National Wood-to-Energy Roadmap

Guide for developing sustainable woody biomass energy solutions

Short Rotation Woody Crops Operations Working Group – Nov. 6, 2012

Bob Emory



Why a National Roadmap?

- Growing interest in wood as an energy source – Heat, electricity, and liquid fuels
- Private forest investment lagging
- Forest health and wildfire threats
- Differing views on using wood for energy
- Thoughtful discussion of the issues
- Chart a proper course for use & conservation

Wood-to-Energy Workgroup Members

- Landowners
- Professional foresters
- Conservation community
- Forest industry
- Energy industry
- Academia

Work Group Vision

"Unlock the nation's potential to sustainably produce woody biomass for energy and traditional uses while providing balanced multiple benefits from public and private forests for the American public."

Work Group Forums

- Wood Demand and Supply
- Sustainability
- Carbon and Climate Change
- Policy

Demand/Supply Forum

Appendix B. Wood Demand and Supply Forum Topics and Speakers January 2010 Forum Organizer – Bob Emory, Weyerhaeuser Corp.

Energy demand outlook for the United States. Marie LaRiviere, Analyst, U.S. Department of Energy, Energy Information Agency, Knoxville, TN.

2010 RPA supply/demand analysis. Dr. David Wear, Project Leader, USDA Forest Service, Washington, DC.

"Billion-Ton" study update. Dr. Robert Perlack, Lead Analyst, Oak Ridge National Laboratory, Oak Ridge, TN.

Wood energy & forest sustainability. Dr. V. Alaric Al Sample, President, Pinchot Institute, Washington, DC.

A developing bioenergy market & its implications on forests & forest products markets in the U.S. Dr. Mike Clutter, Dean, Warnell School of Forestry, University of Georgia, Athens, GA.

Viability of pending of wood-to-energy projects in the southeastern U.S. Brooks Mendell, President, Forisk Consulting, Inc., Athens, GA.

Increasing wood growth & biomass yields from non-intensively managed forests. Neil Sampson, President, The Sampson Group, Alexandria, VA.

Increasing wood growth & biomass yields on current and future forests through intensive forest management. Dr. Eric Vance, Project Manager, National Council on Air and Stream Improvement, Raleigh-Durham, NC.

The role of short rotation forestry in producing feedstock to meet U.S. biomass energy needs. Jake Eaton, Director of Global Acquisitions and Resource Planning, GreenWood Resources, Inc., Portland, OR.

Increasing wood yields via genetics & breeding. Dr. Maude Hinchee, Chief Technology Officer, ArborGen, LLC, Summerville, SC.

Demand/Supply Questions

- Potential and expected demand for traditional wood products?
- Potential and expected demand for wood as an energy feedstock?
- How large could energy demand for wood become and will it materialize?
- How much wood can be sustainably provided for energy production?

Figure 1. Forest Area Trends in the United States by Major Region, 1630-2007 (from Smith et al. 2009, p. 13)



Growing Stock Inventory

Trend in Growing Stock in U.S. Timber Lands, 1953-2007



Source: USDA Forest Service, U.S. Forests Resource Facts and Historical Trends, Sep 2009, http://fia.fs.fed.us/library/brochures/docs/Forest%20 Facts%201952-2007%20English.pdf. Courtesy of NAFO

Timberland Growth/Removal Ratio By Region



• Growth-removal ratio is calculated based on annual growth on timberland divided by annual removal as of reported years. No specific data for growth and removal in between reported years.
Courtesy of Al Lucier

Source: Forest Resources of the United States, 2007 - Table 36

Especially true in the U.S. South

- Steady increase in:
 - Lumber production
 - Pulp & paper productior **AND**
 - Timber inventory

300 250 200 Difficer 150 100 100 50 0 1953 1963 1977 1987 1997 2002 2007 (est.) source: USDA USES

US South Timber Inventory Volume



US South Pulp Output Processing Capacity



US South Softwood Lumber Production

11

source: USDA USFS, RISI

Improvements in Yield



Courtesy of Eric Vance

How?



Figure 2. Estimated total yield and contributions of individual silvicultural practices to productivity of pine plantations in the southern United States from 1940 to 2000.

Source: Fox, Thomas R., Eric J. Jokela, & H. Lee Allen, *The Development of Pine Plantation Silviculture in the Southern United States*, p. 337 Journal of Forestry

Woody Feedstock Demand



Courtesy of NAFO

Other Demand Estimates

Figure 83. Nonhydropower renewable electricity generation by energy source, 2009-2035 (billion kilowatthours)



AEO2011, EIA

General Demand

- •Wood could contribute 3 quads of the 12 renewable quads by 2035 (EIA 2010)
- •47 mdtpyr for 4 billion gpy in 2022 for EISA (BRDi 2008)
- •1 billion dry tons for 30% oil displacement by 2030 (BRDi TAC)

Biomass utilization in electric power and biofuels production, under both a 25 % RFS and 25 % RES, by 2025

SR/OIAF/2007-05 Feedstock 25% RES 25% RFS Total Millions of green tons 194 194 Ag residues **Energy and Economic Impacts** 25 Urban 78 103 of Implementing Both a 25-Percent wood Renewable Portfolio Standard and a 25-Percent Renewable Fuel Standard by 2025 Forest 144 25 169 residues 74 50 124 Energy August 2007 crops Subtotal 296 294 590 Energy Information Administration Wood 610 102 712 Office of Integrated Analysis and Forecasting U.S. Department of Energy Washington, DC 20585 Total 930 372 1302

Adapted from Sample et al. 2010

You Can Do the Math

Average Product Price for Different Raw Materials in US South (Fall 2010)



Wood Demand/Supply Findings

- Wood will continue to be used primarily for conventional wood products.
- Demand for wood for renewable energy will be driven by public policy in the short-term.
- Appearance of overdevelopment is not reality.
- Mill residues primary resource for biomass energy.
- "Low Hanging Fruit" forest residues and non-merchantable tree removals.

Wood Demand/Supply Findings

- Supply of low-quality wood for energy tied to sawtimber demand.
- Supply will be inelastic in short-term.
- Population growth may impact supply.
- Role of public lands will be modest.
- Yields/acre can double to quadruple via long-term management techniques.
- Marginal crop and pasture lands offer great potential via short-rotation cropping systems

Wood Supply Strategies

- Increase end-use efficiency
- Increase recovery through integrated harvesting
- Increasing reforestation and afforestation
- Enhance forest productivity
- Short-rotation tree cropping systems

Sustainability Forum

Appendix C. Sustainability Forum Topics and Speakers April 2010 Forum Organizer – Michael Goergen, Society of American Foresters

Stage Setting: Sustainability - The issues and the opportunities, Dr. Virginia Dale, Director for BioEnergy Sustainability, Oak Ridge National Laboratory, Oak Ridge, TN.

Panel 1: Biomass for energy - Managing for long-term soil productivity and sustainability.

Managing for long-term soil productivity in natural forests. Dr. Andy Scott, Research Soil Scientist, Ecology and Management of Southern Pines, Southern Research Station, U.S. Forest Service, Normal, AL. Managing for long-term soil productivity in intensively managed forests. Dr. Howard Duzan, Forestry Research Team Leader, Weyerhaeuser Timberlands, Columbus, MS.

Panel 2: Biomass for energy - Managing for water quantity and water quality.

Options to achieve water quality and quantity goals as part of forest management for bioenergy. Dr. George Ice, Principal Scientist, National Council for Air and Stream Improvement, Inc., Corvallis, OR.

Managing water quantity and water quality on intensively managed forests. Dr. Jami Nettles, Forest Hydrologist, Weyerhaeuser Timberlands, Columbus, MS.

Panel 3: Biomass for energy - Managing for biodiversity in natural forests and forest plantations.

Rob Olszewski, Vice President, Environmental Affairs, Plum Creek Corporation, Atlanta, GA. Paul Trianosky, Director of Forest Conservation, Eastern Division, The Nature Conservancy, Mountain City, TN. Dr. Tim Volk, Professor, State University of New York, Syracuse, NY.

Panel 4: Biomass for energy - Managing for social and economic sustainability.

Robert Fledderman, Manager, Emerging Issues, Corporate Safety, Health and Environment Department, Mead Westvaco Corp., Richmond, VA. Tom Deponty, Director, Public Affairs, ADAGE, Bethesda, MD. Dr. Dennis Becker, Asst. Professor, Department of Forest Resources, College of Forestry & Natural Resources, University of Minnesota, St. Paul, MN.

Panel 5: Biomass for energy – Strategies for insuring forest sustainability.

John Heissenbuttel, President, Phoenix Strategic Solutions, Inc. Bob Perschel, Northeast Region Director, Forest Guild, Sutton, MA. Nathan McClure, Chief Forester, Forest Utilization Department, Georgia Forestry Commission, Dahlonega, GA. Allison Welde, Director, Conservation Partnerships & Communications, SFI, Inc. Washington, DC.

Sustainability Questions

- How to protect forest values with increased demand for wood as energy feedstock?
- Can use of wood for energy help reduce fuel loading and catastrophic wildfires?
- Sustainability parameters to measure?
- Are sustainable measurement tools available?

Sustainability Findings

- 2008 RPA declining timber output is not driven by resource constraints.
- Land conversion is <u>the</u> major threat to our nation's forests.
- Sustainable forest management is an existing, widespread ethic, reinforced in many states' renewable energy policies.
- Forest owners and managers appreciate the importance of sustainable management and employ best science and technology.
- Using woody biomass for energy may improve forest health and help prevent or reduce wildfires.

Sustainability

In the US there are a variety of mechanisms to address sustainability

- Stable and robust legal system
- Stable forestland base
- **Best Management Practices**
- State renewable portfolio standards
- State forest management assistance
- Certification
- Forest management incentives
- FIA as an "indicator"

Carbon/Climate Change Forum

Appendix D. Carbon and Climate Change Forum Topics and Speakers April 2010 Forum Organizer – Jimmie Powell, The Nature Conservancy

Stage Setting and Overview – The role of U.S. forests, forest production, and forest products in the global carbon cycle. Dr. Richard Birdsey, U.S. Forest Service.

Panel 1: Projections on changes in land-use and carbon stocks/flows resulting from the increasing use of biomass for energy and proper accounting for land use change emissions in climate protection regimes. Dr. Daniel G. De La Torre Ugarte, University of Tennessee and Steve Hamburg, Environmental Defense Fund.

Life cycle assessment and accounting for carbon in forests, forest production, and forest products under proposed climate change and bioenergy policies. Reid Miner, M.S. Chemical Engineering, National Council for Air and Stream Improvement, Inc., Research Triangle Park, NC.

Panel 2: Energy pathways and technologies and their impacts on net carbon emissions. Neal Rossmiessl, U.S. Department of Energy; Greg Morris, Green Power Institute; and Dr. Michael Wang, DOE-Argonne Laboratory.

Panel 3: Forest management systems for the production of renewable energy and global carbon management. Wood energy & carbon management: meeting the challenge. Dr. Marilyn Buford, National Program Leader for Silvicultural Research, U.S. Forest Service; Dr. David Ganz, The Nature Conservancy. Short-rotation woody crops: greenhouse gases and land ownership. Dr. Tim Volk, State University of New York.

Panel 4: Carbon neutral strategies for agriculture and forestry in an uncertain policy environment. Dr. Jeffrey Frost, Agrifresh, Inc., and Bill Carlson, Carlson Small Power Associates.

Carbon/Climate Change Questions

- What is the role of forests in storing and releasing carbon?
- How do catastrophic wildfires affect atmospheric carbon levels and climate change?
- What are the carbon and climate change implications from using wood-based energy compared to fossil fuels?

Carbon/Climate Change Findings

- Working forests are a cost effective source of industrial greenhouse gas offsets.
- Burning biomass for energy will not increase atmospheric CO₂ if done sustainably.
- Carbon and climate change implications must address the relationship between biomass, wildfires and carbon emissions on public lands.
- Scientifically sound and credible carbon lifecycle analyses are needed to compare wood to other energy pathways.

Policy Forum

Appendix E. Policy Forum Topics and Speakers July 2010 Forum Organizer – Charlie Niebling, Biomass Thermal Energy Council

Current issues in federal biomass energy policy. Bill Imbergamo, Majority Staff, Senate Agriculture Committee.

A vision for federal energy policy as it relates to biomass. Chris Recchia, Executive Director, Biomass Energy Resource Center.

Panel: Leaders of major biomass energy trade organizations and NGO interests respond to vision presented by previous speaker. Robert Cleaves, Biomass Power Association

John Ackerly, Alliance for Green Heat and Biomass Thermal Energy Council Ben Larson, Union of Concerned Scientists Eric Myers, Duke Energy

Policy Recommendations

- Set realistic renewable energy goals with properly designed and scaled mandates and incentives.
- Treat all biomass energy facilities the same, regardless of age.
- Keep forests as forests.
- Increase domestic supplies of wood.
- Ensure sustainability in all uses of wood.

Policy Recommendations

- Reward appropriate scale and efficiency
- Maintain a simple, consistent definition of biomass.
- Achieve reliable carbon accounting for all energy sources, including wood.
- Maintain accurate feedback mechanisms on the use of forest resources over time.

Concluding Thoughts

Woody biomass can be an important feedstock for renewable energy if we:

- Ensure that biomass use occurs in a wise and sustainable manner with appropriate feedback mechanisms.
- Choose the most efficient uses for wood in producing energy.
- Ensure private and public forestlands achieve their productive potential.
- Invest in research and technology development.

What Has Changed?

- Biomass power hampered by cheap natural gas, GHG regulatory uncertainty and lack of a national energy policy
- Biofuel production still growing as conversion technology comes on
- Fuel vs food conflict as result of drought
- EU commitment to bio-power with US seen as a key biomass supplier

Copies of the executive summary and full report are available at:

www.25x25.org



AMERICA'S ENERGY FUTURE