

Something Old and Something New: Forest Bioenergy Production in Minnesota

by Dennis R. Becker and Laura M. Eaton

Abstract: As a state with no coal, oil, or natural gas production, the development of renewable energy is vital to Minnesota's future. Forest biomass used for heating, electricity, and biofuel production is one potential source of energy that could significantly reduce our dependence on energy imports while reinvesting in local communities. Appropriately scaled and using the latest technology, it could also enhance forest productivity and reduce carbon emissions. Yet bioenergy investments have been slow to materialize despite an assortment of state and federal incentives. This study investigates the barriers to bioenergy development from the perspective of supply-chain actors in the state and identifies principles to guide enabling policy. One key finding is a lack of coordination and shared responsibility among various state agencies, industry associations, and nonprofit organizations, which has resulted in a fragmented set of policies. Those interviewed also identified the need to reduce fossil fuel subsidies and integrate bioenergy production with bio-based markets, including traditional forest products markets upon which bioenergy production is highly dependent. This research was funded by a grant from CURA's Faculty Interactive Research Program, and the Institute on the Environment's Initiative for Renewable Energy and the Environment (IREE) at the University of Minnesota.

Minnesota is home to vast quantities of biomass, which can serve as a significant source of renewable energy. Forest biomass—which includes the treetops and limbs left over from timber harvesting, as well as wood waste from manufacturing—offers a particularly interesting opportunity for expanding Minnesota's energy portfolio. A recent study estimates that use of forest biomass for energy production could sustainably produce upwards of one million dry tons of biomass annually,¹ enough to generate

¹ D.R. Becker, J. Klapperich, G.M. Domke, M.A. Kilgore, A.W. D'Amato, D. Current, and A. Ek, "2010 Outlook for Forest Biomass Availability in Minnesota: Physical, Environmental, Economic and Social Availability," University of Minnesota Department of Forest Resources Staff Paper 211, 2010.



A stand of mixed conifer forest in northern Minnesota.

150 megawatts of electricity per year to power more than 120,000 homes or (converted into thermal heat) to warm more than 400,000 homes.

Bioenergy production first became an important source of domestic energy after the 1973 Arab oil embargo, but it failed to gain widespread adoption because of low fossil fuel prices. More recently, with the increased volatility of fossil fuels and the need to reduce the risk of catastrophic wildfires, policies to encourage the use of forest biomass for electricity, heating, and biofuel production have proliferated throughout the nation.² In Minnesota, Governor Tim Pawlenty signed the Next Generation Energy Act in May 2007, which requires that 25% of the total energy used in the state be derived from renewable-energy resources by the year 2025. The act provides a framework for more locally produced renewable energy and reduced

² D.R. Becker, C. Moseley, and C. Lee, "A Supply Chain Analysis Framework for Assessing State-level Forest Biomass Utilization Policies in the United States," *Biomass & Bioenergy* 35,4 (2011): 1429–1439.

carbon emissions, and establishes forest biomass as a qualifying source. However, to take full advantage of bioenergy production, more information is needed about the barriers to market entry and performance of the policies enacted. To address these issues, we interviewed state bioenergy experts from a number of sectors to gather their viewpoints on the current market and policy climate. In this article, we report our findings on the challenges of increasing bioenergy production, and present a framework for a statewide bioenergy strategy. These findings are summarized in Table 1.

Methodology

We interviewed 40 bioenergy experts in the spring of 2011 to identify barriers to bioenergy production in the state and possible solutions. We conducted open-ended interviews with individuals representing steps in the supply chain, including forest industry and manufacturing (8 people), public-utility officials (4 people), and economic development experts (4 people). We also interviewed state-agency representatives (6 people),

Table 1. Summary of Barriers to Forest Bioenergy Production in Minnesota and Potential Solutions Identified by Statewide Experts

Policy Problem	Key Issues Involved/Symptoms	Bioenergy Expert Solutions
<p>#1: Existing energy policy gives preference to traditional energy sources, putting forest bioenergy at a competitive disadvantage</p>	<ul style="list-style-type: none"> ▶ At the federal level, traditional energy sources, such as fossil fuels, receive greater governmental support in the form of subsidies ▶ At the state level, biomass receives less preference in the Renewable Portfolio Standards 	<ul style="list-style-type: none"> ▶ Eliminate or reduce federal subsidies for fossil fuels ▶ Provide more equally distributed subsidies for all energy sources ▶ Promote policies that give equal support to all renewable-energy sources
<p>#2: Bioenergy incentives that create competition for raw materials are mutually counterproductive</p>	<ul style="list-style-type: none"> ▶ Competition of resources between the forest-products industry and the biomass industry ▶ Creation of policies such as BCAP, which create market imbalances 	<ul style="list-style-type: none"> ▶ Create policies that are mutually supportive of the forest-products industry and the biomass industry ▶ Promote policies that are designed to foster a symbiotic relationship between the forest-products industry and the biomass industry
<p>#3: Existing policies and procedures fail to adequately integrate bioenergy and traditional forest-products industries</p>	<ul style="list-style-type: none"> ▶ Current logging policies do not financially incentivize loggers to harvest biomass ▶ Traditional logging practices do not include biomass harvesting 	<ul style="list-style-type: none"> ▶ Create policies that provide educational support to assist loggers in incorporating biomass-harvest practices into their system ▶ Promote policy design that financially supports loggers, especially in the areas of biomass removal in the woods and transport of biomass
<p>#4: The various efforts and authorities that exist statewide related to bioenergy are uncoordinated and lack a unified strategy</p>	<ul style="list-style-type: none"> ▶ Lack of a single entity being in charge of biomass statewide strategy results in an unorganized and inefficient system 	<ul style="list-style-type: none"> ▶ Implement a new structure, with DNR taking a lead role and other state agencies having various other roles in the system to create a unified vision and direction for the biomass system
<p>#5: Lack of policy coordination has resulted in an overly complicated structure of governing rules and procedures concerning biomass</p>	<ul style="list-style-type: none"> ▶ Federal and state management of forests in Minnesota result in an uncoordinated management effort, causing a loss of maximum ecological and/or economic benefits ▶ Involvement of multiple state agencies across the supply chain results in disjointed policy (for example, makes the permitting process difficult to navigate) 	<ul style="list-style-type: none"> ▶ Improve coordination of management of forests between the U.S. Forest Service and state foresters ▶ Promote coordination of state agencies in biomass-system management ▶ Encourage biomass management at the community level, to reduce the need for state-level involvement
<p>#6: Existing bioenergy policy gives preference to large-scale applications</p>	<ul style="list-style-type: none"> ▶ Existing biomass policy is often designed to only be applied at too large of a scale, and is not designed to be flexible to be applied at smaller scales 	<ul style="list-style-type: none"> ▶ Create policies that are designed to be applicable at multiple scales, thus enabling the maximum number of users to take advantage of the policies
<p>#7: Lack of public awareness about the benefits of forest bioenergy reduces support and potential impact</p>	<ul style="list-style-type: none"> ▶ Lack of public awareness results in a lack of public support for biomass utilization 	<ul style="list-style-type: none"> ▶ Increase educational opportunities for the public, as well as along the supply chain, to inform them about the economic and ecological benefits of biomass utilization as a fuel source

technical-assistance organizations and conveners (11 people), conservation organizations (3), and university and private-sector researchers (4 people) identified by peers as being the most knowledgeable about these topics. Specific questions focused on the institutional design and governance structure of policies related to the bioenergy supply chain, allocation of raw materials and access to financial capital, industry leadership and accountability, and types of innovation needed. We coded and thematically analyzed transcripts of the interviews to identify common themes discussed and issues unique to specific supply-chain actors.

Findings

Our experts identified several barriers to bioenergy production during the course of our interviews, but the following seven “policy problems” reflect those most commonly and most consistently discussed. The issues identified and solutions presented, combined with a previous (but ultimately abandoned) effort by Governor Pawlenty to create a bioenergy roadmap, provide a framework for a cohesive statewide strategy.

Policy Problem #1: Existing energy policy gives preference to traditional energy sources, putting forest bioenergy at a competitive disadvantage. Despite extensive efforts at both the state and federal levels to increase bioenergy production, there is a perception that current energy policy favors traditional energy sources like coal and natural gas. At the federal level, this preference is rooted in direct government expenditures and tax breaks for electricity production, distribution (e.g., pipelines, transmission, railroads), and related research and development, which forest-bioenergy experts believe creates market imbalances. Fossil fuels (coal, natural gas, and petroleum) accounted for 79% of the energy production in the nation³ and received 11% of total subsidies in 2010 (\$4.2 billion).⁴ By comparison, biomass (not including biofuels like ethanol) accounted for 4% of total energy production and received 3% of total subsidies (\$1.1 billion), half

of which was for research and development. Fossil fuels have a much higher level of production than biomass relative to the level of subsidies provided and are certainly critical to the nation’s economic development, but fossil fuels also have significant impacts on air and water quality and human health. Bioenergy experts argued that the continued subsidization of fossil fuels creates artificially low energy prices, presenting a significant barrier for bioenergy competition. As one individual representing the forest-products industry stated:

Right now oil and gas are just too cheap to have biomass make any sense. Federal subsidization of fossil fuels is a major culprit. This is distorting the market.

Another individual who works for a small bioenergy start-up business voiced the concerns of many by stating that, if we are to develop a comprehensive national energy policy, equal treatment is needed for bioenergy, particularly if the energy security, economic, and environmental benefits are so pronounced.

Just look at the incentives for ethanol versus biomass fuels, wind power versus biomass, oil company incentives versus renewable-energy industry in general. Either ignore the special-interest groups and eliminate them for all industries and let the marketplace decide, or make certain that the economic incentives are equally applied.

Overwhelmingly, individuals interviewed said they preferred that such subsidies did not exist, and that if the market was a level playing field and resources were more evenly distributed, biomass would be able to prove itself as a dependable, efficient, and environmentally responsible source of energy.

Subsidies are not the only contributing factor to an uneven market. Some legislation discourages use of forest biomass for energy and gives preference to other alternative sources such as wind and solar. Energy sector experts cited the Minnesota Next Generation Energy Act as an example, wherein Xcel Energy must generate 30% of its energy from renewable resources—but with a 25% carve-out for wind and solar, and only the remaining 5% from all other sources, including biomass. At the federal level, the Renewable Fuels

Standard in the 2007 Energy Independence and Security Act disqualifies the use of forest residues (e.g., the tops and limbs of trees) obtained from most public lands out of fear that harvesting practices may not be sustainable, even though they are subject to an environmental impact statement as required by the National Environmental Policy Act of 1969.

Policy Problem #2: Bioenergy incentives that create competition for raw materials are mutually counter-productive.

Although many of those we interviewed argued for parity in government support, a majority said they did not want bioenergy policies to distort market prices to the point that they “cannibalize” existing wood-products production through artificial competition for the biomass resource. Interviewees were wary of government intervention that increased biomass demand, thus driving up the price and in effect reducing the competitiveness of industries such as pulp and paper manufacturing. These experts feared this could result in a redistribution of jobs to bioenergy jobs that are, on average, lower paying than those in pulp and paper manufacturing.

One example of unintended consequences that interviewees pointed to was the Biomass Crop Assistance Program (BCAP). Part of the 2008 U.S. Farm Bill, BCAP had two main goals: to support the establishment and production of eligible crops for conversion to bioenergy; and to assist forest and agricultural landowners in the collection, harvest, storage, and transport of eligible crops for conversion. Despite intentions, existing forest-products businesses captured a majority of the funding to subsidize existing manufacturing. Very little new production was created, and new sources of biomass feedstock were not developed. Market interruption resulted in which the price for biomass was artificially increased to the point that those businesses not having contracts were temporarily priced out of the market, or forced to pay more for pulpwood used in paper production. A conservation organization representative summarized the issue this way:

BCAP was good, because it incentivized foresters to get biomass out of the woods, but was designed so poorly that it just became a monster and it didn’t add any infrastructure to the system.

³ U.S. Energy Information Administration, *Annual Energy Outlook 2012 with Projections to 2035* (Washington, D.C.: U.S. Department of Energy, 2012).

⁴ U.S. Energy Information Administration, *Direct Federal Financial Interventions and Subsidies in Energy in Fiscal Year 2010* (Washington, D.C.: U.S. Department of Energy, 2011).

Most interviewees stated that if BCAP had been more carefully designed to favor development of new biomass crops, it could have been a successful approach. Many forest-products experts we interviewed also reinforced the idea that bioenergy policy be designed to benefit multiple industries. They pointed out how the paper and bioenergy industries are increasingly mutually dependent and that higher valued pulpwood and sawlog markets are necessary to subsidize the physical removal of biomass used for lower valued bioenergy markets. Likewise, the use of residual biomass from timber harvesting (e.g., the tops and limbs of trees) not suitable for those higher valued products is an increasingly important revenue stream for beleaguered forest-products industries and landowners. If the value of biomass increased sufficiently to cover a greater portion of the cost of production, forest-products industries would be more likely to invest in suitable technologies and practices so long as the price was not artificially increased to the point of outcompeting traditional industries. Instead of viewing these industries as competitive and shaping policy for each separately, the experts we interviewed believed that developing a statewide strategy is necessary for the ultimate success of both industries.

Policy Problem #3: Existing policies and procedures fail to adequately integrate bioenergy and traditional forest-products industries. Expanding on the previous policy problem, many of the utility and industry experts we interviewed suggested the need for a fundamental change in how timber is harvested—by including biomass harvesting as part of an integrated system with traditional forest-products markets. In the typical timber-harvesting process, loggers remove the higher valued sawlogs and pulpwood to be used in lumber or paper production, leaving the residual tops and limbs at the harvest site. Where biomass is removed, it is generally done immediately or soon after logging crews have left (as typically stipulated in the contract). This results in the transport of “green” or “wet” biomass to processing facilities, where it is purchased on a green-ton or total-weight basis. Purchasing green biomass in effect creates a perverse incentive for loggers to transport water to maximize their weight (instead of partially drying the material in the woods). This ultimately increases the cost of production,



Forest biomass—which includes the treetops and limbs left over from timber harvesting—can serve as a significant source of renewable energy.

both because of increased transportation costs and because higher moisture content reduces efficiency of energy conversion.

Some utility and industry experts suggested adapting logging and procurement systems in Minnesota to emulate the Scandinavian model, which is generally considered the gold standard. In countries like Sweden and Finland, biomass remains onsite to dry and then is purchased on an energy content (Btu) or dry-ton equivalent basis. In this model, bioenergy products are fully integrated into the broader electricity production supply chain, which financially rewards high-quality biomass, maximizes energy output per unit of production, and ultimately minimizes air-quality impacts through more efficient energy conversion. It also addresses concerns about nutrient impacts to soils where needle-cast from harvested tops and limbs remains onsite for a period of time to facilitate nutrient cycling. Some agency and industry representatives suggested revising the state best management practices for biomass and timber harvesting to allow for larger landing sites in the woods where logs and biomass are collected so as to accommodate onsite drying of biomass for later retrieval. Other solutions focused on subsidizing the cost to chip biomass in the woods, which requires specialized equipment for processing and hauling that is in

addition to the suite of equipment many loggers currently possess. Those interviewed suggested that cost-share programs or investment tax incentives be used to entice loggers to purchase new equipment to improve integration of biomass and timber harvesting. They also discussed direct subsidies, in the form of production payments per ton of biomass shipped to qualifying facilities, as a way to offset the disparity in production costs and what utilities were willing to pay. Finally, interviewees suggested increasing legal-load limits on roads and highways to accommodate larger trucks, thus reducing transportation costs.

Policy Problem #4: The various efforts and authorities that exist statewide related to bioenergy are uncoordinated and lack a unified strategy. A number of organizations and efforts exist throughout the state and region broadly aimed at capitalizing on the benefits of bioenergy production. They range from organizational efforts to establish an industry presence and research and development to agency administrative procedures to speed environmental permitting and business siting. The challenge identified by our experts, however, is that confusion exists over who has the authority (and, perhaps more importantly, the responsibility) for coordinating efforts and providing oversight—state government or private industry? Individuals

representing all steps of the supply chain cited a general lack of leadership and coordination necessary to accomplish bioenergy objectives, which themselves are only vaguely defined. Without this leadership, many posited that there can be neither a coherent strategy nor accountability for the lack of progress. Interestingly, there was little agreement on the broad range of ideas for how to coordinate efforts or regarding who or which agency should be “steering” efforts.

Numerous state and federal agencies have a vested interest in the success of bioenergy in Minnesota. The Minnesota Department of Natural Resources (DNR) manages more than 20% (4.5 million acres) of forested land in the state, and provides technical assistance to private landowners representing another 1.3 million acres. The federal government manages another 15% in national forests (excluding wilderness and sensitive areas), and local and county governments manage an additional 16%. Another 5% are managed by private industries. However, private nonindustrial woodlands are overwhelming the largest forest land base in the state at 39% (190,000 owners) and contributed nearly half of the forest-biomass supply in 2010.

Several energy experts we interviewed felt that bioenergy efforts could benefit from the financial support that Minnesota’s Department of Employment and Economic Development provides through grants for project development, technical support, and guidance on renewable energy. They also saw an important role for the Department of Commerce in promoting energy efficiency, engaging prospective businesses in the permitting process, and providing energy-sector training related to bioenergy project development, which is sorely lacking.

Several government representatives and other individuals we interviewed pointed out the lack of communication and coordination among the various state and federal agencies, and how that impedes progress. In addition, no less than a dozen more nongovernmental organizations and associations work on issues of bioenergy around the state, making improved coordination and leadership both a challenge and a necessity. Some of these organizations include the Minnesota Forest Resources Council, the Agricultural Utilization Research Institute, the BioBusiness Alliance of Minnesota, the Institute for Agriculture

and Trade Policy, the Izaak Walton League of America, Dovetail Partners, the Great Plains Institute, Minnesota Forest Industries, and various businesses and electric utilities.

Some of those we interviewed wanted to see the DNR take more of a leading role in the state, given its high profile and the amount of biomass originating from state lands. The DNR also routinely works with private forest landowners and is involved in state environmental permitting. They envisioned maintaining the role of individual agencies while articulating distinct roles and responsibilities within an overarching framework. In an example of how the current structure impedes progress, some of those we interviewed were frustrated with the permitting process and the duplication of environmental review.

Creating a unified state strategy for bioenergy development would inform and guide the reorganization of agency duties and serve to coordinate the disparate efforts currently underway around the state.

Policy Problem #5: Lack of policy coordination has resulted in an overly complicated structure of governing rules and procedures concerning biomass. An overarching theme that emerged during the interviews was the lack of policy coordination across the supply chain. Many experts, especially within the forest-products sector, highlighted what they viewed as incompatible policy objectives relating to the management of state and federal

forests. On one hand, the U.S. Forest Service has expressed a desire to manage federal forests in Minnesota for greater timber and biomass production, but their existing forest-planning rules and procedures result in paralysis and too few projects being approved. Forest-management experts, in particular, were dismayed at the lack of progress given the enormous potential for forest restoration, carbon mitigation, and economic development that exists.

It doesn’t make any sense to have one [forest] stand being managed for old growth by the U.S. Forest Service, and the one next to it managed for timber sales by the state [of Minnesota]. This is just bad forestry practice.

Such policy entanglement was also cited as a problem within agencies. Agency intentions, as manifested through rules and procedures, can be in opposition to jointly stated goals pertaining to bioenergy production. For instance, the synchronization of definitions of what types of biomass qualify for tax credits would facilitate implementation and provide more secure and stable bioenergy production. The same is true where rules exist pertaining to utility-mandated purchases of distributed energy, but where qualifying thresholds are too low to be of use to small-industrial or community-scale applications.

Given the inherent challenges of coordinating policy, many of those we



An automated auger loads processed wood chip heating fuel into a biomass boiler.

Photo © George Clerk/Stockphoto, 2011

interviewed stated that smaller scale efforts (for example, at the community level) might have the greatest chance of near-term success. One example is to enact legislation that provides financial assistance to establish district-heating or small-scale combined heat-and-power systems. Such an approach would empower communities to invest in their energy futures while driving the development of bioenergy policies and production in the state. The positive net return these systems are capable of producing, particularly in communities served primarily by propane and heating oil, could significantly reduce future fossil fuel dependence in these areas and significantly increase the amount of household dollars retained in the local economy.

Policy Problem #6: Existing bioenergy policy gives preference to large-scale applications. The issue of scale was an overarching theme that emerged in most interviews; individuals felt strongly that existing policies too often give preference to a particular scale or size of project rather than providing incentives that could be applied to and used by both large and small operators. Less restrictive policies would create greater flexibility in terms of matching the size of production to the amount of local biomass available, level of community support, and local demand for heat or electricity. One expert we interviewed stated:

Most of the policy initiatives and subsidies have gone to large-scale development, and I would like to see a greater proportion of policy opportunities go to small-scale operations, because for Minnesota I think that is where our best opportunities are.

One example cited was the Minnesota Net Metering law, which mandates public utilities to purchase distributed-electricity generation of up to 40 kilowatts of electricity, whereas a small community system might be in the range of 500 to 1,000 kilowatts. At this point no state policies, fiscal or otherwise, exist to facilitate community-scale independent electricity or district heat production. Encouraging bioenergy at a smaller scale also addresses environmental sustainability concerns, as well as issues pertaining to unfair competition within the forest-products industry and displacement of existing jobs, and is generally easier for municipalities and small businesses to finance.



Wood pellets used for home heating in newer-generation wood-burning stoves.

Policy Problem #7: Lack of public awareness about the benefits of forest bioenergy reduces support and potential impact. One of the issues raised was a lack of public awareness of the environmental and economic benefits of forest bioenergy and, as a result, a lack of knowledge and support for enabling efforts. Many of the experts we interviewed felt the need for greater public involvement in bioenergy planning particularly at the community level. One individual stated that the lack of public awareness and understanding of the potential benefits of biomass as an energy source stymies development.

We lack a coherent plan of attack as well as a ... social consensus when it comes to biomass. If society can get behind biomass, it stands to have a much better chance at being successful, and now that is just not the case.

In addition to the lack of public awareness, many interviewees also noted that investors are hesitant to invest in forest bioenergy, either for fear that the public may not understand the benefits or because of investors' own uninformed perspective of the ecological or financial issues involved. For instance, there is often a misconception that these systems are similar to your grandparents' billowing wood stove. In reality, the technology has advanced dramatically and is highly regulated by the U.S. Environmental Protection Service. Miscommunication about the technology, or a lack of understanding

of the financial costs and benefits, creates trepidation in communities to which these applications are best suited. The solution that was suggested is for the various state and federal agencies and organizations involved to provide more targeted educational opportunities to enable citizens and legislators to become aware of the numerous environmental and economic benefits provided. In terms of creating a unified strategy that includes coordination of the various policies and efforts, several experts suggested that this is an area well suited for interest-group involvement in that they can facilitate making connections between research and public education, gauging public sentiment, and mobilizing political support.

Conclusion

As a state with no production of oil, coal, or natural gas, the development of renewable energy technologies is vital to Minnesota's energy future. Bioenergy will not entirely replace fossil fuels, which have been critical to our prosperity, but the days of inexpensive energy without concern for environmental and human health costs are limited. We no longer have the luxury of ignoring these costs and must find financially feasible, sustainable domestic energy alternatives that reinvest in the economic future of our communities. Scaled appropriately and making use of the right technology, bioenergy can provide new jobs, reduce carbon pollution, and significantly increase wealth in communities that would otherwise spend their hard-earned dollars on

energy purchased from another state or outside the United States.

The prospect of bioenergy is certainly not new, but from the perspective of those we interviewed, we continue to stall for lack of a vision for how to balance the needed financial investments with competing objectives for inexpensive energy. The ideas captured in our study suggest ways to build this vision not only from an environmental and energy standpoint, but also in terms of sound economic investment that creates a greater reliance on home-grown natural resources. The following principles emerged from our interviews and are offered as a guide to near-term bioenergy policy development.

- ▶ **Integrate bioenergy production with new market development.** Minnesota possesses abundant forest and agriculture resources, which if effectively mobilized could bypass obsolete investment pathways. A heightened focus on producing multiple products out of a single feedstock, for instance, would significantly affect financial feasibility. Recent biorefinery innovations in the pulp and paper industry allows for the co-production of heat, electricity, and lignin for textile production, in addition to traditional product areas. Capturing the waste heat from the manufacturing process, and combined-heat and power applications, are examples of integrated production.
- ▶ **Demonstrate new models for integrated bioenergy supply chains.** In addition to new market development, there is an opportunity to better integrate biomass harvesting with traditional harvesting practices. Countries like Sweden and Finland are world leaders in biomass harvesting with more than 20% of their domestic energy production derived from forest feedstocks. Integrated harvesting practices with an emphasis on feedstock quality and energy optimization are critical to their success. Emulating practices that make sense in Minnesota would enhance the financial feasibility of bioenergy as a viable fossil fuel alternative.
- ▶ **Eliminate support structures for fossil fuels.** For many of those we interviewed, fossil fuels are a luxury

we can no longer afford, and at the very least should account for the full costs of their production. The gradual elimination of production incentives would enhance bioenergy competitiveness and reduce the risk of investment in renewable energy ventures. Simultaneously establishing market values for the ecosystem services provided by bioenergy would also create greater parity in the marketplace and encourage technological innovation. Finally, a broader portfolio of energy investments would enhance long-term security with increased use of homegrown energy sources.

- ▶ **Capitalize on existing best management practices.** Minnesota is a national leader in the development of biomass harvesting practices and related environmental protection. More than 7.5 million acres of public and private forest lands are certified sustainable, and Minnesota was the first state in the country to implement biomass harvesting guidelines. The degree to which these best practices are recognized in the marketplace can provide a competitive advantage, as well as assurances about the economic and environmental benefits being delivered.
- ▶ **Mobilize support to leverage public-private partnerships.** The lack of technical experience with bioenergy systems, the amount of capital investment required, and inexpensive natural gas prices inhibit new bioenergy investments. Despite the favorable financial and environmental benefits of such investments, and the fact that natural gas prices are projected to increase in the near future, many public entities and private businesses are content to send dollars out of state and perpetuate fossil fuel impacts. Several experts stressed the need to inform the public of the benefits of bioenergy and to mobilize their support for public-private partnerships that could reduce investment exposure and share technical experience.
- ▶ **Develop a bioenergy roadmap to coordinate efforts.** Despite frequent efforts to coordinate state agency actions and encourage business investment, the institutional structures guiding these actions are tenuous and subject to

administrative priorities. Developing a bioenergy roadmap to guide research and development and subsequent technology deployment would be an initial step in coordinating public-private investments. The experts we interviewed broadly identified the following principles. First, the structure or *architecture* of rules and programs influencing bioenergy and fossil fuel production must be evaluated for the performance of relevant state policies and instruments (e.g., regulations vs. tax incentives), including their coordination along the bioenergy supply chain. Second, there is a need to evaluate how state policies and programs affect the *allocation* and *access* to biomass resources, and to financial and technical resources affecting project deployment. Third, there is a need to clearly articulate the *roles* and *responsibilities* of relevant stakeholders (e.g., state agencies, industry, nonprofits) at each step in the supply chain. For instance, many of those we interviewed suggested the DNR take more leadership, and that the agency be provided with the financial and technical resources, as well as the administrative latitude, to execute plans. Fourth is consideration for the entities and individuals (public and private) who are *accountable* for decisions and for our ultimate progress on bioenergy. Finally, interviewees identified the need for an *adaptive* policy structure to ensure long-term market stability by being able to react to new market developments or research findings pertaining to environmental sustainability.

Bioenergy as a fuel source is certainly not a new idea, but its relevance to state and national policies has become elevated. It is therefore critical that greater focus and attention be placed on the barriers to bioenergy production, and that production is consciously tied to rural community development and wealth retention. Not investing in bioenergy technologies today will result in significant loss of wealth in rural communities in the coming decades. Yet by capitalizing on our abundant forest resources in environmentally responsible ways, we have a unique opportunity to diversify our energy portfolio and at the same time keep more of our hard-earned dollars local. The purpose of this study was to identify challenges to bioenergy production

limiting attainment of these goals. The insights gained may help to guide future policy development and perhaps foster creativity.

Dennis R. Becker is associate professor of natural resource and environmental policy in the Department of Forest Resources at the University of Minnesota. His research focuses on environmental policy development and evaluation, forest resource assessments, and analysis of the social and economic impacts of natural resource policies in the areas of forest biomass

utilization, carbon, environmental review, and community development. **Laura Eaton** is a doctoral student in natural resource science and management. Her background is in geoscience, and her main research interest is examining the interaction between science, policy, and the public, with a focus on how this ultimately impacts policy development in the area of alternative energy, biomass, and carbon.

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encourage University faculty to conduct research with community organizations and collaborators on issues of public policy importance for the state and community. These grants are available to regular faculty at the University of Minnesota and are awarded annually on a competitive basis. Additional funding was provided by the Institute on the Environment's Initiative for Renewable Energy and the Environment (IREE) at the University of Minnesota.

CURA and IonE Launch Resilient Communities Project

CURA is partnering with the Institute on the Environment (IonE) this fall to launch the Resilient Communities Project (RCP), a pilot effort to better connect University of Minnesota resources with communities in Minnesota interested in sustainability. The effort is an initiative of the Graduate Sustainability Education Network, a group of faculty and staff who support graduate-education programs and courses for sustainability studies within the University.

RCP is designed to support one-year partnerships between a selected city in Minnesota and the University, and facilitate faculty-supervised course-based projects that meet city-identified sustainability needs. This model of community-university engagement provides the city partner with access to hundreds of students and faculty across a range of academic disciplines, from architecture, planning, and engineering to business, environmental sciences, and the humanities. Expertise related to all aspects of sustainability—including analysis, planning, design, implementation, and evaluation—is available. In addition, the program offers students real-world opportunities to apply their knowledge and training in service to the community, as well as to engage with students in other programs and fields of study.

"We're excited to be launching this groundbreaking community service and

education initiative at the University of Minnesota," said Carissa Schively Slotterback, RCP's faculty director and associate professor in the Hubert H. Humphrey School of Public Affairs. "RCP responds to the needs and interests of communities, engages the expertise of faculty, and offers valuable opportunities to train the next generation of sustainability practitioners. The program offers a tremendous opportunity to build local and regional capacity for sustainability."

For this pilot year, RCP is partnering with the City of Minnetonka, a suburban community of 49,000 people in the Twin Cities west metropolitan area. According to Minnetonka City Manager Geralyn Barone, "The Resilient Communities Project is an excellent opportunity to partner with the University of Minnesota in completing some of the many projects that city council and staff have identified as important to maintaining Minnetonka's quality of life now and into the future. We look forward to seeing the results of the project, and hope it will provide students with a valuable learning experience."

City staff have identified 17 projects with which they would like University assistance, ranging from zoning for transit-oriented development, improving stormwater management, and inventorying trees in the community to supporting creation of

neighborhood associations, facilitating development of midpriced housing, and evaluating postdevelopment reactions to contentious development projects. RCP has matched about half of the projects with graduate courses from a range of departments being taught this fall at the University. Other projects will be matched with courses offered in the spring. At the conclusion of each semester, outcomes from each project will be documented in a final report and presentation to City staff.

If the fall-semester pilot proves successful, RCP expects to issue a request for proposals later this year to solicit proposals from cities interested in partnering with the University during the 2013–2014 academic year. Applicants would need to identify sustainability-related projects and staff who can serve as lead contact, and demonstrate support from senior staff and elected officials for participation in the program.

RCP is modeled on the Sustainable City Year Program (sci.uoregon.edu/content/scy), a highly successful cross-disciplinary program at the University of Oregon that supports one-year partnerships between a selected city and the University. For more information about RCP, visit www.rcp.umn.edu or find us on Twitter at @RCPumn.