

MEMORANDUM

TO: Clean and Renewable Energy Subcommittee Members

FROM: Hal Nelson

CC: Tom Peterson, Tom Looby, Marnie Stein

DATE: July 26, 2008

RE: Biomass Supply Curve

The tables below are the fuel cost and supply assumptions for different types of biomass in Iowa used by the Agriculture and Forestry Subcommittee. The energy crop costs are used to determine dedicated biomass generation, while agricultural by-products are assumed to be used to co-fire biomass with existing coal boilers. These costs have been used to update the file Levelized Costs for IA v01.xls. The fuel costs are unchanged over the 2009-2020 period. These updated cost estimates are considerably higher than the placeholder costs from the 2008 Annual Energy Outlook biomass costs of \$1.87 MMBTU that had been used in the draft quantification efforts thus far.

Assumed costs of feedstocks in IA

Fuel Type	Cost \$/Ton Delivered	Heat content (MBtu/Ton)	Cost \$/MMBtu Delivered
Agricultural by-products ¹	\$74.25	8.3	\$8.95
Energy crop (switchgrass) ²	\$113.66	14.7	\$7.47
Forest Products ³	\$35.00	9.6	\$3.65

¹ Price of Agriculture residue comes from Iowa State University (University Extension) publication "Estimating a Value for Corn Stover" Ag Decision maker File A1-70, December 2007. Additional Transportation costs of \$14.75 were assumed, taken from Iowa State University, University Extension, publication "Estimated Costs for Production, Storage and Transportation of Switchgrass" PM 2042, October 2007 . Average Heat Content of Selected Biomass Fuels Table 10 EIA (2008) Annual Electric Generator, <http://www.eia.doe.gov/cneaf/solar.renewables/page/trends/table10.html>

² Cost of energy crop was taken from Iowa State University, University Extension, publication "Estimated Costs for Production, Storage and Transportation of Switchgrass" PM 2042, October 2007 Heat Content of Selected fuels ORNL (7,341 BTU per pound), http://cta.ornl.gov/bedb/appendix_a/Approximate_Heat_Content_of_Selected_Fuels_for_Electric_Power_Generation.xls

³ Maryland DNR "The Potential for Biomass Cofiring in Maryland", March 2006. Prepared by Princeton Energy Resources International, LLC and Exeter Associates INC for the DNR Maryland Power Plant Research Program.

Biomass Resource	Annual Biomass Supply (dry tons)	Notes
Forest residue	359,000	2005 NREL Report. ⁴ Estimated using USDA Forest Service's Timber Product Output database for 2002, includes logging residues and other removals.
Primary mill residue (unused)	2,000	2005 NREL Report. Derived from the USDA Forest Service's Timber Product Output database for 2002, includes mill residues burned as waste or landfilled.
Secondary mill residue	29,000	2005 NREL Report. Includes wood scraps and sawdust from woodworking shops— furniture factories, wood container and pallet mills, and wholesale lumberyards. Estimated using number of businesses from the U.S. Census Bureau, 2002 County Business Patterns and assumptions on the wood waste generated.
Urban wood waste	320,000	2005 NREL Report. Includes MSW wood—wood chips, pallets, and yard waste; utility tree trimming and/or private tree companies; and construction/demolition wood. Data on the collected urban wood waste are not available; thus numerous assumptions were applied for estimation.
Agricultural residue	23,590,000	2005 NREL Report. Estimated using 2002 total grain production, crop to residue ratio, moisture content, and taking into consideration the amount of residue left on the field for soil protection, grazing, and other agricultural activities. The NREL report assumes that about 35% of the total residue could be collected as biomass a biomass feedstock. The NREL report assumes that 30% residue cover is reasonable for soil protection, 20%–25% of the stover in grazing, and about 10%–15% of the crop residue is used for other purposes: bedding, silage, etc.
Energy crop	9,413,000	2005 NREL Report estimates a potential 9,413,000 tons of willow or hybrid poplar could be grown on CRP lands. 11,297,000 tons of switchgrass could be grown on CRP lands, but the lower estimate was used.
Municipal solid waste (MSW) fiber including yard and landscape waste debris	TBD	From AFW-8
Wood Pulp		
Total annual biomass supply	33,713,000	
Policy Requiring Biomass	2020 Annual Biomass Demand (dry tons)	Notes
AFW-3	16,000,000	From goals: Annually harvest at least 5 million dry tons of dedicated energy crop production, 10 million tons of annual crop residue, and 1 million tons of forest products or wood residues.

⁴ *A Geographic Perspective On The Current Biomass Resource Availability In The United States*, A. Milbrandt, Technical Report NREL/TP-560-39181, December 2005, Prepared under Task No. HY55.2200.

Biomass Resource	Annual Biomass Supply (dry tons)	Notes
AFW-6	10,000,000	From goals: Increase in-state cellulosic feedstock production by 10 million dry tons by 2020.