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Ensuring Forest Sustainability in the Development of Wood-based Bioenergy¹

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On December 29, 2006, the Manchester (UK) Guardian reported that “an ice island the size of a small city is adrift in the Arctic after breaking free from one of Canada’s largest ice shelves.” The ice island is 3 miles wide and 9 miles long. It broke clear of Ellesmere Island, about 500 miles south of the North Pole, triggering tremors so powerful they were picked up by earthquake sensors 155 miles away. Unlike the free-floating Arctic ice pack, the melting of this island will add new volume to the North Atlantic and contribute to a rise in sea level. It triggered anew the scientific debates over whether the effects of climate change will be gradual, or will happen more suddenly and quickly than even the most pessimistic climate models have predicted. It also meant that, for population centers on the Atlantic coast in North America and Europe, climate change is getting closer to home.

On November 8, 2006, another powerful tremor was felt in Washington, DC, 3,000 miles to the south of Ellesmere Island, as the results of the 2006 elections became clear. Voters were sending a series of powerful signals to their national leaders. One of these signals that the future leaders of the 110th Congress, in both parties, heard loud and clear is that the American public is deeply concerned about the impacts of global climate change, and they want to see meaningful action by our national leaders to (1) better understand the many-layered effects of climate change (economic and social as well as ecological), (2) mitigate further climate change to the extent possible, and (3) begin preparing for the inevitable impacts of climate change where needed.

For those striving to make further progress in sustainable forest management, this presents what seems to be

important and welcome new opportunities. For years we have searched for ways to create economic markets for small-diameter and low-grade wood in order to stem the stubbornly persistent timber harvesting practice of “taking the best and leaving the rest.” It is well known—even among the forest owners who still engage in this practice—that it degrades forests for generations to come, not just for future wood production but for wildlife habitat, water quality, recreation and other purposes. On lands where past fire suppression has resulted in dangerously high accumulations of forest fuels, these new markets present unexpected possibilities for more affordable hazardous fuel treatments—all the while contributing to national priority goals for renewable energy development to mitigate climate change and promote energy security.

Congressional call to action

The new leaders of the 110th Congress have made climate change one of their foremost priorities. It is a leading issue on the agendas of committees from Agriculture, to Energy, Natural Resources, Defense, and Homeland Security. House Speaker Pelosi has announced her intention to create a special Select Committee on Climate Change and Energy Security to focus on this and nothing else. Several greenhouse gas cap-and-trade bills are under consideration. Even the Wall Street Journal editorialized recently in support of a national carbon tax. In this year’s State of the Union address, the President acknowledged the seriousness of the climate change issue, and pledged new support for efforts to reduce US energy consumption and increase renewable energy production.

Congress has already taken substantial action to facilitate renewable energy development, notably the financial

Leadership in Forest Conservation Thought, Policy and Action

and tax incentives enacted to promote the production of corn-based ethanol, but it is not clear that the existing incentives are the right ones for moving forward with a broad array of renewable energy technologies. There is widespread recognition that bioenergy from wood and other plant materials has perhaps the greatest capacity of all to replace fossil fuel use in the US. But few of the existing federal programs and incentives for renewable energy development reflect the major gains in wood-based bioenergy, particularly for electric power generation, that are possible with relatively modest incentives for expanding capacity.

Nearly 90 percent of the current supply of woody materials for potential energy use is in privately-owned forests across the country. Until the recent sharp increases in energy costs, and the growing concerns over energy security, the US made limited use of wood as an energy source. As a result, few of the existing programs aimed at supporting sustainable management of private forests consider the potential demand on these forests for energy, or ways in which private forest owners can obtain information that would allow them to meet this demand in ways that are ecologically, economically and socially sustainable.

The Senate Energy Subcommittee on Public Lands and Forests will be more closely examining the connections between global climate change and the increasing size and frequency of wildfires, particularly on federal forestlands, according to Senator Ron Wyden (D-OR), chairman of the subcommittee. A study currently under way by GAO, in cooperation with the National Academy of Sciences, suggests that climate trends will make it increasingly challenging for federal land managers to protect public natural resources, conserve native biodiversity, water quality and other important environmental values, and prevent significant losses of life and property in adjacent communities. Citing the example of the recently announced biomass energy facility in Lakeview, Oregon, which will be sourced primarily with woody biomass from hazardous fuels treatments on federal lands, Wyden said there are many opportunities for expanding wood-based renewable energy, while at the same time improving the health and resiliency of federal forests, and strengthening local economies. Wyden pledged support for addressing the challenges facing federal agencies in adapting to these new responsibilities, including facilitating agencies' use of multi-year stewardship contracts to attract investment in new appropriately-scaled bioenergy facilities where there is strong community and conservationist support.

Potential for expanding wood-based bioenergy

In general, there is widespread support across party lines for expanding renewable energy development, including

wood-based bioenergy, according to Fred Deneke, a spokesman for the 25 x '25 Initiative. The 25 x '25 initiative is aimed at meeting at least 25 percent of the nation's energy needs from renewable sources by 2025. Even with energy conservation and reductions in current per capita energy use, population growth in the US is expected to drive continued increases in overall energy consumption, so catching up with this moving target will be a significant challenge. Nevertheless, a November 2006 RAND Corporation study found that reaching the 25x'25 goal is feasible both technically and economically. In the RAND analysis, wind and solar energy play a surprisingly small role relative to biofuels—various ethanols and biodiesel that could eventually provide 70 percent of our transportation fuels.

This is already being reflected in the economic boon for US agriculture and local farm economies. Ethanol demand has pushed corn prices to record highs, with soybean prices not far behind. Wood prices have been slower to respond, reflecting the remaining technological and financial challenges in producing biofuels like cellulosic ethanol, but new demand for power generation alone is pushing up prices and creating new markets for low-grade wood that until a short time ago had little or no value.

Woody biomass from hazardous fuels treatments alone could potentially supply nearly 60 million tons/year for bioenergy production, says Corbin Newman of the US Forest Service. To put this into perspective, this would be enough to supply 300 15 MW power plants, and meet the energy needs of 4.5 million households. Only a quarter of that (14.7 mm tons/year) would come from federal forestlands; critically needed fuels treatments on private forestlands could provide more than two-thirds of the total (41.5 tons/year). The biggest challenge, according to Newman, is not the total amount of woody biomass available, but the consistency and reliability of the supply, particularly in regions characterized by a mix of federal, state, corporate and family forests.

To arrive at more realistic and practical estimates of the amount of woody biomass that this mix of forest ownerships could provide on a sustainable basis, Catherine Mater of Mater Engineering has completed a series of coordinated resource offering protocol (CROP) studies in several locations around the country, including Oregon, Arizona, Utah, Colorado, Louisiana (area affected by Hurricane Katrina), and northern New England. When the community of Lakeview, Oregon began seeking an energy company willing to invest in a biomass energy plant in their community, it was Mater's estimates that persuaded DG Energy to seriously consider the possibility.

But estimating the sustainable level of local woody bio-

mass supply is one thing. Ensuring the reliability of that supply over the period of time needed to recoup the capital investment in a new bioenergy plant is quite another. In Lakeview, 70 percent of the sustainable woody biomass supply within a reasonable distance (the economics of wood-based bioenergy are highly sensitive to the distance wood chips must be transported to the power plant) was on federal lands managed by the Forest Service and BLM. Establishing a long-term biomass supply agreement, even utilizing the agencies' new authorities for multi-year stewardship contracts, meant overcoming a number of significant challenges: uncertainties over Congressional appropriations in future years; the cost of planning and administering the agreement, including analysis of potential environmental effects; and the possibility that, in spite of such analysis, the effort could still be halted suddenly by litigation. The recent announcement that DG Energy would go forward with construction of a 15 MW wood-based bioenergy power plant in Lakeview, supplied in large part by materials from hazardous fuels treatments on local federal forests, was the culmination of many months of discussion, with active support from the local community and state government.

DG Energy's CEO, Steven Mueller, notes that in spite of the current surge of interest in renewable energy production—and the launch of the Lakeview project—companies that invest in wood-based bioenergy still have the cards stacked against them. Most federal tax credit programs and financial incentives for renewable energy development are currently focused on ethanol, and on producing electricity with wind and solar power. Wood-based bioenergy already supplies more than twice the electricity produced by wind power in the US, at lower cost, and with greater efficiency. Wood-energy plants operate at close to 90 percent capacity, whereas solar and wind generators can operate an average of only 40 percent of time. In Oregon, the state government offered Business Energy Tax Credits as an incentive, and there is a standard power purchase agreement that facilitates the purchase of biomass energy by utilities. Even with the increase in energy prices, electricity from fossil-fuel power plants often is still less expensive than the \$.09-.10 per kilowatt-hour many biomass energy plants need to break even.

At the federal level, there is an opportunity for relatively modest incentives to spur investment in wood-based bioenergy, and significantly expand the current electrical generating capacity. An incentive of only 1.8¢ per kilowatt-hour helped expand wind power from negligible capacity in 1995 to more than 14,000 MW in 2007. The production tax credit for investing in wood-based electrical power generation currently is less than .5¢ per kilowatt-hour. According to Mueller, Congressional action to ensure that biomass energy investments are eligible for the same pro-

duction tax credits as other renewable energy technologies could, in 2007 alone, result in an estimated \$400 million in new private capital investment in biomass energy, add 200 MW in new electrical power generating capacity, create hundreds of new jobs in rural communities for years to come—all the while reducing greenhouse gas emissions and reducing US dependence on imported energy.

There are other policy considerations that could affect private investment in wood-based bioenergy in unpredictable ways. Longstanding disagreements over the use of federal forest lands, such as the extent to which hazardous fuels should be removed from federal forests, are finding their way into the renewable energy debate. For example, there is a measure currently before the California state legislature to deny energy companies the use of Renewable Energy Credits for energy generated from woody biomass removed from federal forestlands. Although such efforts are limited, and it is unclear how widely they are supported even within the conservation community itself, they introduce another element of uncertainty that could dampen private investment in wood-based bioenergy facilities that would depend in part on woody biomass supplies from federal forest lands.

"Doing it right"—ensuring that essential environmental safeguards are in place

"Clean energy" can have its dark side. Both the Wall Street Journal and NPR recently have reported that hundreds of thousands of acres of primary tropical forest in Indonesia and Malaysia—some of the richest and most biologically diverse on the planet—currently are being cleared to make way for oil palm plantations to meet the demand for biodiesel. The cover of the January 2007 issue of National Geographic showed soybean production, displaced in the US by the expansion of corn for ethanol production, now pushing its way into the Amazon at the expense of forests.

Closer to home, the surge in demand for corn has led to a recultivation of marginal crop lands that were set aside through the Conservation Reserve Program. On February 5, 2007, Agriculture Secretary Mike Johanns proposed to suspend the program, citing the "need for increased corn production to meet demand." CRP was established in the 1985 Farm Bill, and when it was set to expire it was the state fish and wildlife agencies that strongly advocated for its continuation, because of the enormously important wildlife habitat that reforestation of these lands had created. Now much of this habitat is being lost as the forests are once again cleared to make way for corn for ethanol production.

Conservationists almost universally support renewable

energy development. But they want to see it “done right,” especially when it comes to potentially placing new demands on forests. We need to carefully think through how we respond to emerging markets for wood-based bioenergy in order to avoid unintended negative consequences that could undo years of progress in biodiversity conservation, water quality, wildlife habitat and other important conservation values. The forest products industry has for several decades participated in an interactive dialogue with the rest of society, to arrive at a set of widely accepted principles for what constitutes “sustainable forest management.” Generally, the energy industry is new to this dialogue. The tough lessons the forest products industry has learned about what it takes to “maintain the social license to practice forestry” will need to be absorbed and understood by the energy sector.

Fortunately, there are both public policies and market-based mechanisms in place to hasten the energy industry’s ascent of its learning curve. Environmental protection and sustainable management statutes relating to federal lands, as well as state laws governing forest practices on private lands, apply to timber harvesting whether the materials are destined for wood products or generating electricity. Beyond that, there has been surprisingly little dialogue within the conservation community itself regarding the kinds of environmental safeguards that need to be in place in advance of the anticipated further growth in wood-based bioenergy, and its effects on both public and private forests.

The National Wildlife Federation’s Barbara Bramble, who also currently chairs the board of the Forest Stewardship Council-US, notes that the principles and standards development for third-party certification can at least provide a significant head-start toward forest management standards that could be applied in the bioenergy context. Most of the existing forest management guidelines, whether public policies or market-based certification standards, were developed primarily to address the harvesting of “merchantable size” trees destined for wood products manufacturing. Large-scale woody biomass harvesting, which may entail the removal of “coarse woody debris” so essential to biodiversity conservation and nutrient cycling, may require further consideration and possible augmentation of these guidelines.

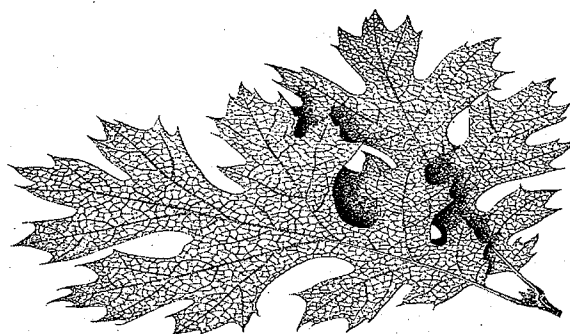
The question of scale

It is possible that many of the most challenging questions surrounding wood-based bioenergy development, from both the energy production and the environmental perspective, could be alleviated through careful consideration of appropriate scale and distribution of bioenergy facilities. Highly decentralized, small-scale wood-based bioen-

ergy production can be surprisingly efficient, according to Biomass Energy Research Center director Tim Maker, and reduce the likelihood of unacceptable impacts on forests. During previous “energy shocks,” rural communities were hit disproportionately hard by sharp increases in the prices of natural gas or imported oil. They know that further spikes in fossil fuel prices are not a question of “if,” but “when.” Rural communities in heavily forested regions of the country have begun experimenting with wood-based bioenergy on a variety of scales, from downtown districts to individual buildings, and are finding a number of reasons why “small is beautiful” when it comes to wood energy.

In Vermont, one-fifth of elementary school students attend schools heated entirely with wood. Is this a return to the old days, when each student was expected to bring a log from home each day? Hardly. Wood chips from local sources are unloaded into underground hoppers, and fed automatically into highly efficient boilers. These systems are finding their way into not just schools, but numerous other kinds of large institutional and public buildings. Even greater efficiencies are possible through “distributed generation” systems at a somewhat larger scale. On college campuses and downtown areas as large as St. Paul, Minnesota, combined heat and power (CHP) plants generate electricity, but also capture thermal energy that would otherwise be lost and circulates it as hot water through a series of buildings.

There are other advantages to community-based energy systems that go to the heart of the concept of sustainability. Communities that derive their power from local forests have an additional incentive to ensure the long-term sustainability of their use and management of those forests. Money may change hands from forest landowner to wood harvester to energy user, but it continues to circulate within the local economy, creating income and employment solidly grounded in the sustainable use of local resources. Not only is the community less vulnerable to price spikes for imported fuels, but the decrease in “transaction costs” associated with obtaining, processing, and transporting fossil fuels, and reducing the “efficiency loss” of transmitting electric power over long distances to



rural communities, can make cumulatively meaningful contributions to national energy sustainability.

Massachusetts is one state that has taken these lessons to heart. Although the state has almost 3 million acres of forest, an average of 40 acres a day are being permanently lost to development, according to chief forester Jim DiMaio. There is an effort to protect up to 2.5 million acres as "New England working forest" through conservation easements. If successful, this will help slow the loss of forest, but income from these private forests will still be necessary. Until recently, less than 1 percent of the state's energy came from renewable sources. Under the new Massachusetts Sustainable Forest Bioenergy Initiative, funded cooperatively by both federal and state agencies, the state is moving forward to promote a range and diversity of wood-based bioenergy facilities. As part of the initiative, the state is sponsoring the enrollment of 4,200 private forest owners in third-party certification programs to ensure that their forests continue to be managed under accepted principles of sustainable forest management.

Conclusion

The near-term future of sustainable forest management will be influenced more by energy policy than it will be by traditional forest policy. Wood-based bioenergy has a significant and largely unrealized potential to contribute to national priorities for renewable energy development. Further development of markets for wood energy could help address several longstanding challenges in sustainable forest management: treating hazardous fuels accumulations to minimize future threat of wildfires, creating economic outlets for small-diameter and low-grade wood to reduce forest degradation, and strengthening community economic development on the basis of sustainable use of local forest resources.

There is no guarantee that the energy sector will be able to fulfill this potential, even given the incentives for renewable energy development through federal tax credits, and state requirements that energy companies produce an increasing percentage of their power from renewable sources. Renewable energy programs continue to emphasize liquid biofuels and electrical generation from wind and solar power. In the absence of standard power purchase agreements to buy biomass energy—or perhaps a carbon tax that increases the relative cost of power from fossil fuel plants—wood-based bioenergy will continue to be placed at a disadvantage. Community-based wood bioenergy development at smaller scales would benefit greatly from the creation of a community energy trust fund for technology innovation, and community energy infrastructure grants to assist rural communities in restructuring their energy economies. The conversion of public

schools and other large municipal buildings to wood energy has been proven successful in a number of locations across the country. A small grants program to assist other communities in assessing the feasibility of such programs, and facilitate energy system conversions where warranted, could make these programs successful at the national scale.

There are no guarantees even where emerging markets for low-grade wood for bioenergy seem to be the perfect answer to problems such as hazardous fuels accumulations. This is particularly true when it involves federal forests. Segments of the environmental community still deeply embittered by past battles with federal land management agencies have displayed a continuing unwillingness to allow active forest management to take place, even to reduce wildfire risks or promote carbon-neutral renewable energy production. Beleaguered field personnel for these agencies, already constrained by tight budgets and personnel cutbacks, are in some instances unwilling to invest scarce resources in the lengthy process of developing a multi-year biomass supply agreement, convinced that their plans will be halted or delayed indefinitely by litigation focused on administrative process rather than the merits of woody biomass removal. Significant opportunities to expand renewable energy production, improve forest management, and contribute to local community well-being are thus crushed before they can even be thoughtfully considered.

Whether the context is public forests or private forests, anticipating and avoiding unintended negative consequences for important conservation values will be critical to success in developing the nation's potential for wood-based bioenergy. A key objective during the coming months must be to surface the potential issues—before political battle lines get drawn and positions become entrenched—and adapt existing public policy frameworks and private market-based mechanisms to address these issues. With careful consideration and forethought, and the support of local communities and the full range of forest conservation interests, there will be significant opportunities in wood-based bioenergy to contribute to national priorities for renewable energy development, while also advancing conservation and sustainable forest management.

1. This article summarizes presentations and discussions at the Forum on Climate Change, Forests and Bioenergy, held at the Library of Congress on January 26, 2007, and sponsored by the Congressional Research Service and the Pinchot Institute. The presentations themselves and other informational materials can be found at www.pinchot.org.

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