Utilization of Woody Biomass for Energy

A Position of the Society of American Foresters

Originally adopted by SAF in October 2005 and last revised in May 2019. This position statement will expire in 2024, unless, after subsequent review, it is further extended by the SAF Board of Directors.

Purpose: Recommendations on the appropriate use of woody-biomass for energy production through long-term resource agreements, continued support for bioenergy research and development, and resource inventory and monitoring.

Scope: This position statement applies to woody biomass that is generated from forest industries, forest management, forest conservation and restoration, or forest salvage activities, that is used for energy.

Position

The Society of American Foresters (SAF) encourages the creation and enhancement of local and national policies that support the development of markets for fuel, heat, and power from sustainably sourced woody biomass. SAF also supports continued investment in forest products research and development to support more resilient supplies and markets. Properly designed policies, including equitable treatment to other net carbon neutral renewable energy sources (e.g., solar and wind power), that incentivize the use of wood for energy can increase energy independence and contribute to a thriving US forest industry. Opportunities exist for integrated power systems, utilizing biomass for energy and captured syngas for electric power, steam, or hot water. These systems can be coupled with carbon capture and storage, a major strategy for recent climate change mitigation scenarios due to potential for negative carbon emissions. Furthermore, use of low-value timber, salvage wood, and residues from thinning and other forest-sector activities can contribute to restoration goals, deter outbreaks of pests, reduce fuel availability for wildfires, and enhance forest conditions and the provision of ecosystem services. Policy-makers should support public outreach activities to disseminate peer-reviewed science on the need for forest thinning and the benefits of using renewable biomass for energy. Ongoing monitoring of US forests to inform management activities can ensure maintenance of forest conditions that support a diversity of ecosystem services for current and future generations. Investments to retain land in forests and manage forests more sustainably need incentives such as long-term agreements (e.g., private contracts, volume commitments from federal lands) and options to supply diverse forest product markets. More stable and secure demand attracts investments in forestry, biomass processing, and conversion facilities.

Issue

Expanded markets for biomass can provide economic incentives to retain forestland and restore healthy forest

conditions. Thinning forests can reduce the risk of loss from both fire and pests[1] while also improving the quality of the remaining trees. However, many thinning activities are costly and result in low-value residues that are often piled and abandoned or burned. Alternatively, bioenergy markets for low value and small-diameter trees[2] can improve forest conditions by enabling forest managers to improve the quality of forests and reduce overstocking. Utilizing domestic forest biomass for bioenergy can also contribute to reduced life cycle carbon emissions relative to nonrenewable fossil fuel use, local and national energy security,[3] and bolster domestic rural economies through job creation[4].

The U.S. lacks effective policies to incent the use of biomass residues, low-quality or small-diameter trees and economically stranded forests for bioenergy. Furthermore, uncertainty or direct barriers associated with regulations, permits, contracts, and policy discourage long-term investment in bioenergy industries. Examples of current impediments include limitations on public land biomass removal for private sector use, inadequate duration of contracts for federal lands biomass production and delivery, lengthy facility siting and permitting cycles, uncertainty in securing long-term power purchase agreements, inequitable classification of forest biomass in renewable energy policies (see also Forest Offset Projects in a Carbon Trading System [5] and Forest Management and Climate Change [6]), air quality regulations that fail to recognize the reduced amount and toxicity of emissions from modern biomass facilities relative to historic fossil-based fuel facilities or open burning of residues, and negative public perception.[7] (See Also Timber Harvesting on Public Lands)

Background

Sources of forest biomass available for energy production include residues generated during logging or forest product manufacturing (e.g., mill residues) or right-of-way construction, storm-damaged forest areas, urban wood wastes, and whole trees. Additional sources include fuel or forest health treatments, stand improvement activities, and other projects that remove biomass from forested lands. In the US, forest biomass provides a small portion of the nation's total energy needs, primarily in the form of steam for heating and electricity generation[8] and some home-heating use. Bioenergy used 25 million metric tonnes in 2018 but barriers to further development of domestic markets persist[9], including lack of infrastructure and lower-cost alternative energy sources such as petroleum-based fuels. In contrast, wood pellet production from US forests has become a thriving export industry and have contributed to European renewable energy markets[10], where there are energy policies in place to incentivize the use of biomass and growth in industrial demand[11].

Fuelsheds may be able to sustain these production levels and even increase sustainable use of low-quality

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[1] USDOE 2016; Coppoletta, Merriam and Collins 2016

[2] Small-diameter and low-quality hardwood timber markets have been in decline, while the hardwood veneer market (e.g., international furniture production) has stabilized. As a result, many US forests require thinning. Without a biomass market, these low-quality small-diameter hardwoods will not reach markets, further destabilizing the hardwood market.

[3] Malmsheimer et al. 2011, USDOE 2016

[4] Strauss 2014

[5] The SAF supports the creation and maintenance of stable, predictable forest carbon offset markets that reflect applicable, current, efficient, accurate, and scientifically defensible practices, including practical accounting for carbon stored in harvested wood products. See Forest Offset Projects in a Carbon Trading System

[6] Substituting cellulosic biomass for fossil fuels greatly reduces GHG emissions; for every Btu of gasoline that is replaced by cellulosic ethanol, total life-cycle GHG emissions (CO2, methane, and nitrous oxide) are reduced by 90.9 percent (US EPA 2007). New and stable product markets also provide positive incentives to landowners (Miner et al. 2014). It is therefore necessary to support viable wood products markets that recognize the benefit of carbon storage and sequestration, and that provide positive incentives for forestland ownership. See Forest Management and Climate Change

[7] Young et al., 2018

[8] US EIA 2011

[9] Martin, S. 2018. North American Bioenergy, 5-Year Forecast. RISI, Inc.

[10] 4.7 million metric tonnes were contributed to European energy markets in 2016 according to US ITC 2016. See also European Union (2016).

[11] Abt KL, Abt RC, Galik CS, Skog KE (2014); Alberici S, Boeve S, van Breevoort P, et al. (2014)

woody biomass as large quantities of overstocked or disturbed stands need to be thinned.[12] In addition, purpose-grown woody crops can contribute to future production of biomass.[13] Tree genetic improvement programs have the potential to further increase the volume of forest biomass available for bioenergy. While opportunities to increase production of woody biomass exist, the US lacks necessary infrastructure to process and convert large volumes of biomass and barriers persist for utilization of the smaller-diameter forest biomass domestically and internationally. Some of these barriers are interrelated and are discussed below.

Uncertainty: policy, markets, and supply

Implementation of existing supportive policies and the subsequent bolstering of biomass markets have been delayed or even reversed.[14] In enacted federal energy policies, differing and often conflicting definitions of renewable biomass interject uncertainty and hinder investment.[15] For example, support of the Clean Power Plan and associated state targets has waned, which deters expansion of biomass power markets, and the US Environmental Protection Agency has reduced expectations for wood-based liquid biofuel production.[5] Numerous states across the nation also do not have a Renewable Energy Portfolio which typically sets the stage for supportive state and local policies for biomass.

Stability in trade policies and consistency in international science-based sustainability indicators are needed to support growth of the pellet industry. Domestic supply and consumption of wood-based bioenergy can both be increased.[16] The US Southeast is responsible for the majority of exports of woody material for bioenergy, without adversely affecting the health of these forests.[17] Yet emerging sustainability schemes[18] are directed at US producers with increasingly stringent, and therefore costly, criteria to participate in these markets.[19] If sustainability certification programs are adopted, there should be a focus on science-based quantitative measures with international agreement, facilitating comparisons between feedstock and energy options[20]. Consistent monitoring of forest conditions can also be used to ensure management goals are attained, and for timely correction in the case(s) of non-attainment, and should result in publicly available datasets that can be used for adaptive management.[21] With these long-term datasets, standards or certification programs, the private sector would be strengthened in their ability to negotiate with energy producers and government agencies.

Further, the ability of the US Forest Service and Bureau of Land Management to provide a guaranteed supply of forest biomass has been very uncertain due to legal challenges of federal land-management decisions. Lending institutions and wood products companies are generally unwilling to invest in biomass harvest and transport equipment or processing facilities without a guarantee of a dependable long-term supply of forest biomass[22].

Financial barriers to investment in forest biomass utilization

Many pulp, paper, lumber and plywood mills have closed in the US, resulting in fewer processing options and greater hauling distances for all forest products. This situation contributes to costs of delivered low-value

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[12] LeVan-Green and Livingston 2001
[13] USDOE 2016
[14] US RFS 2018, U.S. EPA Clean Power Plan 2015, Paris Agreement 2015
[15] For example, the Energy Policy Act of 2005 disallowed the use of federal woody biomass for the renewable energy credit. In contrast, Section 203 of the Healthy Forests Restoration Act of 2003 (PL 108-148, codified at 16 US Code Section 6531) provided authority for the Biomass Commercial Utilization Grants Program, which emphasizes the use of woody biomass especially from wildfire-affected areas in the wildland–urban interface. A universal definition of renewable biomass and clear policy goals are needed (Malmsheimer et al. 2011).
[16] A recent study by Dale et al. (2017) has found that just 3% of removals are used for US pellet exports.
[17] Dale et al, 2017
[18] e.g., Dutch Biomass Certification Foundation: a voluntary, emerging program aimed at small forest owners in North America.
[19] McDonnell 2017, Parish et al 2017
[20] e.g., ASTM E3066 2015
[21] Dale et al., 2017.
[22] GAO 2005

timber and residues, often resulting in “stranded resources.” Compared to larger-diameter saw timber, biomass produced from small-diameter trees is more expensive to harvest, transport, process, and store and yields lower end-product returns.[23] Also, much of the potentially available forest biomass in the western US is located in remote areas where there are a limited number of roads or originates on steep slopes that require specialized and costly harvesting systems. Most forest roads were not designed to accommodate longer chip-hauling vehicles. Throughout the US, material in and near urban-forest interface areas can be difficult to access because of local conditions and ordinances and because of the large number of small owners that make up a substantial part of the supply base in most regions. In particular, fragmentation of supply can provide a two-fold limitation to accessibility; directly because of additional costs of procurement from a large number of small producers and/or indirectly because of how supply/demand dynamics influence the ability to develop facilities of sufficient size to be economically viable.[24] This barrier has eased in the southeastern US, but remains a problem in other areas of the country.

As made evident by Camp Fire in Northern California in 2018, the Great Smoky Mountains Fires in 2016, and others, fuel-load reduction and diminished continuity of fuel is needed in wildland-urban interface forests. Such fuel-load reduction is expensive due to fragmented ownerships and diseconomies of scale. To help offset these costs, incentives for fuel-load reduction in the wildland-urban interface should be explored.

[23] GAO 2005; Nichols et al. 2008
[24] Becker et al. 2010

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