The Virginia Rate Impact Study
Appendix

Estimates for Virginia Biomass Potential

In an unreleased study conducted by Virginia Tech Cooperative Extension (VTCE), biomass residuals, reported in bone-dry tons (BDT) were estimated throughout the Commonwealth. Residuals assessed were grouped into five broad categories: 1) agricultural crops, 2) agricultural manures, 3) forestry, 4) food waste, and 5) municipal sources. The VTCE study estimated woody biomass residuals alone could support generation of nearly 780 MW annually. However, the VTCC study did not consider primary production of feedstocks. Public Policy Virginia (PPV) estimates potential warm season grass (WSG) production potential could support an additional 1800 MW annually for a total sustainable biomass production potential of approximately 3350 MW annually.

Delivered costs of green woody biomass residuals can range from $15 to $23 per ton. At 50% moisture the BTU content of green wood delivered works out to $2.50 to $4.00 per MMBTU. Combustion of WSG is about 33% more efficient than woody biomass due to lower delivered moisture content. WSG are estimated to be delivered at $1.67 per MMBTU. With twice as much WSG estimated to be available as woody biomass residuals, the total fuel price of the biomass mix would look something like this: $2.50 /mmbtu for wood, 1.67 for WSG; 2 X 1.67 + 2.50 = 5.84 divided by three = $1.95.

Biomass residuals (Virginia Tech Cooperative Extension):[1]
Total BDT = 10,229,960 of which woody biomass = 5,162,689 BDT
10,229,960/6600 = 1549.99 MW(say 1550) of which woody biomass is 782 MW.

Energy crop potential
Assumptions:

a. Farmers will consider planting energy crops on currently used land if the net revenues are greater than what they now earn.
b. Surveys in Southside show that roughly 45% of farmers will make the decision described above.[2]
c. Of the acreage considered – Pastures and rangeland, CRP land and all hay (less alfalfa) revenue yields per acre[3] are less than the BTU value of grass when compared at present prices to coal: One ton of grass hay (15MM BTU) at the current price of Coal BTU of $1.75 /MMBTU = $26.20/ton. [4]
d. Acreage dedicated to dairy farming, a combination of haylands, and pasture, is deducted from the total.
e. Yields on land devoted to energy crops should be 10 tons/acre.[5]
f. 30% of lands nominally available in c. above will be unsuited for a variety of reasons – terrain, small size, etc.
g. Unused land – land not reported as in farming but otherwise suited for some crops --not yet considered in estimates.
h. Yields on Lands considered are less than 2 tons per acre, except alfalfa. [6]

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[1] Preliminary Residual Biomass Inventory for the Commonwealth of Virginia, 2010
[2] Ignosh and Wu study, 2008
[3] Virginia Agricultural Statistics Bulletin and Resource Directory, 2006 p. 90 and interview with extension agents regarding dollar yields per acre for beef cattle.
[4] Biomass Rules, LLC. http://www.biomassrules.com/ data for 7/30/10
[5] UTenn Knoxville and Genera results in Tennessee with Alamo variety of switchgrass.
[6] USDA Census of Agriculture, 2007, Table 33.

i. 1 MW from biomass requires 6600BDT/year.

Total Pasture and rangeland –	2,150,933 acres[7]
CRP Acreage	70,112
Forage and Haylage	1,305,624
All Hay	1,258,823
Less alfalfa	(89,213)
Less dairy acreage[8]	(378,086)
Total lands available	4,318,193
X availability (f. above)	3,022,735
X Farmer willingness to plant (b.)	1,360,230
Gross Yield at 12% moisture	13,602,307
BDT	11,970,030
Potential MW	1,813 MW (say 1800)
TOTAL BIOMASS POTENTIAL	3350 MW

[7] Ibid., Table 33.
[8] Ibid., Table 46.