

WOODY BIOMASS ISSUES

***“WOODY WASTE” AND “ENERGY CROP
WOODY BIOMASS”***

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Woody Biomass – Big Picture

- Seems simple? -- details can be surprisingly complex, however...
- Focus on big picture can suggest some solutions....
- Which should:

Promote effective and sustainable biomass development that is both sensitive to environmental imperatives and manageable and verifiable

- “Woody Waste” and “Energy Crop Woody Biomass” merit different consideration
- “Woody Waste” describes virtually all use today; should be broadly defined
- “Energy Crop Woody Biomass” solution may take time
- Studies vary, wood use and waste supply vary with economy – take data accordingly

Woody Biomass – General Concerns

- Health and sustainability of forests -- changes in land use, etc.
- Carbon – long series of studies support neutral to negative.
 - o Cut the tree and re-grow – deficit then repay – focused on harvest of grown trees for fuel, “business as usual” ignores changes in forest practices, forest system not considered; this view is of trees rather than the forest, economics not there
 - o Harvest annual growth – Energy Crop Biomass, forest mass constant or still increases; unlikely due to economics
 - o It was going to be cut anyway – Woody Waste – its what we do today, much more potential for generation, CO2 issues with waste less controversial
 - o Position is that biomass will in practice be neutral to negative, and better than fossil in any case.
- Definition might encourage “Wasteful Uses”. Not sure what this means -- should be talking about encouraging “Use of Waste”

Forest Update -- How Much Forest Is There?

- **Total US Forest Area -- ~750M Acres**
- **Forest area and mass has increased significantly over the last century due to:**
 - **Changes in agriculture**
 - **Fire control**
 - **Increased management and improved forestry**

Forested Land Area & Mass Have Increased for Many Years & Still Growing

- The nation's forest land area is still about two-thirds the size it was in the year 1600, in spite of the conversion of 370 million acres of forest land to other uses, principally to agriculture
- More trees are growing in America's forests today than at any time since the early 1900's
- Overall, annual growth of U.S. forested acres exceeds harvests and losses to insects, fire, and disease by 33% each year in the commercial forests
- In 1900, forest growth rates were a fraction of harvest. Today, overall annual forest growth in all forests exceeds harvest by 37%
- Annual growth in National Forests now exceeds harvest by more than 55%
- Net annual forest growth has increased 62% since 1952, and total growth per acre has increased 71%
- Nationally, standing timber volume per acre in U.S. forests is 30% greater today than in 1952
- Summary: Forest area and mass are increasing and woody biomass is dynamic resource

US Forest Facts -- Protected Areas

- More than 270 million acres of federal land are set aside by various government agencies for use as wildlife refuges, parks, and wilderness areas.
- Some 36 million acres of U.S. timberlands are reserved for non-timber uses through special legislation
- More than 10 million acres of old-growth forest can be found in Oregon, Washington, and California.
- The U.S. has 8.25 million acres of old growth forest on federal lands in Oregon and Washington alone. More than half (57%) is preserved in parks, wilderness areas, and other legislative and judicial set-asides.
- 70% of America's National Forest land base is in land-use categories where timber production is forbidden. 30% remains open to varying levels of harvest activity.
- UGA -- http://www.bugwood.org/intensive/forests_and_timberland.html

Forest Update -- Who Owns American Forests

- **33% - Federal government**
- **21% - Family by millions of small landowners/producers**
- **35% - Large Corporate Producers**
- **11% - State and Local government**
- **Varies by region – 83% private in East; 43% Pacific Coast -- Georgia >90%**
- **Government retained forests in West; had to repurchase in East**
- **Sources: ASTM D7612 - 10, various**

Georgia Forest Facts

- Georgia commercial forest land is about 24M acres, or 66% of the state
- Georgia's timberland owners number around 650,000
- Individuals own 72% of the state's commercial forest land; corporations, 21%; and government, 7%
- 11% of Georgia's forest products are sold to foreign markets -- pellet business growing
- Georgia has replanted more than 3 billion trees over the past decade
- An estimated 92% of Georgia's commercial forest acreage is in compliance with Best Management Practices (BMPs), which are voluntary guidelines that ensure water quality is protected during forestry operations
- Forest area and mass have increased significantly over last 100 years
- Sources: UGA and ATFS

Development of Woody Biomass Generation Today – State of Depression

- Many biomass projects announced, but very few go forward...Georgia 2 out of 24 in recent years
- Perfect Storm: last two years have seen no credible threat of RPS, reduced load forecasts, natural gas prices down by 2/3 or more and staying there, extremely low prices for wholesale power. Throw in regulatory uncertainty for good measure and industry is frozen
- Most projects going forward today secured PPAs before Perfect Storm
- Prospects for development limited and declining with no improvement in sight
- No project can go forward using anything other than Woody Waste (broadly defined) due to cost
- Voluntary REC prices aren't helping much, but Green-e matters a lot in the Southeast

“Woody Waste” Issues

- What is “Woody Waste”?
- “Waste” as an economic term refers to residuals and/or co-products with low or negative value (tipping fee required for disposal)
- In larger sense, refers to large variety of by-products, residuals, and end-of-life materials which come indirectly from forests plus a variety of by-products, co-products and residuals which come directly from forestry operations
- In most basic sense, is woody material which will be harvested anyway, so issue is how it will ultimately be disposed of
- Difficult to craft definition which includes all sources
- Narrow definition of Woody Waste will eliminate most if not all current biomass plants as Green-e

Many Sources of Woody Waste – Broad Categories

- Mill by-products and residuals – sawdust, slabs, bark, black liquor, shavings, etc.
- Urban wood waste – significant source because much is captured – estimates 16M to 38M wet tons/yr -- potentially 11,000 to 27,000 MW capacity
- Cleaned and sorted C&D
- Changes in land use in rural areas
- Forestry by products and co products – thinnings, slash, forest management operations
- Removal for forest management (details below)
- Right of way and other open space clearing and maintenance

When Whole Trees are Woody Waste

- Pre-harvest: thinning, brush control
- Post-harvest: harvest of residuals, clear to replant
- Isolated trees uneconomical to collect for wood product uses
- All Forests:
 - o Disease /Insects
 - o Fire damaged or killed
 - o Storm damage
 - o Fire Hazard Mitigation
 - o Restoration / Control of Invasive Species

Woody Waste – Generation Generally Best Option in Use and Disposal

- Varied uses; economics will determine
- Commercial uses: short list -- landscaping, animal bedding, boiler fuel
- Disposal: site burial, landfill, dumping/spreading, open burning, windrowing, left in woods
- Much more biomass is dumped than is reported
- Natural decomposition and open burning give off varying amounts of methane, carbon monoxide, particulates, and VOCs, including carcinogens
- Controlled combustion results in lower emissions – CO₂ instead of CO or CH₄, VOCs combusted (up to 1000s of times reduction), particulates controlled by emissions systems, site impacts reduced
- Green Power can incentivize use for controlled combustion with lower emissions and bonus of power generation and offset of fossil fuels

What About Requirement That Woody Waste Come From Certified forests?

- **American Tree Farm System (ATF)**
- **Forest Stewardship Council (FSC)**
- **Sustainable Forestry Initiative (SFI)**

How Much Certified Forest Is There? – Not Much, And Only Part is Available

- FSC Certified -- 33.7M Acres -- 4.5% US Total
 - o ~50% on state owned lands in a few states
 - o In Southeast, only 1% of forests certified to FSC
- SFI Certified – 58 M acres – 7.7% US Total
 - o Includes substantial public lands with limited use
 - o Significant tracts of lands dedicated to use by owner
- Georgia ATF is about 1.6M acres, or 6.6%
- Preponderance of FSC and SFI forests are held by governments and large landowners
- In SC, 88% of forestland privately owned with average tract size of ~ 64 acres
- There is overlap with certifications; percentages are not additive and only portion of certified lands available for Woody Biomass fuel. Small landowners less likely to participate.
- Summary: biomass supply from certified forests very limited in extent and availability

Woody Waste – Tracking and Certification Issues

- Tracking origin of Woody Waste difficult to impossible for many secondary sources
- Chipped or ground material loses its identity
- Urban wood waste, C&D become blended streams from many discrete sources
- Biomass is a commodity often traded through brokers and sources subject to confidentiality; intermediate processing and long supply chains make tracking difficult
- To extent waste harvested anyway, not much sustainability benefit

Woody Waste Definition

- Objectives of definition – to encourage use of Woody Waste biomass for environmental benefits in way that is administrable and verifiable
- Definition should be broad, excluding only categories of concern:
 - Current exclusions of coated, treated, and railroad ties
 - Add exclusion for Woody Biomass used as Energy Crop
- Would not incentivize changes in production of Woody Waste or changes in land use for production of dedicated energy crops
- Would encourage disposal of Woody Waste in environmentally beneficial manner with benefit of power generation
- **Requirement for use of fuel only from certified forests would disqualify most, if not all, current and proposed biomass generation, including (but not limited to) all such sources used by Southeastern utilities in Green-e programs**

Woody Biomass as an Energy Crop

- When does Woody Biomass become an Energy Crop?
- Generic definition: “Harvest of stands of whole trees which are otherwise merchantable for purposes other than as fuel, including sale for use as pulp chips, for production of lumber and/or other forest products, where the primary purpose of such harvest is for use in the production of electric energy at a generating facility, whether a co-firing or dedicated biomass facility, where such harvests constitute a material portion of the fuel supply for such facility on an ongoing basis.”

Energy Crop Woody Biomass for Power? – Not Likely Anytime Soon

- Current power price required for development of typical Woody Waste biomass facility is 8 to 10 cents/kwh based on use of Woody Waste Biomass – ~4 cents/kwh is fuel cost
- Price multiples for pulp chips and timber vs. Woody Waste from forest sources are near historic lows, but still about 1.5 to 3 times higher (based on boiler fuel at ~\$15-20 wet ton delivered, pulp chips ~\$30 ton, timber ~\$40/ton)
- Using non-waste fuel – essentially pulp chips and timber quality material – would increase required power price by 2 to 8 cents/kwh at today's prices; increase could be 8 to 12 cents/kwh at historic prices (based on pre-crash prices of \$40/ton pulp chips and \$80/ton timber delivered)
- Recent wholesale, non-peak power prices to utilities in Georgia have been in the 3s, occasionally lower, and avoided cost calculations and regional ISO pool pricing have been in the 4s or lower
- Using other than Woody Waste would require prices of 10 to 18 cents/kwh in today's depressed markets for a project to succeed, which can be more than projected for nuclear, etc. Would be higher with return to traditional spreads between fuel and pulp/timber. Biomass is not viable at these price levels.

But Do We Need Energy Crop Woody Biomass?

- SAFER 2010 study looked at forest biomass availability in 13 Southeastern states in anticipation of RPS to assess generation potential based on “underutilized biomass” or forest residues
- Overall, the study found that a price increase would increase utilization of available forest residues sufficient to meet a phased-in 15 to 17 percent RPS standard without diversion of biomass from traditional timber uses – i.e. for pulp and timber
- Study recommended regional flexibility as states with less biomass (Texas, Florida, Oklahoma) and/or higher overall electric loads would need generation from other states.
- Study noted that production of biomass fuel could be increased over time – dynamic supply
- Suggests changes in land use for diversion of trees from higher value uses is unnecessary and unlikely – means no foreseeable need for “Energy Crop Woody Biomass”

Georgia Example of Unused Woody Waste and Potential Generation

- Georgia Forestry Commission 2008 Biomass Assessment found ~15M tons/yr of recoverable, unused, waste biomass available. Excluded waste biomass currently being used, but Included urban wood waste, rural land use change sources, and forestry residuals including:
 - 50% recovery of slash/other residuals on the 2% of timberland harvested each year (50% left in woods)
 - 100% recovery of thinnings on the 1.4% of timberlands thinned each year
- This material could support ~1100 MW of biomass generation
- With this additional use, Georgia forest mass would still grow by +15M tons/yr
- Estimate probably conservative in 2008, may be high until homebuilding recovers
- New Georgia generation: 17 MW plant running and 55MW under construction
- Georgia Power studied conversion of coal plants for ~500MW – would NOT be Green-e under current repowering criteria
- In any event, no scenario to exceed available Woody Waste biomass

Energy Crop Woody Biomass – “Responsible Sourcing”

- Requirements for “Responsible” sources as defined in ASTM D7612 – 10, “Standard Practice for Categorizing Wood and Wood-Based Products According to Their Fiber Sources”, exceed “Legal Requirements”
- FSC and SFI Certification Programs Used by US and Canadian Forest Products Companies
- SFI fiber sourcing requirement focus on logging practices and training, and Best Management Practices
- FSC controlled wood standard more at ecosystem level, requiring larger consideration of old growth, rare species, etc.
- However, both require consideration of old growth, endangered species, etc
- Both require third party audits
- Can have both certifications -- some companies do
- SFI currently working with Nature Conservancy to test program applicable to utilities

Suggested Approach to Woody Biomass Energy Crops As Fuel

- Enough issues to merit developmental approach with case by case review
- Approach successfully used by Green-e for co-firing
- Review criteria to include certification for responsible sourcing
- Fuel supply plan which addresses sustainability and maintenance of forest mass
- Requirement to seek renewed approval in event of material change to fuel supply plan
- Long term goal to develop set of generally applicable criteria

Summary

- **Broad definition of Woody Waste will:**

- o Allow continued operation of current Green-e generators
- o Incentivize environmentally beneficial disposal of Woody Waste
- o Provide for manageable and verifiable process
- o Allow for specific exclusions as circumstances warrant
- o Allow issues with Energy Crop Woody Biomass to be treated separately

- **Energy Crop Woody Biomass:**

- o Not a concern for foreseeable future
- o Similar to Green-e approach on co-firing, could be considered on case by case basis according to specified criteria with long term goal of standardizing requirements