WOOD BIOMASS ENERGY

A Forest2Market Research Report[1]

Emerging wood bioenergy industries will provide new markets for forest resources, producing net benefits for forest health, local economies and the forest and wood products industries. Negative effects will vary by region, and they will be offset by good harvesting practices and more stable wood fiber supplies and markets over the long term.

- In 2007, nearly 8.68 million MWh of electricity were generated by electric utilities and independent power producers from wood and wood wastes.[2] Federal and state standards and incentives will induce construction of additional capacity. Currently, 56% of states (plus D.C.) have mandatory Renewable Portfolio Standards (RPS), 12% have voluntary standards or goals, and 8% are currently considering an RPS.[3] Federal incentives include production tax credits and loan guarantees.[4]
- In 2007, combined heat and power (CHP) producers using wood wastes produced nearly 30.34 million MWh of electricity. Oak Ridge National Laboratory (ORNL) identifies CHP as "a proven and effective near-term energy option" to fossil fuels and has proposed a plan to increase CHP to 20% of electricity capacity by 2030. Generally, as energy prices rise, so does CHP capacity.
- The wood pellet market is growing and is expected to more than double its consumption level from 2007 to 2012. Based on announced U.S. capacity, Forest2Market estimates total wood pellet production will increase to 6-7 million tons annually by 2012.
- The Biomass Research and Development Initiative (BRDI) estimates that wood-based cellulosic ethanol production could grow from nearly zero to 4 billion gallons per year by 2022.[5]

Wood biomass energy will develop gradually, but biomass availability will lag behind as it waits for the markets to mature, requiring the use of existing classes of wood fiber in the interim.

- Wood bioenergy capacity is growing slowly. As a result, increases in demand will also be gradual. Bioenergy facilities take 3-5 years to move from announcement to production. Ten to 15 years will elapse before multiple bioenergy companies become operational and add significant demand to the system. As a result, other consumers of wood fiber will have multiple years to plan for changes in the wood fiber supply chain and for any subsequent increases in wood fiber prices.
- Wood fiber markets and pricing vary by region. The fastest growing wood-based bioenergy market is located in the South. Current consumers of wood fiber in the South use 130 million tons of raw material per year. By 2020, Forest2Market estimates that the total amount of additional demand placed on the wood fiber supply system will increase by 18.58 million tons as result of wood biomass energy production, an increase of 14% over 2007.[6]
- Through existing harvesting systems, thirty million tons of wood biomass are available throughout the U.S. South annually. In order to increase the amount of biomass that can be removed from forests, harvesting

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[1]Forest2Market is a forest industry analytics group offering benchmarking, pricing, and forecasting services to participants in the wood fiber supply chain. F2M's products are built on industry-standard databases contain transaction level data of actual timber sales in the U.S. South and Pacific Northwest. All evidence marshaled in this report is either cited below or is based on conversations with industry professionals conducted over the last 15 years by our forest economists, foresters, researchers and data collection specialists. www.forest2market.com

[2]United States Department of Energy's Energy Information Administration. *Electric Power Annual 2007.* January 2009. Available at http://www.eia.doe.gov/cneaf/electricity/epa/epa.pdf.

[3] Federal Energy Regulatory Commission. *Electric Market National Overview*. 2009. Available at http://www.ferc.gov/market-oversight/mkt-electric/overview/2009/01-2009-elec-ovr-archive.pdf.

[4] Database of State Incentives for Renewables and Efficiency. *Federal Incentives for Renewables and Efficiency.* Updated February 3, 2009. Available at http://www.dsireusa.org/library/includes/genericfederal.cfm?CurrentPageID=1&state=us&ee=1&re=126.

[5] United States Department of Energy Biomass Research and Development Initiative. *Increasing Feedstock Production for Biofuels.* December 2008. Available at http://www.brdisolutions.com/Site%20Docs/Increasing%20Feedstock_revised.pdf.

[6] Forest2Market. *U.S. South Forest Biomass: Outlook and Price Forecast.* 2008. All forecasts have been built on Forest2Market's databases of actual timber sales in the U.S. South. The data represents 75% of the wood fiber market in the U.S. South, or 200 million tons of raw material.

practices will need to be adjusted and loggers will be required to purchase biomass harvesting equipment.[7] Until then, Forest2Market estimates that, in 2020, roughly 9% of total feedstock requirements will come from logging residuals, a total of two million tons annually, up from under 1% in 2008. Larger increases could occur if efficiencies are gained in in-woods biomass harvesting more quickly than we anticipate.

- To make up this deficit in the short-term, bioenergy companies will look to conventionally sourced wood, primarily longwood and residual chips, which will account for 60% of wood feedstocks in 2020, down from 75% in 2008.[8]

Regionally, feedstock prices will rise gradually and moderately, though local disruptions may occur.

- Because bioenergy will compete with pulp and paper and OSB mills for pulpwood and chips, price increases could occur, though these increases will be moderate.
- Regional price increases will be moderate and gradual. Between 2010-2013,real pulpwood stumpage prices in the South will be 29% higher than in 2007. By the 2018-2020 period, however, the market will correct to a level that is approximately 14% higher than 2007 prices.[9]
- When a wood-based bioenergy facility is sited in close proximity to a pulp and paper mill, an OSB mill, or other bioenergy facility, competition for raw materials will intensify, and local prices will rise more dramatically.

While definitive evidence of the exact environmental impacts of in-woods biomass harvesting does not exist, the process can be managed to control negative repercussions.

- Environmental effects of biomass harvesting, like price changes, will vary by region. Consensus is building within regions about harvesting regimes that will reduce fire hazards, maintain soil and water quality and preserve wildlife habitat.
- Case studies show that biomass removals have reduced wildfire hazard and severity, in addition to providing smoke management and carbon benefits.[10]
- The impact of biomass harvesting on soil quality have generally been minimal. If harvested with responsible management practices, there are no significant impacts on deadwood, which provides nutrients.[11] The impacts in nutrient levels that have been found are generally short-term in nature unless the sites are of poor quality to begin with.[12] An increase in soil compaction is also minimal.[13]
- Changes in forest structure will benefit some species while harming others. Most studies have shown, however, that little to no impact on wildlife and diversity occur when sound harvesting practices are used, including minimizing soil disturbance and run off, buffering bodies of water, and leaving some coarse and fine woody debris in the forest to supply nutrients and habitat.[14]

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[7] Arnosti, D., et al. *Harvesting Fuel: Cutting Costs and Reducing Forest Fire Hazards through Biomass Harvest.* Institute for Agriculture and Trade Policy. *June 2008. 59-69.*

[8] Forest2Market. *U.S. South Forest Biomass: Outlook and Price Forecast.2008.*

[9] Forest2Market. *U.S. South Forest Biomass: Outlook and Price Forecast.* 2008. Prices are in real 2007 dollars.

[10] Evans, A.M. *Synthesis of Knowledge from Woody Biomass Removal Case Studies.* U.S. Forest Service. September 2008. 19-20.

[11] Arnosti, D., et al. *Harvesting Fuel: Cutting Costs and Reducing Forest Fire Hazards through Biomass Harvest.* Institute for Agriculture and Trade Policy. June 2008.

[12] Hacker, J. *The Effects of Forest Residue Removal on Forest Sites.* Smallwood 2008 and Bioenergy & Wood Products Conference. May 13, 2008. Available at: http://www.forestprod.org/smallwood08hacker.pdf.

[13] McIver, J.D. et al. *Environmental Effects and Economics of Mechanized Logging for Fuel Reduction in Northeastern Oregon Mixed Conifer Stands.* Western Journal of Applied Forestry 18 (4): 238-249.

[14] Evans, A.M. *Synthesis of Knowledge from Woody Biomass Removal Case Studies.* U.S. Forest Service. September 2008. 17. Oregon Department of Forestry. "Environmental Effects of Forest Biomass Removal." December 2008. Available at http://www.oregon.gov/ODF/PUBS/docs/ODF_Biomass_Removal_Effects_Report.pdf

- Active landowners—those with certification or following forest management plans that include guidelines for protecting soil and water quality and wildlife habitat during harvest—tend to be better informed about biomass than landowners who do not. These forest owners will constitute the majority of the wood biomass suppliers.

The potential for some land use changes as a result of growing bioenergy demand for wood feedstocks exists, though the effects are likely to be localized and minimal.

- Research done by the U.S. Forest Service's Southern Research Station suggests that moderate increases in timber prices will produce no net loss of timberland.[15] In general when agricultural prices rise, a decrease in forestland results, and when timber prices rise the amount of forest land rises.
- According to the Oak Ridge National Laboratory, "There are extensive lands in pasture, annual row crops, and idle lands that have been identified as available for production of biomass crops. These lands would be much less expensive to convert to biomass crop production than natural forests, so there should be no increased pressure on national forests. BFPD [Biofuels Feedstock Development Program] is encouraging sustainable production of biomass crops for energy. Preliminary economic analysis suggests that the production of short-rotation woody crops (SRWC) can actually reduce the pressure on natural forests. With 3-10 times the productivity of natural forests or traditional plantations, SRWC can readily substitute for many forest species in fiber uses, at competitive prices."[16]
- Land conversion will be gated by the amount of high quality timberland that has the soil quality necessary to support fast growing trees (poplar and cottonwood) or crops (switchgrass). Poplar and cottonwood need wet, clay-based soils that exist only in swampy, coastal areas.
- A USFS survey of family forest owners shows that landowners retain forestland for beauty/scenery, privacy, nature protection and legacy reasons.[17] Owning timberland is a low intensity investment, requiring limited attention to remain profitable and enjoyable. SRWC require more intensive management, and many will be unlikely to make this conversion as a result.

The economic benefits from new bioenergy facilities will be significant, especially with the current state of the forestry and wood products industries.

- Economic impact studies of wood biomass in Massachusetts and South Carolina show substantial increases in economic output and jobs, both in the region a new plant is located and statewide.[18] A struggling logging industry will benefit from increases in the value of sales, as well as the number of brushland harvests, thinnings, and fuel treatments they conduct.[19]
- "Biomass sales will help offset the costs of important forest operations including brushland harvest for wildlife habitat, fuel reduction, thinnings to enhance forest productivity and treatment" (which will allow more acres to be treated).[20]

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[15] Wear, D. *Assessing Market Impacts on Forest Conditions in the US South***.** USDA Forest Service Southern Research Station**.** Global Markets Forum. February 2005. Available at http://ncseonline.org/NCSSF/Documents/Wear2.pps#276,10, Forecast for Forest Land.

[16] http://bioenergy.ornl.gov/faqs/index.html#overview1

[17] Butler, B.J. *Family Forest Owners in the U.S., 2006: A Technical Document Supporting the Forest Service 2010 RPA Assessment. U.S. Forest Service. June 2008. 15-16.*

[18]Urquhart, B. *Biomass: What Is It and Will It Benefit Landowners?* Massachusetts Landowners Association, January 2008. Available at http://files.eesi.org/urquhart_presentation_0108.pdf; Harris, Robert A., et al. *Final Report to the South Carolina Forestry Commission on Potential for Biomass Energy Development in South Carolina*. Available at http://www.state.sc.us/forest/prod1004.pdf.

[19]Current, D. and Abbas, D. *Economics of Biomass Harvest*. Woody Biomass Harvesting Workshop and Equipment Demonstration. August 2006. Available at http://www.extension.umn.edu/Agroforestry/biomass/Economic%20of%20Biomass%20 Harvest%20-%20Dean%20Current.ppt#259,3,Potential opportunities for loggers.

[20]Current, D. and Abbas, D. *Economics of Biomass Harvest*. Woody Biomass Harvesting Workshop and Equipment Demonstration. August 2006. Available at http://www.extension.umn.edu/Agroforestry/biomass/Economic%20of%20Biomass%20 Harvest%20-%20Dean%20Current.ppt#259,3,Potential opportunities for loggers.