725
Total U.S. Emissions	1,471.1	17,339
Reduction as a Percent of U.S. Emissions	2.1%	4.2%

result in global warming savings of 4.6 million metric tons of carbon equivalent.

UNINTENDED CONSEQUENCES

Executive Order 13134 promotes use of biomass as alternate fuel. It might cost \$80 per ton to replace coal with switchgrass. Subsidies of \$80 per ton could make it attractive to burn materials currently recycled. This discussion assumes no subsidies.