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Bioenergy Markets: New Capital Infusion for Sustainable Forest Management?

How the expanding market for wood-based renewable energy is proving beneficial to our forests.

V. Alaric Sample

Today's rapidly expanding market for wood-based bioenergy is creating new opportunities for sustainable forest management. The increasing market value of woody biomass from what until recently has been considered byproducts and waste materials is injecting new capital into the sustainable forestry equation, and enabling forest managers on both public and private lands to address longstanding needs for better forest protection from insects, disease and wildfire, and for overcoming poor forest practices such as "high grading" that degrade forests for a variety of economic, social and ecological values. Although the prices being paid for woody biomass for energy uses still can seldom compete with land prices offered by developers, the positive economic effects of biomass markets are creating new options for many private forest owners—allowing them to decide to continue conserving their land as forest, and managing it sustainably.

Policy goals for renewable energy development

The expanding markets for wood-based bioenergy are part of the larger national thrust toward renewable energy development driven by record oil prices and national security concerns. World oil prices reached a peak of more than \$77 per barrel in July 2006, deepening concerns over inflation and other potential impacts on the US economy (Swanson 2006). Although energy prices moderated somewhat during September, even the leading energy experts are unable to agree whether in six months the US will

be paying less than \$50 per barrel or over \$100 (Reed and Coy 2006). This uncertainty has not diminished the current national policy emphasis on maximizing US energy independence, and increasing renewable energy production as a significant component of total US energy production.

A more immediate factor behind the expanding market for wood-based bioenergy production is the recent flurry of state-level legislation that requires energy producers to provide a significant and steadily increasing proportion of their power from renewable energy sources. Thus far, 23 states have enacted "renewable portfolio standards" (RPS) requiring as much as 25 percent of a state's energy production to come from renewable sources by 2025; the targets and timetables vary from state to state (see Figure 1).

In many regions of the country, economically feasible opportunities for wind and solar power will meet only a small part of these renewable energy goals. Corn-based ethanol has received a great deal of attention and support, in spite of the fact that the process uses more energy than it produces, and probably will not be economically feasible without continued federal and state subsidies (Hammerschlag 2006). Cellulosic ethanol (from agricultural plant waste and woody plants) is widely regarded as having the greatest potential for meeting energy needs (Wyman 1995), particularly in the liquid-fuel transportation sector, but commercially feasible technologies are still under development (Wallace, Ibsen, McAloon and Yee 2004).

Leadership in Forest Conservation Thought, Policy and Action

EXECUTIVE OFFICE: 1616 P Street NW, Suite 100, Washington DC 20036 202/797-6580 FAX: 202/797-6583 WEB: www.pinchot.org
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INSIDE THIS ISSUE

FEATURES

Bioenergy Markets: 1 **New Capital Infusion for** **Sustainable Forest Management?**

V. Alaric Sample

Payments for Environmental Services: . . 8 **An Alternative Approach to Promoting** **Stewardship of Private Forest Lands**

V. Alaric Sample

Report Finds Chesapeake Forests 12 **Disappearing by 100 Acres Daily**

Eric S. Sprague

PERSPECTIVE

Putting the Needs of the Nation First: 13 **Regional Considerations in the Forest** **Service Strategy on Bioenergy**

Michael T. Rains

FROM THE PROFESSIONALS

Do Good and Trim Taxes 15

Julian Block

INSIDE THE INSTITUTE

Clark Binkley Named 2007 Pinchot . . 14 **Distinguished Lecturer**

Richard H. Phillips Appointed as 14 **Edgar Brannon Conservation Fellow**

GREY TOWERS NEWS & NOTES

Forest Service Introduces Two New . . 17 **Leadership Programs**

New Visitor Pavilion Opens at Grey . . 18 **Towers**

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Recognized as a leader in forest conservation thought, policy and action, the Pinchot Institute for Conservation was dedicated in 1963 by President John F. Kennedy at Grey Towers National Historic Landmark (Milford, PA)—home of conservation leader Gifford Pinchot. The Institute is an independent nonprofit organization that works collaboratively with all Americans nationwide—from federal and state policymakers to citizens in rural communities—to strengthen forest conservation by advancing sustainable forest management, developing conservation leaders, and providing science-based solutions to emerging natural resource issues. Further information about the Pinchot Institute's programs and activities can be found at www.pinchot.org.

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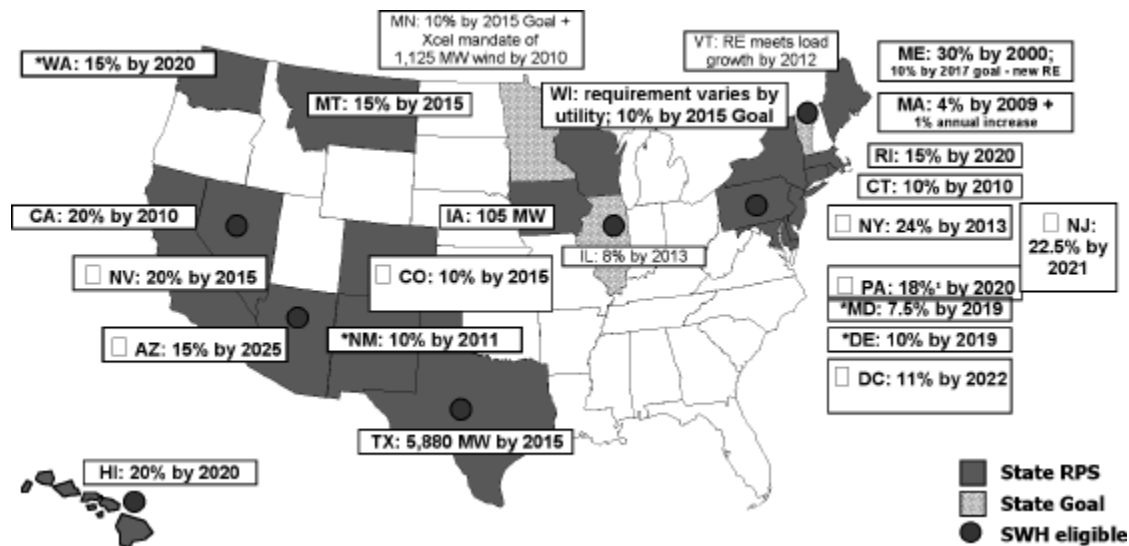


Figure 1. States that have enacted Renewable Portfolio Standards, and goals for renewable energy as a percentage of total energy production. Courtesy of *The Database of State Incentives for Renewables and Efficiency*, North Carolina State University Solar Center www.dsireusa.org

In the near term, wood fiber-based technologies involving direct combustion, and possibly liquid biofuel derivatives from the chemical byproducts of pulp and papermaking processes, have perhaps the greatest potential for increasing renewable energy production (Benjamin 1997).

Opening new doors for sustainable forest management

Commercial energy generation from wood is hardly new to the forest products industry, which already meets more of its own internal energy needs from renewable sources than any other major industry in the US (Nilsson et al. 1996). What is new is the rapidly growing demand for this energy outside the forest sector, and the value that this new demand is creating for woody biomass that until recently was considered a byproduct or waste material of little or no value.

Forest products processing facilities of all sizes have long utilized waste materials such as sawdust, slabs and edgings, which are burned in boilers to co-generate steam and electrical power for their own processes. There was little incentive to generate power that was excess beyond these internal needs. In many cases, additional capital investment in equipment such as transformers is needed to enable facilities to generate a net excess of power into the regional electrical power grid. In most states, there was no legal requirement for utilities to pay for this power.

Wood-fired power plants have been built in places where a local concentration of wood processing facilities could reliably produce wood waste on a scale sufficient to economically operate such a power plant. For example, Shasta Energy operates a 50MW power plant in Anderson, California that was established when there were seven large sawmills in the vicinity (Jolley 2006). With the local decline in timber harvesting in the 1990s, only two mills continued to operate, drastically reducing the supply of waste wood and nearly forcing the shutdown of the power plant. Early experiments with trucking loads of woodchips from thinning operations on nearby forests were short-lived when it became clear that the price the power plant was able to pay for delivered chips was less than the cost of harvesting, loading and trucking them to the plant.

That situation has now begun to turn around. In 2002, the California legislature established an RPS requiring 20 percent of the state's power to come from renewable sources by 2017 (State Environmental Resource Center 2006). Prices for wood chips are up more than 30 percent from a decade ago, as competition for woody biomass increases. This woody biomass is starting to "pay its way out of the woods," and helps cover the cost of thinning and hazardous fuels treatments designed to improve the health and productivity of the forests themselves.

Improving forest practices

One of the most persistent and troublesome challenges in

promoting ecologically sound and sustainable forest management practices is that there is little or no market for the smaller diameter, lower quality materials from ecological restoration, silvicultural thinnings, or forest protection activities aimed at reducing the risk of insect or disease infestations or wildfire.

Timber harvesting often focuses only on the largest and most valuable trees, leaving the smallest and least valuable trees to serve as the seed source for regeneration following harvest. This practice, known as “high grading,” significantly degrades the forest for a variety of ecological, economic and social values—wildlife habitat, water quality, recreation, aesthetics, and future wood production to name a few. Although many forest owners fully recognize the effect of high grading, they often feel they have no economic alternative.

Increasingly valuable markets for woody biomass for energy purposes offer the prospect of changing this situation for many forest owners, providing an economic outlet for lower quality material and opening the door to better forest management. The combination of high oil prices and new RPS requirements throughout the Northeast has stimulated the development of a diversity of new industries centered around wood-based energy, and in turn created new and valuable markets for lower quality woody materials from thinning and other forest management activities. Schools and other public buildings are installing sophisticated wood-pellet furnaces and wood chip boilers to replace or augment traditional oil or natural gas heating (Rizzo 2006). Power plants and manufacturers that co-generate much of their own power are investing in the latest combustion technology for co-firing boilers with a mixture of woody biomass and traditional fuels. Greater reliance by individual households on increasingly efficient wood heating may be the most decentralized and smallest-scale of new wood-energy applications, but cumulatively may be the largest impact (Fahrenthold 2005).

Could the increased demand for wood energy have a deleterious effect on forests in the Northeast? Quite possibly, yes. This was a concern to the citizens of Vermont when, during the energy crisis in the 1970s, the Burlington Electric Power Company proposed building an entirely wood-fired power plant. Would this new power plant become a hungry maw whose appetite for wood would devastate Vermont's forests? The 50 MW McNeil Generating Station in Burlington began service in 1983 (Irving 2006). According to some of Vermont's leading conservationists, the 30-year track record of the McNeil Generating Station suggests that it has been a highly positive force for sustainable forestry in the region. Harvesting of an average annual 350,000 tons of wood chips used by the power plant is certified as meeting sustainable

forestry standards set by the Vermont Public Service Board, and approved by state wildlife biologists to ensure that critical wildlife habitats are not placed at risk.

Paying for hazardous fuels treatments

Where local circumstances permit, the expanding market for woody biomass for energy production could represent an important breakthrough in efforts to reduce hazardous fuels accumulations in both public and private forests. Because the woody materials to be removed have negligible value, they are often left on site or simply piled and burned. Most forest owners cannot afford such a large out-of-pocket expense with no immediate return, even if it promises greater productivity in the future. In many instances, even the thinning operation itself is prohibitively expensive so it is never done, leaving the situation unaddressed and growing worse over time.

The risks of this approach were demonstrated in 2001 when the Rodeo-Chediski wildfire burned 156,000 acres of Ponderosa pine forest in northern Arizona. It was one of the largest and most expensive wildfires in US history. The USDA Forest Service recognized that there were many more acres of overly-dense pine forest in Arizona likely to share the same fate, forests that were once characterized by 40-60 trees per acre and now average more than 400 trees per acre. The Forest Service took decisive action to help avoid this possibility.

In 2004, the Forest Service announced the start of a ten-year contract with a local business partnership to complete hazardous fuels treatments on 5,000 to 25,000 acres per year on the Apache-Sitgreaves National Forest. It was the first agreement of its kind, utilizing new statutory authority for multi-year “stewardship contracts” (see sidebar) focused primarily on “large-scale forest restoration activities that result in healthier forests, enhanced rural development, and the utilization of previously unmarketable small-diameter trees” (USDA Forest Service 2004).

Previous thinning efforts had been at a much smaller scale, and usually resulted in the thinned materials being piled and burned on site. Under the 10-year stewardship contract, the materials will be utilized for local electrical power generation, the manufacture of wood pellets for heat or power generation at more distant locations, and manufacturing of value-added solid wood products.

Economies of scale and the increasing value of wood-based energy contributed to reducing the cost of mechanical treatments for reducing hazardous fuels by half, from an average of \$500-600 per acre to an average of \$250-300 per acre. Even at this rate, however, treating 25,000

acres will cost the Forest Service nearly \$7 million. With an estimated 145 million acres nationwide in need of hazardous fuels treatment, this will still be a major practical and political challenge for the Forest Service.

Fortunately, the increasing importance of renewable energy production—and its ability to attract significant new private investment—offer the possibility of these costs dropping significantly where the circumstances are favorable.

Near the Winema-Fremont National Forest in southern Oregon, Collins Pine Company recently signed a letter of agreement with DG Energy of San Diego to build a 20 MW biomass co-generation plant to be located on-site with Collins' existing solid wood products manufacturing facility in Lakeview, Oregon. Collins owns 80,000 acres of forest in south central Oregon to support its mill, and can provide 30-35 percent of the needed woody biomass from its own operations.

The Forest Service manages an adjacent 490,000 acres in the Lakeview Federal Stewardship Unit, part of the Fremont National Forest. The Bureau of Land Management oversees another 143,000 of available forests and woodlands nearby. Nearly 70 percent of this land has been designated as highest priority for hazardous fuels treatment (Condition Class 2 or 3). About 250,000 acres is determined to be at high risk for catastrophic fire and is a priority for hazardous fuels treatment. The budgetary requirements are a major problem. The current cost of hazardous fuels treatment (mechanical) is approximately \$500-600 per acre. The Forest Service can use prescribed fire on the areas with lower fuels accumulations for \$200 per acre, but is cautious of using prescribed fire in the areas of highest risk. This typically leaves the areas at highest risk of catastrophic fire with no treatment at all.

What has been proposed is a 10 year stewardship contract for thinning 8,000-10,000 acres annually, much of it in the areas with the highest fuels accumulations. The woody biomass from these operations would be sufficient to operate the biomass co-generation facility economically—and provide DG Energy the assurance it needs to commit the estimated \$30 million capital investment. At the current delivered price of \$20 per green ton for woody biomass, Collins estimates that it could do the fuels treatments on federal lands at no net cost to the agencies. The Forest Service and BLM could accomplish their hazardous fuels treatments for essentially little or no cost.

The Forest Service is currently looking into the possibility of developing a 10 year stewardship contact on the Lakeview Unit, similar to that now operating on the

Apache-Sitgreaves National Forest. On the Lakeview, there are the advantages of substantial existing infrastructure and a ready source of new private capital to be invested. For other federal lands with significant needs for hazardous fuels treatments, the cost of accomplishing these under a long-term agreement will vary based on a variety of factors. Along with external contracting costs there are internal cost to be considered, such as NEPA analysis and other aspects of preparing and administering the contract. A further challenge is addressing the "Catch-22" situation in which so much of the Forest Service's funding gets swept into wildfire suppression that it is difficult to fund land treatment activities that would reduce future fire suppression costs (Lenart 2006).

Nevertheless, the increasing importance of renewable energy production, the availability of technology for utilizing woody biomass for energy purposes at several scales, and the critical importance of hazardous fuels treatments to the future of the forests themselves suggest that these kinds of stewardship contracts will be a high priority for federal land management agencies.

Developing the institutional framework for sustainable energy

Sustainable forest management costs money. When markets are strong and returns to forest management are sufficient, investments can be made that take better care of forests today and help ensure their health and productivity well into the future. Economic pressures on private forest lands often result in unsustainable forest management practices, and contribute to the increasing loss of forest land through conversion and development. Economic pressures on public forest lands often result in deferring basic stewardship responsibilities, sometimes to the point where neglect triggers resource damage and events that are catastrophic for the forests themselves and the communities around them.

The growth of new markets for woody biomass for energy applications, and the availability of significant new private capital for investment in renewable energy production, opens the door to important new opportunities to facilitate improved forest management on both public and private lands. Sustainable forestry in the US is less limited by scientific knowledge than it is by shortcomings in its financial and institutional underpinnings.

Unlike the temporary oil supply shock of the 1970s, the current urgency for national energy independence and increasing energy supplies from renewable sources is not likely to go away soon. Seeing sustainable energy production as one component in the broader concept of sustainable forest management can substantially increase forests'

Using stewardship contracts

In 2004, Congress expanded the statutory authority for both the Forest Service and Bureau of Land management to enter into multi-year agreements for land management services. These “stewardship contracts” are intended to allow federal land management agencies to:

- undertake comprehensive ecosystem treatments in areas where traditional contract mechanisms are insufficient to complete the necessary work;
- combine ecosystem management activities into one contract, resulting in fewer entries into a site and a reduction in adverse environmental impacts;
- increase administrative efficiency and reduce overall costs of contract development and administration; and
- increase opportunities for contractors to expand their range of skills and services and achieve economies of scale.

Features that distinguish stewardship contracts from other kinds of agreements include:

Exchange of Goods for Services. The exchange of goods for services provides a means of extending the value of appropriated funds available to help carry out needed ecosystem restoration, maintenance, and improvement activities. This extension occurs by virtue of the fact that some or all of the value of commercial

timber products being sold is retained and reinvested on-site as opposed to being returned to the Treasury or deposited in one of the Agency’s special trust funds. The existing financial structure within the Forest Service accounts for the disposal of goods based upon receipts, and the purchase of services based upon expenditures from appropriated and other special funds. A change in this traditional accounting system causes some concern over possible abuse of incentives, thus its use will be closely monitored.

Receipt Retention. Through receipt retention, portions of proceeds from the sale of commercial products can be retained at the local level to fund other non-revenue producing activities, however they must be reinvested in the specific pilot project that generated them or by another approved pilot project. Historically, the Agency has had limited authority to retain receipts through the various Forest Service trust funds (e.g., Knutson-Vandenberg Act, the Brush Disposal Act, and the Salvage Sale Fund provisions within the National Forest Management Act). However, in nearly all of these instances, funds from these accounts must be re-applied to those project areas in which commercial material has been extracted and any remaining funds must be returned to the National Forest Fund in the federal Treasury for future Congressional appropriation. There is some public concern over receipt retention due to the potential impact it might have on reducing the income to the Treasury. Additionally, some individuals fear that by allowing maintenance of receipts by the Agency, the public cannot be assured

contribution to these national priorities. Thinking strategically about how we approach this historic opportunity will be key to ensuring that this contributes as well to the long-term productivity, resiliency and sustainability of our forests themselves.

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(through Congress) that they have control over spending of public revenue.

Designation by Description or Prescription. Designation by description or prescription offers a potential way to reduce sale preparation costs and to more fully apply the concept of end-results contracting. Traditionally, the designation, marking, and supervision of timber harvesting activities are conducted by federal employees or service contractors who have no prospective tie to the timber sale, thereby ensuring the accountability for products sold by the government. Under the expanded authority, land managers can provide prescriptions or area designations that clearly describe the silvicultural objective or desired “end results” in place of federal designation and marking. It should be noted that designation by description has been used in the past under very strict silvicultural prescriptions (e.g., in areas designated for clearcuts, by specific species, by live versus dead material, or by basal area). Because of this historical link to more aggressive management techniques (e.g., clearcuts), some of the public has expressed concern over how to assure purchaser discretion in selecting material to be cut and the proper control of removed property.

Best-value Contracting. Best-value purchasing allows the Forest Service to use other factors in addition to price when making decisions on the award of contracts. These other factors include: past performance, work quality, delivery, and experience. In making award decisions, the Forest Service may, among other techniques, compare offers and hold discussions and negotiations with offerors, and may make awards to a

more qualified firm at a higher price. As a result, those vendors who have performed well in the past, provided quality work, complied with wage requirements, and have high standards of workmanship will have a competitive advantage.

Multi-year Contracting. Among the desired goals of stewardship projects is the ability to engage contractors in long-term management services. It has been theorized that operators who provide services within a given management area over a long period are likely to develop a stronger sense of stewardship for that area. Additionally, the use of multi-year contracts may help to provide more stability for the contractor, as well as administrative continuity for the Forest Service contract supervisor.¹ Historically, both timber sales and service contracts operated under specific time limitations. Whereas both can extend beyond the appropriations period during which they were initiated, the National Forest Management Act limits the length of timber sale contracts to 10 years (and restocking efforts in five years) and annual Congressional appropriations limit the length of service contracts. Unlike multiple year contracts, which require the Forest Service to exercise an option for each designated project year, multi-year contracts allow the purchase of more than one year’s requirement of product or service only at the onset of the project.

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V. Alaric Sample is president of the Pinchot Institute for Conservation in Washington, DC. alsample@pinchot.org