HEINRICH BÖLL STIFTUNG
The Green Political Foundation

Farmers Union

Harvesting Renewable Energy

German-American lessons learned on rural development

Neil **Veilleux**

HARVESTING RENEWABLE ENERGY

German-American Lessons Learned
on Rural Development

HEINRICH BÖLL STIFTUNG
The Green Political Foundation

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German-American Lessons Learned on Rural Development

by Neil Veilleux
Meister Consultants Group

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EXECUTIVE SUMMARY

In Germany, over 200,000 farmers have become energy producers, harvesting energy revenues, green jobs, and local economic development opportunities from renewable energy technologies like solar, wind, biogas, and biomass. Driven in large part by Germany's renewable electricity policies, which provide both large and small energy producers long-term revenue certainty, energy production has opened up new opportunities for Germany's farmers. As a result of these policies, the country has experienced vibrant growth of its renewable energy markets as well as significant economic development benefits in its agricultural communities. A typical German energy farmer, for example, can earn up to a quarter of his or her annual income from farm-based biogas or solar PV facilities.

Energy farming in the US, on the other hand, has been slower to develop. While Germany has relied on CLEAN[i] contracts (feed-in tariffs) to encourage development from both large and small energy producers, US federal policy-makers have stimulated US renewable energy markets largely through the tax code. This makes it challenging for small and medium-sized farmers, who oftentimes lack large tax liabilities, to cost-effectively develop renewable energy projects.

As a result, Germany has a much more robust farm- and community-based renewable energy market. Approximately 50% of the German wind market has been developed by farmers or local community cooperatives. In the US, by contrast, only about 2% of the US wind market has been developed by local communities or farmers. Moreover, as the owners and developers of renewable energy projects, German farmers (and rural communities) receive a larger share of a project's economic value than do their US counterparts – in terms of direct revenue generation, economic and energy security, and local job creation.

Nonetheless, significant opportunities exist for US farmers and rural communities to increase development of renewable energy projects. In recognition of this potential, the National Farmers Union and the Heinrich Böll Foundation partnered to conduct a series of meetings with farmers, policy-makers, and advocates exploring renewable energy and rural economic development opportunities across the Midwestern states of Wisconsin, Minnesota, and South Dakota. The *2011 Midwestern Renewable Energy Tour* facilitated dialogue between Midwestern stakeholders, German energy farmers, as well as renewable energy and policy experts. This report, *Harvesting Renewable Energy: German-American Lessons Learned on Rural Development*, represents the result of that dialogue, laying out potential for renewable energy and economic development opportunities in Germany and the Midwestern states.

In particular, the report proposes a menu of policy and market recommendations intended to drive greater renewable energy and economic development opportunities in the Midwestern farm communities. This includes recommendations encouraging greater direct support through policy incentives, as well as approaches that work within the existing policy environment such as financial innovation and the organizational efforts of private farm-based organizations. In the final analysis, renewable energy has significant potential to increase the economic development opportunities in rural and agricultural communities across the US. The recommendations outlined in this report are intended to assist farmers and policy-makers in pursuit of this goal.

i "CLEAN" stands for making Clean Local Energy Accessible Now (CLEAN).

PREFACE

Almost a year ago, I had the pleasure of traveling to Germany and the Czech Republic with the Heinrich Böll Foundation to see firsthand the transformative change that renewable energy development is having on the rural economy. The experience touring farms, energy facilities and institutions with a focus on renewable energy projects reinforced my earlier understanding of what progressive, forward looking policies can do for our environment and rural economies.

The main driver of this transformation is the country's CLEAN contract (aka Feed-In Tariff). This policy ensures that farmers have a clear, long term incentive to produce distributed power at a profit with a reasonable return on investment. Long term price contracts guaranteeing a profitable market for the energy, coupled with a government policy requiring utilities to provide access to the grid provide a powerful incentive for individuals, farmers and small businesses to develop renewable energy.

While on the 2011 Midwest Renewable Energy Tour, I also traveled through farmland with untapped resources for renewable energy development. While there are pockets in these states that have managed to navigate the roadblocks to renewable energy development, there exists an extraordinary potential in America's vast farmlands. Whether it is biogas in Wisconsin or wind in Minnesota and South Dakota, I am confident that with the right policies, these states will reap tremendous economic benefits by harnessing the power of renewable sources of energy. Certainly, I would not suggest that these states simply adopt the same policies as Germany and expect the same result. But we can learn from what others are doing to provide a stronger rural economy, to reduce our crippling dependence on dangerous, foreign sources of oil and to begin dealing with our shared responsibility to leave a more stable, more sustainable world for our grandchildren.

Roger Johnson
President, National Farmers Union

The Promise of Energy Farming in the US

The Promise of Energy Farming in the US

Energy farming is a concept that has been pioneered and successfully implemented in Germany. Over 200,000 German farmers enjoy the benefits of energy farming, which provides job creation, economic development, energy security, as well as environmental advantages to farmers and rural communities.

Within the US, the promise of energy farming is slowly gaining greater traction. According to a recent survey by the US Department of Agriculture, over 8,596 farm operations in the US produce their own renewable energy from wind, solar, and biogas.[1] Moreover, the US is the global leader in ethanol production, which has historically provided the agricultural community with valuable investment opportunities and new markets for agricultural commodities.

Despite the promise of farm-based renewable energy production, however, US policy-makers have been slow to provide long-term and robust policies to assist farmers in developing resources like biogas, solar, biodiesel, or even wind. Though some notable exceptions exist, renewable energy policies in the US have tended to support development of large, corporately-owned energy facilities, which have failed to provide economic development benefits to US farmers and rural communities comparable to the successes experienced in Germany.

This report assesses opportunities for renewable energy development among farmers and rural communities. It is a collaboration of the National Farmers Union (NFU) and the Heinrich Böll Foundation (HBF). Both organizations have actively been exploring renewable energy opportunities for farmers in the US and seeking to draw lessons from experience in Europe. HBF has sponsored a series of farm-based renewable energy assessments, including a 2010 report entitled *Beyond Biofuels: Renewable Energy Opportunities for US Farmers,* which examines drivers for farm-based renewable energy deployment in Germany and the US and provides broad recommendations to increase energy farming opportunities for American farmers. Additionally, HBF assessed renewable energy economic development opportunities in Midwestern states in its *Clean Energy Jobs for the US Midwest – Lessons Learned from the German Success Story of Low Carbon Growth* report. The foundation also recently completed a farm-based renewable energy assessment in Canada entitled *Harvesting Clean Energy on Ontario Farms: A Transatlantic Comparison*.

The National Farmers Union has historically provided grassroots leadership and support to America's family farms and ranches. Within the renewable energy sector, NFU has encouraged development of the Renewable Fuels Standard (RFS), Renewable Portfolio Standards (RPS), as well as a host of other policies to encourage renewable energy opportunities for agricultural communities.

In 2011, NFU and HBF co-sponsored the *2011 Midwest Renewable Energy Tour* in which a delegation of German and American agriculture and renewable energy experts took part in a series of meetings, interviews, and dialogue sessions with farmers, policy makers, and energy industry representatives in Wisconsin, Minnesota, and South Dakota. This report builds on previous work by NFU and HBF by summarizing key lessons learned from the *Energy Tour*.

While the report does draw broad comparisons between energy farming in the US and Germany, its primary focus in on three specific case studies – one per each state – of new ways for farmers to engage in or expand their involvement in renewable energy. The case studies were selected based on their prominent role during the *Energy Tour* discussions. The recommendations that accompany each case study also draw heavily from the insights provided by local farmers, policy experts, and decision-makers in each state. The recommendations in this report do not represent an exhaustive analysis of renewable energy policy and market development. Instead, they are intended to be illustrative of the types of conversations that are currently ongoing between farmers and policy-makers to build stronger rural economies, reduce US dependence on foreign energy, and preserve the environment.

Policy Impacts on Energy Farming and Economic Development in the US and Germany

Introduction

Over the past twenty years, Germany has developed aggressive policies to encourage renewable development across the country. In 2010, Germany established a national target to derive 35% of its electricity from renewable sources by 2020, 50% by 2030, and 80% by 2050. These ambitious goals have been augmented by a recent decision to close its nuclear power plants by 2022.[2] Germany proposes to replace its nuclear energy base with power from renewable energy in order to become the world's leading clean energy economy.

German policies promoting renewable energy development have significantly benefited the country's farmers and rural communities. A typical German farmer utilizing PV or biogas earns on average about *a quarter of his income* from selling electricity.[3] Unsurprisingly, German farmers and local communities have installed significant amounts of renewable energy. Between 2005 and 2008, for example, German farmers installed on average 200 to 250 MW of Photovoltaic (PV) *annually*. This is as much as (or more than) the US market installed nationally during the same time period.[4] Similarly, German farmers have led the world in biogas development, with over 6,000 installations as of June 2011 representing over 2,700 MW of baseload electric power, most of which have been installed on-farm.[5] US farmers, by contrast, have installed only about 169 digesters, or approximately 59 MW nationally.[6]

A similar story has unfolded in the wind markets. Though the US wind market is about twice the size of Germany's in terms of installed capacity, German farmers are more likely to receive economic development benefits than their US counterparts. For example, of the 22,000 MW of installed wind capacity in Germany in 2008, approximately half of it was owned by farmers or local cooperatives (see Figure 1 below). This represents an investment of nearly $20 billion that is directly owned by, and provides accompanying economic benefits to, local farmers and rural communities.[7] In the US by contrast, only about 2% of the wind market is directly owned by community investors. The remaining 98% of the market is owned by corporate or utility investors, who are the major beneficiaries of federal incentives and project revenues.

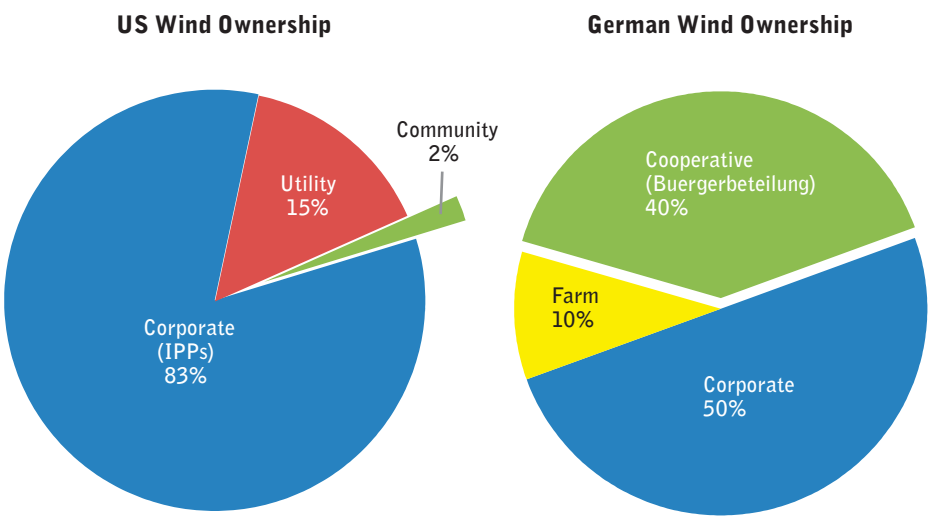

Figure 1: US and Germany Wind Ownership Structures[ii,iii]

ii Gipe, P. (2008). Comments on New Brunswick's Community Wind Initiative. Retrieved from www.windworks.org
iii Wiser, R . and Bolinger, M. (2010). 2009 Wind Technologies Market Report. US Department of Energy.

Ultimately, due in large parts to the stable renewable energy policies that underwrite renewable energy markets in Germany (which are discussed later), German farmers and rural communities reap significant economic development benefits from renewables. In a typical German biogas installation, for example, over 80% of the project value accrues to farmers and rural communities. To this end, Christine Woerlen, the former Head of Renewable Energy at the German Energy Agency, notes:

> ...35% of the added value benefits [of a typical biogas plant] benefits the investor of the plant and the owner of the land on which the biogas plant is located. Typically, this is the farmer or the agricultural cooperative that has invested in the biogas plant. Some 28% of revenues go to the supplier of the feedstock – again, typically the farmer or his or her neighbors who provide the plant material, but who also use this opportunity to dispose of their animal waste. Approximately 14% go to local service providers. Finally, 7% of the revenues go to the local tax authorities, which use these to improve schools and infrastructure. Thus, if plant production was done locally, 100% would go to local communities and support economic and job growth. Nevertheless, even if the plant was produced elsewhere, an estimate 70% to 80% of added value remains in the local economic cycle.[8]

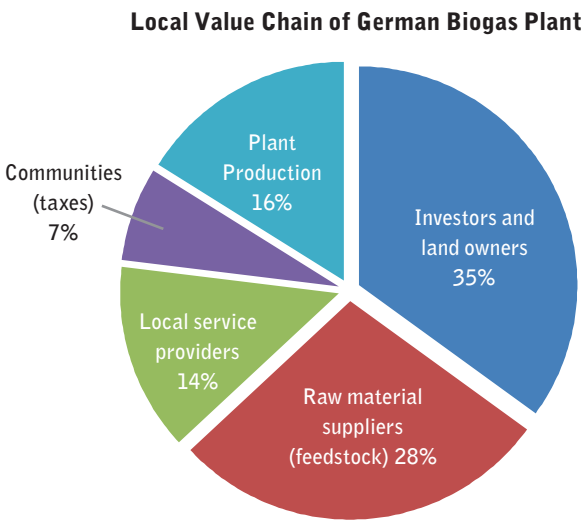

Figure 2: Economic Benefits and Division of Profits of a Typical German Biogas Plant[9]

In the US, by contrast, banks, corporations, and utilities are the direct beneficiaries of the majority of federal energy incentives (primarily in the form of tax incentives). As a result, corporate entities typically own renewable projects and capture a much larger share of the project's economic value.

Policy-driven Markets: US Federal Policy and Energy Markets

Energy markets, whether in the US or Germany, are policy-driven markets. In the US, for example, a recent analysis by the Environmental Law Institute, a non-partisan research and policy organization, reported that the US federal government allocated over $100 billion in subsidies to support fossil-based and renewable energy production between 2002 and 2008 (see Figure 3). Fossil fuels received the majority of federal support during this time, primarily in the form of tax breaks – with the most significant of these, the Foreign Tax Credit, supporting the overseas production

of oil.[10] The farm community received a significant share of federal energy subsidies, supporting primarily transportation fuels, with approximately $16.8 billion for tax and direct spending support going to corn ethanol production. Traditional renewable electricity projects – like wind, solar, and biomass – received slightly over $12 billion in federal subsidies or slightly less than 13% of total federal support.

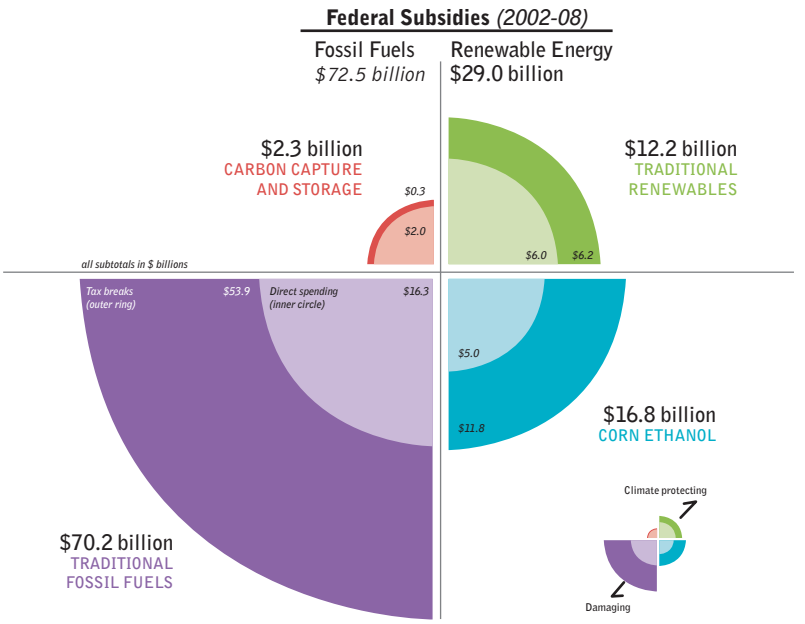

Figure 3: US Federal Energy Subsidies between 2002 and 2008[11]

Significantly, as illustrated by the comparison between direct spending (inner ring) and tax breaks (outer ring) in Figure 3, the US renewable energy market is supported largely through the federal tax code.[iv] Tax incentives have historically driven the US wind market, which is the largest wind market in the world (in terms of total capacity). US wind project developers depend upon the federal performance tax credit (PTC), which provides a production-based tax credit of 2.2 cents (indexed for inflation) for every kilowatt-hour of energy produced during the first 10 years.[12] The PTC, however, is subject to Congressional approval and there have been several years when the PTC has expired and the US wind market collapsed. As illustrated in Figure 4 below, the annual installed wind power capacity in the US fell significantly in 2000, 2002, and 2004, which were years when the federal PTC expired.

iv According to the the Environmental Law Institute's analysis, for example, over 62% of renewable energy and corn ethanol incentives were distributed in the form of tax breaks.

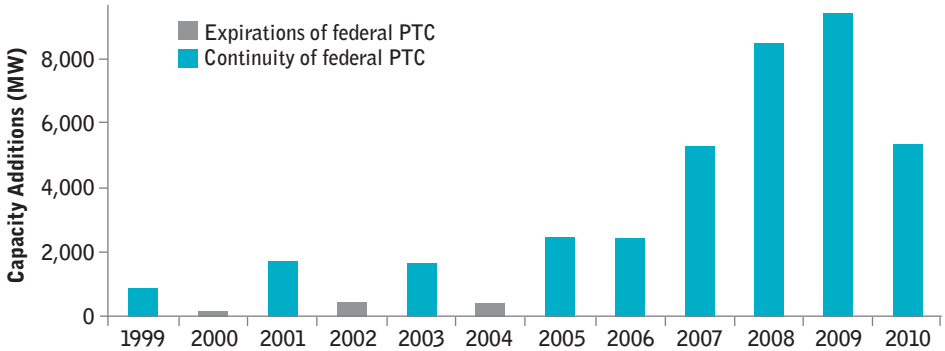

Figure 4: The Federal PTC and Annual Installed Wind Power Capacity[13]

Renewable energy tax credits like the PTC encourage project development and ownership by entities with tax liabilities large enough to monetize tax credits and deductions – entities like large corporations and banks. Small or medium-size farmers, who lack such a large tax appetite, tend not to be able to take advantage of renewable energy tax incentives.[14] *As a result, US farmers and community investors lack the incentive to invest in or own renewable energy facilities like wind farms. On the contrary, as noted earlier, the US wind market is dominated by corporate and utility investors. Because government policies incentivize banks and corporations through the tax code, community projects make up only about 2% of the US wind market (see Figure 1).*

In many cases, the primary source of potential revenue for farmers from renewable electricity in the US is from land leases, rather than from project ownership. Farmers may benefit from wind lease payments by allowing developers to access their land to install wind turbines; however, lease payments tend to be small relative to the benefits of ownership.

RENEWABLE ENERGY INVESTMENT FOR FARMERS AND RURAL COMMUNITIES

Two important programs which have enabled local farmers and rural communities to build renewable energy projects are the US Department of Agriculture's Rural Energy for America Program (REAP) grants and the 1603 Treasury grant program.

The USDA issues periodic solicitations for agricultural producers and rural small businesses to apply for REAP funding. Of total REAP funding available, approximately 88% is dedicated to the competitive grant programs or loan guarantees for energy efficiency and renewable energy systems. In 2010, the program funded over 5,800 renewable energy and energy efficiency investments, leveraging over $1.5 billion in public and private sector investments.

Under the 1603 Treasury Grant program, tax-payers eligible for the federal business energy investment tax credit could take an upfront grant instead. The grant program has been a significant factor to the continued growth of the non-residential renewable energy market, which includes agriculture. The program eliminates the need for tax-payers to have a large tax liability to benefit from federal incentives. As a result, farmers and local businesses can benefit from the federal incentive without having to partner with corporate entities that have large tax appetites.

German Policy and Energy Farming

In contrast to US renewable policies, German policies have encouraged participation from a diversity of renewable energy players, including farmers, local community members as well as large corporate entities. In Germany, a number of policy drivers encourage renewable energy development, including:

1. Comprehensive National Climate Strategy and Policy, requiring 40% reduction in GHG emissions below 1990 levels by 2020;
2. A national mandate to derive 35% of electricity from renewable resources by 2020;[v]
3. A national mandate to derive 14% of energy for heating from renewable energy by 2020;
4. A national biofuels target of 10% by 2020; and
5. And the implementation of German CLEAN contracts (feed-in tariffs), which provide guaranteed long-term contracts and priority interconnection for renewable electricity.[15]

While all of these policies have been important in growing Germany's renewable energy market, the country's CLEAN contract is arguably the most important policy, enabling farmers to develop and own renewable energy projects. The German CLEAN contract provides farmers and other developers with (i) guaranteed grid interconnection; (ii) stable cash payments for electricity based on what the technology needs to be profitable; and (iii) a standard long-term energy purchase contract, which does not require lengthy and expensive negotiations with utilities. As a result, CLEAN contract provides the *transparency, longevity, and certainty (TLC)* that investors require to deploy capital.[16] With German CLEAN contracts, farmers can raise relatively low-cost debt from banks, thus minimizing the upfront equity needed to build capital intensive renewable energy projects.

CLEAN contracts reduce both transaction costs and the cost of capital for building renewable energy projects. Unlike US federal renewable energy incentives, which are primarily deployed through the tax code, CLEAN contracts are available to anyone who can build a project regardless of tax liability. *As a result, German CLEAN contracts have, unlike US federal tax incentives, enabled farmers to become major players in renewable energy markets.*

CLEAN contracts also enable policy-makers to encourage farmers to match project sizes to their own specific circumstances. Table 1 below illustrates the CLEAN contract rates farmers may receive when developing a biogas project. As can be seen in the table, the rates are set to enable small farms, which may require more expensive systems, to utilize their biogas resource. In order to prevent windfall profits for larger systems, however, the payments are adjusted downward as system sizes go up. Moreover, the rates are differentiated to adequately compensate those that are able to utilize animal waste, crop waste, or efficient combined heat-and-power applications, among other applications.

v Within the US, various administrations have introduced various renewable energy goals, outlined in such documents as the Bush Administration's U.S. Department of Energy report 20% Wind Energy by 2030: Increasing Wind Energy's Contribution to U.S. Electricity Supply. However, neither a federal Renewable Energy Standard nor comprehensive greenhouse gas legislation has been adopted.

	Facility Size (kW)		
	<150 kW	<500 KW	<5 MW
Base Rate (Euro/kWh)			
Biogas base rate	0.1167	0.0918	0.0825
Premium for (Euro/kWh):			
energy crops	0.07	0.07	0.04
feedstock that is from "landscape" waste	0.02	0.02	0.02
liquid manure (>30% of feedstock)	0.04	0.02	0
"innovative" engineering system	0.02	0.02	0.02
cogeneration	0.03	0.03	0.03
feeding gas into grid (300 Nm3/h)	0.02	0.02	0.02
Feeding gas into grid (700 Nm3/h)	0.01	0.01	0.01

Table 1: 2008 CLEAN contract (feed-in tariff) Rates and Adders for Biogas[17]

The payments available to farmers for biogas are additive. A farmer signing a German CLEAN contract in 2008 for a system 150 kW or smaller, for example, was eligible to receive a base payment of 11.67 cents. Farmers deploying agricultural biogas (using energy crops) received a 7 cent adder on top of the 11.67 base. If the farmer deployed a biogas digester using at least 30% manure, then he received an additional 4 cents and another 3 cents if he used the heat produced from the digester (cogeneration). All told, a farmer developing an agricultural biogas project under 150 kW that used 30% liquid manure feedstock and employed cogeneration was eligible for a CLEAN contract rate of 25.67 Euro cents/kWh in 2008.[vi]

By providing farmers higher rates for co-digesting manure and/or using waste heat (co-generation), German policy-makers create social and environmental benefits by incentivizing farmers to improve water quality through proper manure management and reduce greenhouse gas emissions by recycling waste heat. In other words, German policy makers have structured energy incentives to promote efficiency, water quality, and other conservation goals.

Ultimately, CLEAN contracts have driven significant growth in Germany's renewable energy market, which in turn has created valuable economic development opportunities for farmers and rural communities. For example, when CLEAN contracts were introduced into the German biogas market in 2004 (as Figure 5 illustrates), the number of installations increased significantly after years of relatively flat market growth.

vi Assuming an exchange rate of one Euro is equal to $1.4071 dollars, this is equivalent to a biogas energy rate of 36.12 US cents per kWh. However, the typical German retail rate for electricity is 28-35 US cents/kWh (20-25 Euro cents), suggesting that biogas plants in Germany are eligible to sell power at roughly the German retail energy rate. Additionally, to manage costs, feed-in tariff rates are also subject to a digression schedule, meaning that the eligible feed-in tariff rate decreases over time. In such a manner, German regulators manage ratepayer impacts of the feed-in tariff.

HOW A GERMAN COMMUNITY COLLABORATED TO BUILD 150 MW OF WIND

Dirk Ketelsen, a German farmer, developed the cooperatively owned Dirkshof Bürgerwindfarm (community wind park) with 90 local households in the northern state of Schleswig-Holstein. Ketelsen oversees management of the operation, which has assets worth over approximately $309 million (220 million Euros). While successful today, Ketelsen is considered by many to be a wind pioneer, who overcame significant obstacles in the market's early days to become an energy farmer.

Many observers of Germany's wind market emphasize the importance of the country's CLEAN contracts (feed-in tariff), though Ketelsen also highlights the importance of community collaboration to drive project development (and market growth). When Ketelsen launched his first wind turbine in 1989, he did not have financial security afforded by CLEAN contracts or a track record of project development. At that time, he notes, wind energy was not viewed as a significant opportunity for the local community. Unsurprisingly, Ketelesen's first project was subject to local opposition. "In 1989," he recalls, "it was hard to overcome local skepticism in order to build the first wind turbine, but as early adopters, several friends and I were fascinated by the opportunity to harvest renewable energies."

Ketelsen recognized that he had to convince local residents to embrace his vision for wind power. To build local support for the project, Ketelsen developed a cooperative business structure (similar to a limited liability company in the US) in which community members invest in and profit equally from the project. The overall business structure was designed to create a win- win situation for all people affected by the project. Farmers on whose land wind turbines were sited, as well as neighbors with property directly abutting the turbine site, received an extra annual lease payment equivalent to four percent of the turbine's annual production. Farmers providing site access to turbines also received an extra payment of approximately $2,100 (US).

Ketelsen notes that it is essential to gain local support when building wind projects, because "local people will be affected day and night by the turbines located just outside their doorstep." And while he recognizes the importance of the CLEAN contracts to drive project development, he further notes that no law can build local support for a project. This can only occur "through discussion and by taking the concerns of local people seriously." By creating a Bürgerwindfarm, which engaged his local community and enabled neighbours to share in profits, Ketelsen overcame local skepticism, especially from neighbours on abutting property sites. He points out, "it's interesting how perceived project drawbacks like wind turbine noise or flicker become unimportant when everyone affected shares in the profits."

When the German government created an incentive program in the 1990s to build 100 MW of wind, and later instituted the feed-in tariff, Ketelsen and his community collaborators were ready to expand their operation. Today they manage over 140 MW of renewable energy projects. Ketelsen notes, "My home state of Schleswig-Holstein counts thousands of farmers like me: self-made business men who joined forces with residents to build local, sustainable businesses that produce energy, create jobs, and add value to the economy. We have transformed the way our home state produces energy from the ground-up. Currently more than 40% of electricity in our state is generated from sources such as wind, biomass and the sun, and by 2020 we could supply 100% of electricity demand from renewable energy sources."

Source: Interview with Dirk Ketelsen on June 30, 2011

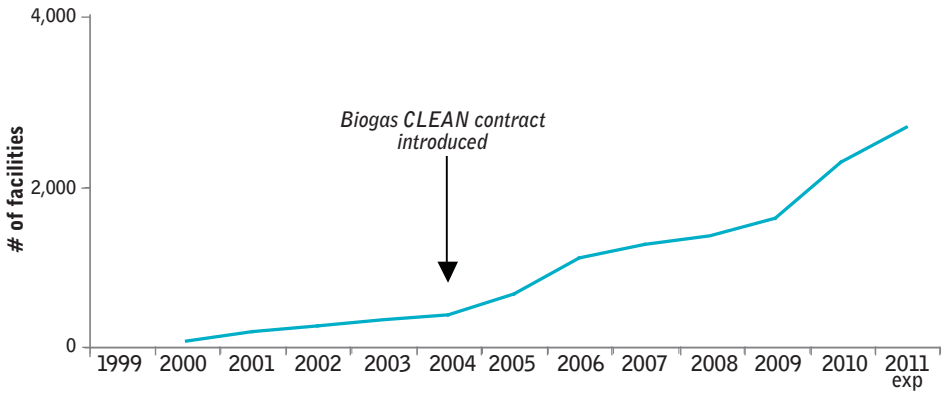

Figure 5: Biogas Installations in Germany[18]

Next Steps: Encouraging Energy Farming in the US

Germany's use of CLEAN contracts has leveled the playing field for farmers in renewable energy markets, enabling farmers to compete with corporations to own and operate renewable energy projects. As a result, German farmers and rural communities have realized significant economic benefits. Nationwide, Germany has created over 370,000 jobs in the clean energy sector, and over 200,000 farmers are active in the renewable energy industry.

Although German policy cannot be directly imported to the US because of our unique political, regulatory, and market context, the key elements that CLEAN contracts provide – transparency, longevity, and certainty, (TLC) – could be replicated to support new revenue and new investment for US farmers. For US farmers to succeed in renewable energy, they need policies and market structures that encourage their participation. Current US energy incentives, based largely upon the tax code, make it hard for farmers to realize the significant economic benefits of renewable energy and to diversify their income to better weather crop price volatility.

Energy Farming in Midwestern Farm States

With the above lessons learned from Germany and the US in mind, the following sections explore renewable energy policies and opportunities at the state level. This section provides an overview of the policy and market drivers for farm-based renewable energy in Wisconsin, Minnesota, and South Dakota – the three states visited during the National Farmers Union and Heinrich Böll Foundation's *2011 Midwest Renewable Energy Tour*.

The US Department of Agriculture recently surveyed the number of *on-farm* small wind (under 100 kW), solar, and biogas renewable energy installations across the United States. It is important to note that the USDA survey does *not* include commercial-scale wind facilities, biodiesel facilities, or ethanol production. The results of the USDA survey are as illustrated in Figure 6 below, which shows that of the three states examined in this report, Wisconsin leads in number of renewable energy installations with 242 on-farm facilities. Minnesota comes next with 177 on-farm installations, and South Dakota follows Minnesota with 68 installations.

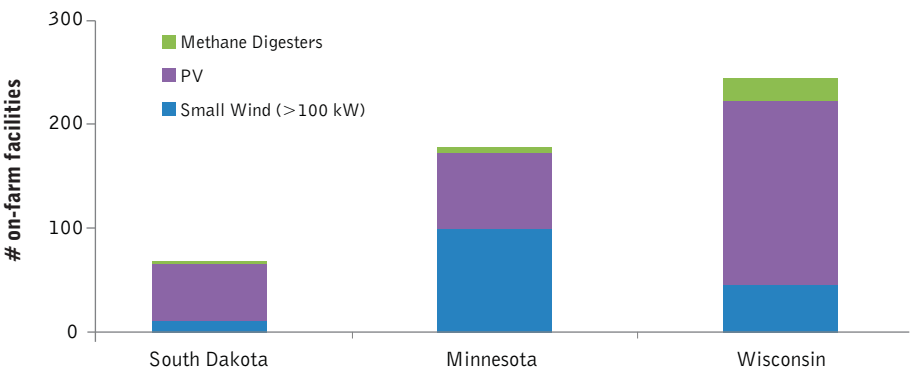

Figure 6: Farm-based Renewable Energy Projects in SD, MN & WI[19]

Table 2 below provides a broader snapshot of the state of renewables in Wisconsin, Minnesota, and South Dakota (on-farm or otherwise), showing on-farm renewable energy facilities, percentage of electricity derived from renewables, installed capacity of community wind, annual ethanol production, as well as each state's renewable portfolio standard and net metering policies. These metrics are also discussed in greater detail below for each state.

	South Dakota	Minnesota	Wisconsin
# of USDA On-farm Facilities (2009)[20]	68	177	242
% Electricity from Renewables (2007)[21]	50%[vii]	8.40%	4.50%
Community Wind Installed Capacity (MW in 2010)[22]	4	469	0.2
Ethanol Production (million gallons as of Feb 2011)[23]	1,016	1,119	498
Renewable Portfolio Standard	10% by 2015 (target)	30% by 2020 for Xcel[viii]	10% by 2015
Net Metering	None	Up to 40 kW	Up to 20 kW

Table 2: Renewable Energy in SD, MN & WI

vii South Dakota derives almost all of its renewable electricity from large hydroelectric resources in the state.
viii Minnesota requires other utilities to provide 25% by electric load from renewables by 2025.

Wisconsin

In terms of total USDA-surveyed installations (see Figure 6), Wisconsin has the strongest farm-based renewable energy market of the three states considered here. In addition, Wisconsin is the national leader in biogas development, with 26 on-farm installations. The state's strength in on-farm renewable energy installations is due, in part, to the strong role that the state's renewable energy program, Focus on Energy, plays in the farm-based renewable market. Focus on Energy provides farmers with "information, resources and financial incentives" to implement energy efficiency and renewable energy projects.[24] According to regional stakeholders, the program has historically provided stable, consistent, and transparent renewable energy incentives to participants.

Wisconsin's renewable energy market (farm-based or otherwise) is also supported by a renewable portfolio standard that requires retail electric providers to meet 10% of their load from renewable resources by 2015. In 2010, over 7% of electricity sold by utilities and cooperatives was generated from renewable resources. Wisconsin municipal and investor-owned utilities (but not electric cooperatives) are also required to offer a net metering tariff, enabling customers to credit on-site generation up to 20 kW (100 kW for We Energies customers) to their electric account[ix] at the retail rate for renewables and avoided cost rate for non-renewables.

Minnesota

Next, based on the USDA survey, Minnesota has the second largest farm-based renewable energy market of the three states (as illustrated in Figure 6), and it has the largest number of on-farm small (under 100 kW) wind installations. Moreover, Minnesota is a national leader in terms of total wind capacity (ranked 4th in the nation) with over 2,000 MW installed, and it is *the* national leader in total capacity of community-owned wind projects[x]. Minnesota has 469 MW of community-owned wind assets, more than any other state in the nation (as illustrated in Figure 7 below). Farmers and rural communities are the typical beneficiaries of community-wind projects.

Figure 7: Installed Community Wind and Wind Capacity in the US[25]

ix Wisconsin utilities will provide for the actual purchase, in the form of a check payable to the customer, of net excess generation (NEG) at the utility's retail rate for electricity generated by a renewable-energy system if NEG exceeds $25. Database of State Renewable Energy Incentives. (September 27, 2010). Minnesota – Net metering. Retrieved from www.dsireusa.org.

x According to Windustry, "the key feature of community wind is that local community members own and have a significant financial stake in the project beyond just land lease payments and tax revenue. Community wind projects can be any size, ranging from a single turbine to more than one hundred, yet typically serve local communities or consumers." Windustry. (2011). Community Wind. Retrieved from www.windustry.org/communitywind.

Minnesota also provides the most robust support to its renewable energy market (farm-based or otherwise) of the states examined here. The state's renewable portfolio standard (RPS) requires Xcel energy (the state's largest utility) to supply 30% of its retail electricity load from renewable resources by 2020. All other Minnesota utilities must supply 25% of retail electric load from renewables by 2025. Minnesota's municipal, investor-owned, and cooperative utilities are also required to offer a net metering tariff, enabling customers to credit on-site generation up to 40 kW to their electric account at the "average retail utility energy rate."[xi] In addition, Minnesota provides limited *community-based development (C-BED) tariffs* to support renewable energy, which are similar to Germany's CLEAN contracts (the C-BED tariff is discussed in greater detail in the following sections).

South Dakota

Lastly, South Dakota has the smallest on-farm renewable market of the states examined here (see Figure 6). However, the state derives about 50% of its electricity from hydroelectric power and is a leader in other renewable energy areas as well, namely in biofuels. South Dakota is the fifth largest producer of ethanol in the country – refining one billion gallons annually,[26] benefiting from strong federal incentives. The state has additionally offered a production-based incentive to ethanol producers and more recently is offering rebates to increase availability and use of ethanol to motorists at gas stations. South Dakota additionally has strong wind resources, ranked 4th in the nation in terms of wind energy *technical* capacity. However, South Dakota has been slow to develop its wind resources, due to a lack of policy support as well as inadequate grid transmission.

Across South Dakota, stakeholders indicated that the state has little appetite for renewable energy policies or incentives, a fact that is reflected in its current policy mix. South Dakota's renewable energy market is supported by a renewable *objective*, in which retail electric providers have a goal to meet 10% of their load from renewable resources 2015. There is no compliance mechanism associated with this objective, which makes it a voluntary target. Moreover, in 2009, the policy was modified to enable utilities to meet the objective using "conserved energy." South Dakota also has no net metering policy, and local stakeholders indicate that the state is unlikely to pass net metering legislation in the near future.

The next sections explore specific renewable energy development opportunities in Wisconsin, Minnesota, and South Dakota. Based upon interviews with local farmers, policy-makers, and advocates, each section concludes with concrete recommendations to encourage farm-based renewable development and the concomitant economic development benefits. With the right policies and market transformation initiatives in place, local, state, and federal leaders can help spur bottom-up development of renewable energy opportunities in agricultural communities.

xi Compensation may take the form of an actual payment (i.e., check for purchase) for net excess generation (NEG) or as a credit on the customer's bill. Database of State Renewable Energy Incentives. (September 27, 2010). Minnesota – Net metering. Retrieved from www.dsireusa.org.

Biogas Market Development in Wisconsin

This section focuses specifically on biogas in Wisconsin. Biogas has emerged as an issue of significant interest in Wisconsin during the past several years and the Wisconsin Bioenergy Initiative recently published a state biogas roadmap. During the *Tour*, stakeholders emphasized biogas as a way to: capitalize on the biogas resource produced by the state's dairy farmers, decrease the amount of money leaving the state to pay for energy imports, build on Wisconsin's national leadership in biogas installations, and to create opportunities for additional farm revenue by turning waste into energy.

Background: Farm, Energy, and Economic Development Profile

Farming in Wisconsin. Of the three states examined in this report, Wisconsin has the largest GDP, generating over $221 billion of economic activity every year. Agriculture is a significant economic driver in the state, accounting for over $9 billion dollars of total output in 2009. Agriculture is also prominent on the physical landscape, accounting for approximately 43% of total land area in the state.[27]

Farms in Wisconsin are small compared to Minnesota and South Dakota as well as the national average, with the average Wisconsin farm size at 194 acres[28] (national average is 418 acres). The majority of Wisconsin dairy farms are also small with between 50 to 99 head of cattle.[29] However, Wisconsin leads the nation in dairy farm and processing production, generating over 2 billion pounds of cheese and 25 billion pounds of milk in 2009.[30] It also has a vibrant organic farming community, with over 1,000 organic farms in 2008, the second highest number of certified organic farms in the US (trailing only California).[31]

Energy in Wisconsin. Wisconsin is a major importer of energy. With no significant petroleum reserves or refining operations (aside from Murphy Oil in Superior). It produces no natural gas, and gas pipelines are owned entirely by out-of-state companies. As a result, 85% of petroleum expenditures leave the state (see Figure 8).

The state is also highly dependent upon coal for electricity generation, which makes up approximately 62% of total electric consumption (Figure 8). Like petroleum, coal generation is purchased primarily from sources outside Wisconsin, meaning that almost all of expenditures for coal (95%) leave the state.[32]

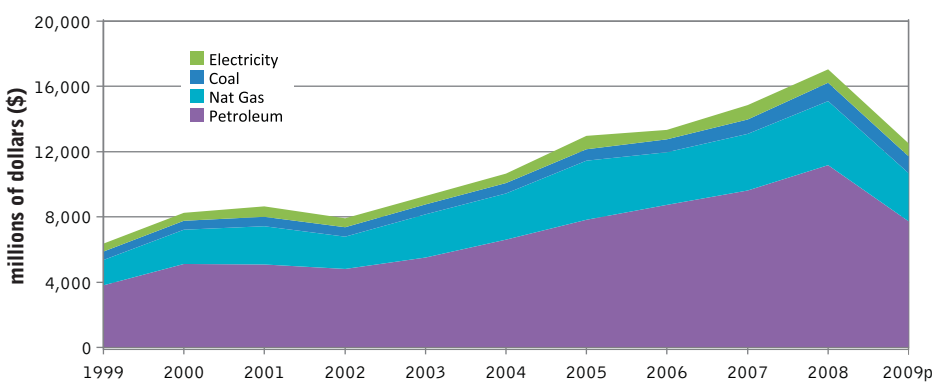

Figure 8: Annual Energy Expenditures Leaving Wisconsin[32]

In total, the Wisconsin Office of Energy Independence estimates that over $12.5 billion in energy expenditures left the state in 2009, an amount greater than the economic contribution of Wisconsin's entire agricultural sector. If even a small portion of energy expenditures leaving the state were instead redirected into local, on-farm energy production like biogas, Wisconsin would be well-positioned to create significant long-term economic development benefits in clean energy for its farming and rural communities.

Farm-based Biogas Development in Wisconsin

Wisconsin has already made considerable headway in farm-based renewable energy development. In particular, Wisconsin is the national leader for on-farm biogas development, with 26 installations currently in operation. While small relative to the explosive growth seen in Germany's biogas sector, Wisconsin has established a solid foothold for developing an on-farm biogas energy cluster in the state. Additionally, many farmers capitalize on additional revenue available from digestate and fertilizer sales, though such markets are small.[33]

As illustrated in Figure 9 below, most biogas facilities in Wisconsin occur on dairy farms with 1,000 or more head of cattle, with the highest frequency occurring on farms with 1,000 to 1,500 head. This enables farmers to achieve economies of scale and sound project economics; however, because Wisconsin is home to relatively few large-scale dairy operations, this makes biogas market development in the state challenging for most farmers. According to the USDA, of Wisconsin's 14,000+ dairy operations, only 250 have herd sizes over 500 head of cows, less than 2% of total dairy operations in the state.[34]

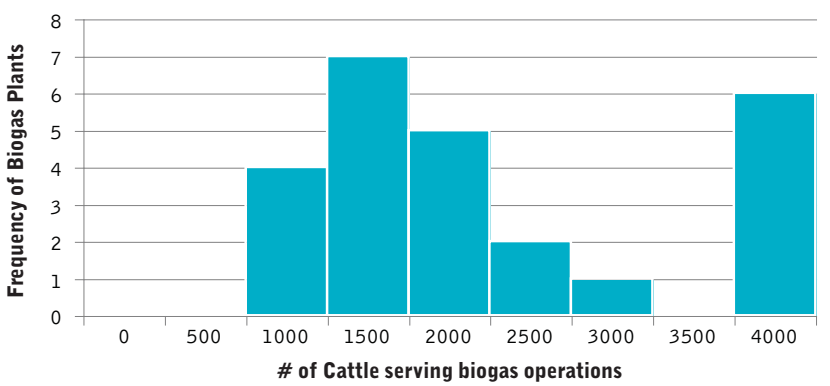

Figure 9: Size of WI Dairy Operations Providing Feedstock for Biogas Facilities[35]

In some cases, however, medium-to-small size dairies have aggregated manure feedstock to develop community digesters, thus achieving the necessary economies of scale. For example, the Cow Power project in Dane County is Wisconsin's first "cluster" manure-digester project, which brings together feedstock from 2,500 cows on three family-run dairies into one central biogas plant.[36] Looking ahead, for large-scale market development on Wisconsin's dairies to be feasible, it will likely require dairy farmers to aggregate feedstock from multiple farms in such community digesters or to collect feedstock from commercial sources, such as cheese way processing or food processing plants, in order to increase methane production and achieve acceptable paybacks for investment.

Recommendations for Wisconsin's Farm-based Renewable Market

Wisconsin is poised to develop a vibrant biogas market. The state has a significant number of dairy farms, which provide a ready feedstock for biogas projects. The state is already a leader in the nation's nascent biogas energy market. Moreover, Wisconsin loses over $12.5 billion in out-of-state energy expenditures each year, which could be redirected to support farm-based biogas development and create new economic development opportunities for farmers and rural communities. With this in mind, the following recommendations are proposed to develop Wisconsin's biogas market.

Biogas-specific CLEAN contracts. Following Germany's success in creating the world's leading biogas market, Wisconsin should develop a biogas specific CLEAN contract. In such a manner, policy-makers would encourage revenue diversification and development on Wisconsin's dairy farms, as well as increase in-state investment and economic development opportunities, especially if energy expenditures are shifted away from out-of-state fossil fuel sources and toward on-farm, renewable resources. For example, state leaders could develop an investment fund through an energy assessment that redirects one-half of one percent of out-of-state energy expenditures to local biogas production. With this fund, Wisconsin would generate $62.5 million annually (based on 2009 out-of-state energy expenditures), which could be deployed to provide farmers with a reasonable rate of return on capital investments in biogas facilities.

Ideally, funds would be deployed to offset the difference between the current market price for biogas energy generation and fossil-based generation. Incentive rates could be structured to provide greater or lesser support for farmers based on dairy size and/or community collaboration. Over time, as Wisconsin's biogas market matured and installation costs declined, the incentive structure would also decline, ultimately building local market capacity with minimal impact to ratepayers.

Wisconsin's utilities have already voluntarily taken the initiative to develop a policy that is similar to the German CLEAN contract called buy-back rates. Buy-back rates are standard offer energy contracts that provide sellers long-term power purchase agreements for energy production. Buy-back rates are tied to utilities' voluntary green power programs, with biogas electricity blended into the utilities' green power offerings and sold at a premium to utility customers.

Wisconsin utilities' buy-back rates vary, depending on which utility is offering the incentive and whether generation serves on- or off-peak load. Wisconsin utility, *We Energies*, for example, offers anaerobic digestion facilities (up to 2 MW) 15 year energy contracts at rates of $0.155 per kilowatt-hour for on-peak power and $0.06 per kwh for off-peak power. Xcel Energy, by contrast, offers a 10 year standard contract at $0.073 per kilowatt-hour for biogas energy up to 800 kW (regardless of time of use). It is worth noting, however, that these rates are significantly lower than biogas rates offered under Germany's CLEAN contracts, thus resulting in much slower market growth. Additionally, utilities capped the total amount of generating capacity eligible for under buyback rates (at 10 MW for We Energies and 0.25% of retail sales for Xcel Energy).

The buy-back rates could be built on and amended to provide long-term contracts with rates differentiated by system size in order to support biogas on both small and large farms. Additionally capacity caps should be expanded or lifted altogether. Consumers Energy in Michigan, for example, voluntarily established a small CLEAN contract for solar energy that attracted significant interest. The state is now asking Consumers to also explore an expanded CLEAN contract that also supports biogas. Vermont has also successfully developed a CLEAN contract specifically for on-farm biogas and the program saved several existing digesters from going out of business.

ORGANIC VALLEY: FARM-BASED REBEWABLE DEVELOPMENT IN THE PRIVATE SECTOR

Wisconsin is home to Organic Valley, a marketing cooperative for organic farmers across the US. With operations based in La Farge, WI, Organic Valley has over 13,000 organic farm members across 32 states. The organization has a unique position to provide private sector leadership for on-farm renewable energy development by leveraging its relationships to encourage renewable energy adoption. To this end, in 2008, the cooperative launched its Farmers Renewables & Energy Program (FREP), in which it serves as an advocate for its members to assess, fund, and implement renewable energy and energy efficiency systems. In 2010, Organic Valley assisted farmers install six projects. In 2011, it expects 12 to 13 installations will be completed.

Organic Valley reaches out to farmers through a mix of open houses, conferences, and member meetings. Organic Valley staff then guide interested farmers through an energy efficiency audit and perform a comprehensive site assessment to evaluate renewable energy opportunities. During the site assessment, staff work with farmers to assess goals, determine on-farm load, develop preliminary size and price assessments for renewable energy projects, and calculate the projected return on investment.

If a farmer decides to move forward with the project, Organic Valley staff will assist the farmer in selecting an installer (as necessary) and applying for grant funding. With regard to the latter, Organic Valley subcontracts a professional grant writer to apply for state and federal grant opportunities.

Organic Valley's Farmer Renewables & Energy Program (FREP) is a free service available to all Organic Valley members. The model builds on Organic Valley's reputation as a trusted voice among farmers, and enables the cooperative to institutionalize challenges, benefits, and knowledge associated with farm-based renewable energy development.

Nutrient Trading System to Support Biogas Development. During the *Energy Tour*, it was made clear by stakeholders that support for expanded CLEAN contracts was mixed. If expanded utility incentives are not a near-term solution, the state could explore alternative forms of revenue to support biogas. One potential source of such revenue could come from nutrient management. Specifically, Wisconsin could play a nation-leading role by developing nutrient-trading system to specifically support biogas market development. Under the scheme, regulators calculate appropriate nutrient loads for a watershed and/or the necessary nutrient reductions (i.e. the Total Maximum Daily Loads or TMDLs) and create a market for trading credits and/or offsets to manage TMDLs.

In general, nutrient trading programs focus on managing reductions for major point-source polluters like wastewater treatment plants or agribusiness plants.[37] However, significant opportunity exists to accelerate cost-effective technology development within the agricultural sector to minimize nutrient loading from non-point source pollutants. For example, because anaerobic digestion converts organic nitrogen from manure into ammonium and creates a digester effluent that is more predictable product than untreated manure, biogas digesters could offset nutrient reductions for agribusiness or wastewater plants. If properly managed and structured to be bankable, this market could provide farmers with additional revenue streams needed to develop biogas plants and additionally enable major point-source polluters to meet watershed quality requirements cost-effectively. To this end,

discussions have recently taken place between the Wisconsin Department of Natural Resources and Dane County to pilot a nutrient trading program. If this program moves forward, it could provide a valuable model for a nutrient-trading program for the state.[38]

Low-cost Market Development Measures. In addition to policies that seek to provide new revenue directly to biogas plants, the state could also initiate market transformation initiatives to support biogas which also remove barriers, lower transaction costs, and therefore reduce the amount of money that farmers need to pay to develop biogas in the first place. For example, in collaboration with private businesses and farmers, the state could provide significant support for new projects by creating favorable conditions for permitting, zoning, interconnection, and financing farm-based renewables.

Additionally, waste management regulations offer the potential for growing the biogas industry. Biogas market development is driven in part by the availability of energy rich organic waste for feedstock. Interestingly, manure is not a particularly energy rich product. On the contrary, many biogas developers aim to increase biogas production from manure digesters by including industrial feedstock such as food scraps, bakery wastes, and fats and greases to increase energy production.[39] Thus, stricter organic waste regulations – like an organic waste landfill ban – could be deployed to encourage greater participation in biogas projects from energy-rich waste producers.

Wisconsin stakeholders could also focus on channeling new investment to the state by focusing on cluster development initiatives such as developing community investment or collaboration models, increasing technical assistance, encouraging technology transfer (from in-state innovators or from overseas, e.g. Germany), and attracting greater federal and private-sector funding to Wisconsin's emerging biogas industry. For example, Organic Valley has provided technical assistance to its organic farm cooperative members to encourage renewable energy investment for solar, wind, and biodiesel (see textbox). Models like this could be expanded to incorporate biogas technologies.

Additionally, there was significant interest in joint fact-finding initiatives around biogas among stakeholders. Wisconsin's state government leaders, for example, could participate in a private-public sector fact-finding mission to Germany to examine its success in building a robust biogas cluster. With the right mix of farmers, policy-makers, developers, and other experts, Wisconsin could use such an initiatives as a starting point for implementing a strategic biogas plan and creating the relationships necessary to strengthen the biogas cluster.[xii] A fact-finding mission would also provide opportunities for increasing international collaboration through technology transfer and/or developing private investment opportunities. Finally, it would provide policy-makers an opportunity to evaluate policies abroad firsthand and consider strategies to adapt those policies to meet the unique needs of Wisconsin's own political and regulatory context. Ultimately, by encouraging development of a farm-based renewable energy cluster, the state will be able to leverage private dollars to assist industry players in developing new opportunities for on-farm development.

xii A number of stakeholders in Wisconsin have already developed a biogas strategic plan for the state. The state and federal government should work with stakeholders to review and implement such market development recommendations.

Community Wind & Renewables in Minnesota

This section focuses specifically on community renewable energy and rural electric cooperatives in Minnesota. Minnesota already has a robust in-state renewable energy market and ranks 4th in terms of total installed capacity. Minnesota also has a strong history of community-owned wind energy development, which has created significant economic development benefits for the state's rural communities and farmers. During the *Energy Tour*, stakeholders emphasized opportunities to build on this momentum by supporting new renewable energy opportunities. In particular, it became apparent that there are opportunities to encourage greater farm-based renewable energy development in Minnesota by working with private and utility stakeholders across the state, especially with the state's rural electric cooperatives. This would involve not only working directly with rural cooperatives to streamline their renewable energy development within their territories, but also working with federal and state government to channel financial resources for renewable energy to rural communities in a more focused way through rural cooperatives.

Background: Farm, Energy, and Economic Development Profile

Farming in Minnesota. At $87.1 billion, Minnesota's gross domestic product ranks 36 in terms of total economic activity. Like the other states in this report, agriculture is a significant driver of Minnesota's economy, accounting for about $15 billion of total output or approximately 17% of the state's GDP in 2009.

Minnesota is a major producer of corn, which makes up nearly 30% of total farm receipts. Next to corn, the state is a major producer of soybeans and hogs. Minnesota's 81,000 farms cover the physical landscape as well, accounting for just over half of the state's total land area. The average Minnesota farm, at 332 acres, is slightly smaller than the US average. Minnesota also has a strong and growing organic agricultural sector, with 543 operations in 2008, the seventh largest cluster of organic farms in the nation.

Energy in Minnesota. Minnesota ranks 20th in the nation In terms of total energy use, the state is a national leader of total wind capacity (ranked 4th in the nation) with over 2,000 MW installed, with far greater installed wind capacity than either South Dakota or Wisconsin (as illustrated in Figure 10)[40]. As described in the previous section, Minnesota additionally has 469 MW of community-owned wind assets, more than any other state in the nation (as illustrated in Figure 7).

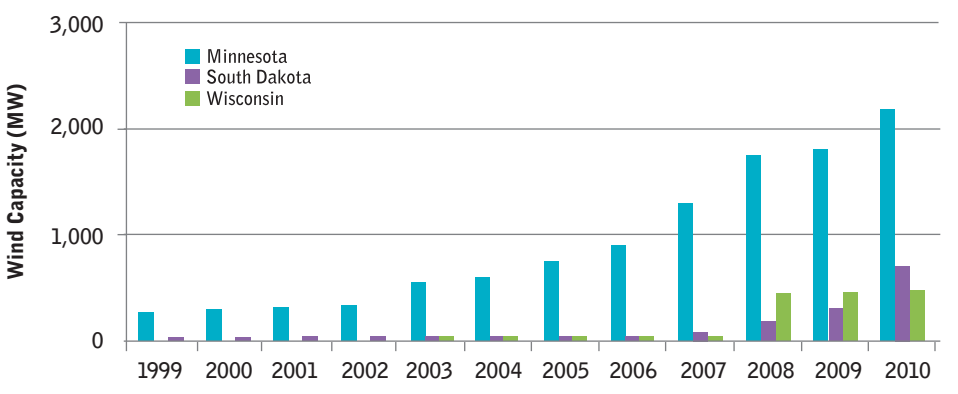

Figure 10: Wind Energy Capacity (cumulative) in MN, SD & WI[41]

Minnesota also has the most ambitious framework for renewable energy expansion (farm-based or otherwise) of the states examined in this report. The state's renewable portfolio standard (RPS) is aggressive, requiring Xcel energy (the state's largest utility) to supply 30% of its retail electricity load from renewable resources by 2020. All other Minnesota utilities must supply 25% of retail electric load from renewables by 2025. In addition, Minnesota provides limited community-based development (C-BED) tariffs to support renewable energy, which are similar to Germany's CLEAN contracts.

Finally, with over a dozen plants located in the southern half of the state, Minnesota is also a national leader in ethanol production. As with wind, Minnesota's success in ethanol lies in large part due to its aggressive policy support. Minnesota is one of only three states to have created a comprehensive policy support for the ethanol industry, including a mandate, production-based incentive, and infrastructure development incentive (for equipment to distribute E85).[xiii]

Community Renewable Energy Development

Minnesota is a national leader in wind power in terms of total capacity, on-farm development, and community-based development. With regard to the latter, Minnesota has developed an innovative community-based energy development (C-BED) tariff to drive local, farm-based wind and other renewable energy projects. Since 2005, public utilities in Minnesota are required under the C-BED statute to file a 20-year power purchase agreement for community-owned renewable energy projects.[42]

The C-BED tariff is similar to Germany's CLEAN contract, in that it enables local developers to enter into PPAs that provide stable energy payments to renewable energy producers (primarily wind generators). Currently, Minnesota requires that 51% of project revenues flow to Minnesota-based owners and other qualifying local entities (like municipalities). No single wind project investor may own more than 15% of the project (consisting of two or more turbines), except for local governments, which may own 100% of the project. The project must have a local resolution of support adopted by each county board, and any property owner whose property is traversed by transmission lines serving the project must also be given an opportunity to invest.[43] As of December 2010, 178 MW of CBED projects have come online – with an additional 199 MW under contract (see Figure 11). Completed projects range in size from 0.2 MW to 50 MW in size.[44]

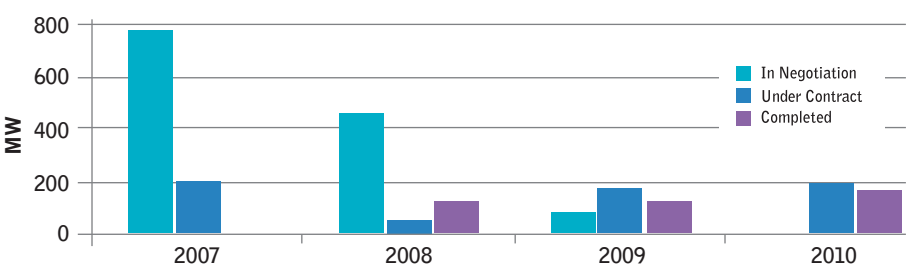

Figure 11: Cumulative Wind Capacity (MW) installed under Minnesota's C-BED tariffs[45]

xiii The other two states are Hawaii and Kansas. Voegele, E. (Januray 4, 2010). Incentives: Its all about Location, Location, Location. Ethanol Producer Magazine. Retrieved from www.ethanolproducer.com.

Rural Electric Cooperatives

Minnesota's 50 rural electric cooperatives serve approximately 1.8 million people (approximately 30% of the state population) and cover about 85% of the geographic area of the state. Initially developed to serve hard-to-reach rural and agricultural customers, rural electric cooperatives tend to have high fixed costs due to large distribution grids. For example, within Minnesota, electric cooperatives operate the largest distribution network in the state with more than 121,000 miles of electric distribution lines, greater than Xcel Energy's Minnesota operation (28,718 miles) or the three private power companies in Minnesota combined (40,722 miles).[46]

At the same time, rural electric cooperatives tend to have far fewer customers. In Minnesota, for example, the electric cooperatives average six consumers per mile of distribution line, "compared with 38 consumers per mile for investor-owned electric utilities and 48 customers per mile for municipal electric utilities."[47] This makes cost recovery for fixed assets more challenging than in more urban areas.

Rural electric cooperatives are privately owned and regulated by local members (consumers). They are governed by a board of directors elected from the membership, which sets policies and rates implemented by the cooperative staff. As a result, despite the challenges of high fixed costs and a low consumer base, cooperatives have a significant opportunity to promote development of farm-based renewable energy, if their members demand it. As member owned and regulated organizations, cooperatives are well-structured to respond to the local needs of the community.

Dairyland Power, for example, is a generation and transmission cooperative in Minnesota, which has developed a solid renewable energy and energy efficiency program. The co-op seeks to serve 25% of its load with renewable energy by 2025 (it currently serves 11% of its load with renewables). It owns eight anaerobic digesters, wind farms in Minnesota and Iowa, and serves 250 distributed generation (customer-owned) facilities. It also allows farmers and other customers to net meter projects under 40 kW and provides specific rate tariffs for biogas projects under 2 MW (though no long-term contracts). Executives from Dairyland Power point out that though many of these initiatives have been subject to considerable debate within the Board of Directors, they are *voluntary* initiatives that fit within the long-term strategic framework of the utility.

Recommendations for Minnesota's Farm-based Renewable Market

With its history of strong renewable energy policies and rural electric cooperatives, Minnesota's rural communities are uniquely situated to increase economic development opportunities through renewable energy. In particular, stakeholders in the state should develop local policies with their rural electric cooperatives that encourage greater deployment of community renewables. Similar models have been successfully deployed in Germany; a model for Minnesota is proposed below.

Setting ambitious community targets in rural areas. Minnesota's rural and farm communities could develop local renewable energy goals and work with their rural electric cooperatives to meet them. Within Germany, a number of towns and communities have pursued strategies to become 100% energy independent, deriving all of their heat and electric power from renewable resources like biogas for CHP, wood chips or pellets, and wind energy.[48] Minnesota's farming communities have a tradition of innovation and entrepreneurship. Whether or not all communities are ready to entertain 100% renewable energy goals, the establishment of "stretch" local targets and the development of the plans to get there could create new opportunities to build further momentum for community and farmer ownership in Minnesota.

Numerous studies show that wind power brings greater economic development benefits to local economies than any other form of a new electricity, including coal or natural gas.[49] As member-

owned organizations, rural electric cooperatives are well-structured to respond to the economic development needs of their constituency. Thus, farmers and farm advocates should explore new ways to engage their rural electric cooperatives to spur economic development through locally-owned renewable energy facilities.

Assisting co-ops integrate renewable energy. Federal, state, or local governments as well as private foundations could assist communities by providing basic technical assistance and targeted funding resources to support rural cooperatives to identify and pursue practical strategies. Similar initiatives have occurred at the federal level under the Department of Energy's Solar America Cities program, for example, which helped cities across the US develop initiatives to drive solar energy development. A similar program could be deployed to assist rural communities develop a renewable energy community program in collaboration with their rural electric cooperatives.

In tandem with hands-on technical assistance, there are also opportunities to provide rural electric cooperatives with more incentives and tools to expand the amount of renewable electricity in their portfolios. This could be achieved by channeling resources through structures such as the USDA's Rural Utilities Service, creating on-bill financing mechanisms for energy efficiency or renewable energy (e.g. RuralStar legislation), or by authorizing the Clean Renewable Energy Bonds (CREBs) program to support coops.

A New Cash Crop for South Dakota's Farmers: Wind Exports

This section focuses on the potential to support farmer-owned wind in South Dakota – both for use in-state and also for export to states with heavier electricity demand. South Dakota is one of the least populated states in the US, a fact that is reflected in its relatively small GDP and electric load. It is rich in renewable resources and currently supplies 50% of its electricity from renewable generation (primarily hydropower). South Dakota also has a history of exporting renewable energy resources from its ethanol refineries. Stakeholders on the *Tour* emphasized that there are opportunities for South Dakota to position its farmers as generators, owners, and potentially exporters of renewable electricity.

Though stakeholders across the state voiced hesitation to embrace policies encouraging government intervention in markets, many also recognized the importance of creating strong markets for farmers. Given South Dakota's comparatively small population, its success in expanded farmer-owned wind energy development will depend, in large part, on the state's ability to leverage federal and private funding to drive greater market growth and increase transmission capabilities. The state's approach to the ethanol market provides a good model for creating the conditions for investment, which it could emulate to drive greater investment from farmers in the state's significant wind resources.

Background: Farm, Energy, and Economic Development Profile

Farming in South Dakota. South Dakota's gross domestic product (GDP) is small relative to other US states (ranked 47th in the nation), generating approximately $36 billion annually.[50] Agriculture is a major driver of the economy, however, accounting for $8 billion in total economic output in 2009 or approximately 20% of the state GDP.

South Dakota's 31,500 farms dominate the physical landscape as well, accounting for about 90% of the state's total land area. The average South Dakota farm, at 1,401 acres, is large – about 1000 acres larger than the US average. South Dakota farmers are major corn producers, which accounts for over 28% of the state's agricultural receipts. Following corn, South Dakota farmers raise beef cattle (22.6% of total receipts) and soybeans (20.6%). The state has a small presence in organic agriculture, with only 103 farms certified as organic.[51]

Energy in South Dakota. South Dakota ranks 45th in the nation in terms of total energy use,[52] reflecting the state's relatively small population and GDP. South Dakota has the smallest on-farm renewable market of the states examined here (see Figure 6). However, South Dakota is a leader in other renewable energy areas, namely in biofuels. South Dakota is the fifth largest producer of ethanol in the country – refining one billion gallons annually,[53] benefiting from strong federal incentives. The state has additionally offered a production-based incentive to ethanol producers and more recently is offering rebates to increase availability and use of ethanol to motorists at gas stations.

In addition, South Dakota has strong wind resources, ranked 4th in the nation in terms of wind energy *technical* capacity. However, South Dakota has been slow to develop its wind resources, due to a lack of policy support as well as inadequate grid transmission. Policy experts throughout the state note that to significantly develop its wind resources, South Dakota needs to make significant investments in new transmission capacity to connect it to eastern load centers like Chicago or Minneapolis.

South Dakota and the Ethanol Market

As illustrated in the Figure 12 below, South Dakota is one of the largest centers for ethanol production in the country, producing over one billion gallons annually. The state is home to 12 ethanol refineries, and one of the largest ethanol producers in the world, POET, launched its operations (and currently is headquartered) in South Dakota.[54]

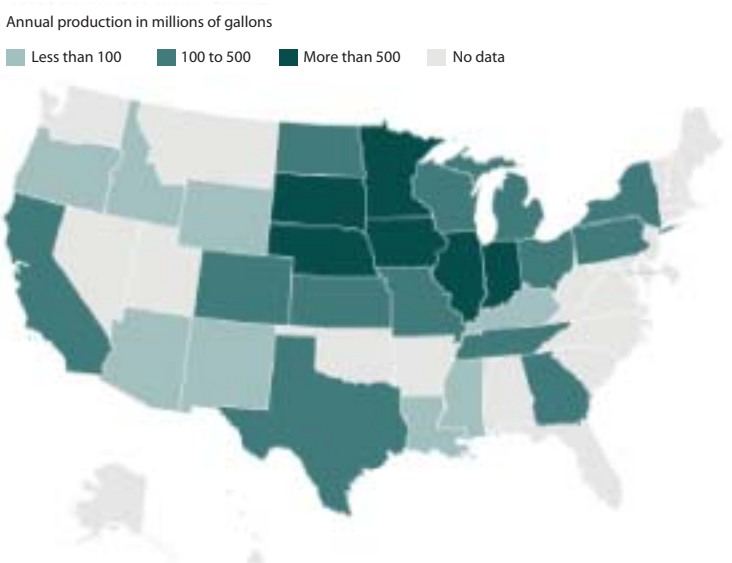

Figure 12: Ethanol Production by State (millions of gallons)[55]

South Dakota's ethanol industry has thrived in large part due to federal and state policies that created sound market conditions for development of the ethanol industry. For example, at the federal level, policy-makers created a number of policies to encourage the ethanol market. Chief among these are (i) the Renewable Fuel Standard (RFS), which created a federal mandate requiring 36 billion gallons of renewable fuel to be blended into transportation fuel by 2022;[xiv] (ii) the Volumetric Ethanol Excise Tax Credit (VEETC), which provides oil companies an economic incentive currently worth 45 cents/gallon to blend and/or purchase ethanol with gasoline; (iii) the US ethanol tariff, which places a 54 cents/gallon tariff to protect domestic producers from foreign (e.g. Brazilian) ethanol imports; and (iv) Clean Air Act regulations requiring gasoline to meet certain oxygen requirements, for which ethanol became the only economically feasible oxygenate.[56] Taken together, these policies created long-term security for the US ethanol industry by ensuring demand (RFS and Clean Air Act requirements), creating an economic incentive for production (VEETC), and encouraging domestic market development (US ethanol tariff).[xv]

At the state level, mandates and incentives played a key role in the development of the ethanol market, especially in the early days of the market. For example, despite a small appetite for government incentives, South Dakota policy-makers have historically provided incentives encouraging in-state ethanol production. The state has offered ethanol producers a production incentive of $0.20 per gallon "for ethanol that is fully distilled and produced in South Dakota."[57] Going forward, the state has redirected funding from production incentive payments to grant programs that increase "ethanol use by motorists" among other initiatives.[58]

xiv No more than 15 billion gallons can be corn ethanol. The remainder is slated to take the form of cellulosic ethanol (16 billion gallons), advanced ethanol (4 billion), and biodiesel (1 billion). Compared with the gasoline it replaces, cellulosic ethanol must reduce global warming pollution by 60 percent; advanced ethanol and biodiesel by 50 percent. Union of Concerned Scientists. (October 2008). Carbon Counts in the 2007 Renewable Fuel Standard. Retrieved from www.ucsusa.org/clean_vehicles/solutions/advanced_vehicles_and_fuels/2007-renewable-fuel.html.

xv The US Congress has recently proposed eliminating the VEETC as well as US tariff on ethanol imports.

Ethanol has been popular with South Dakota farmers due in part to the economic development and market creation opportunities it provides. For example, within the private sector, POET learned early-on the value of creating a community investment model for its ethanol refineries. The company reports: "Every POET biorefinery (except the POET Research Center) is owned by investors, mainly people with a direct stake in the success of the plant." Along with POET LLC, over 10,000 farmer-investors own shares of POET ethanol plants through private offerings.[59]

In addition to local community investment opportunities, a typical plant creates new demand for South Dakota corn, an important benefit to the 30,000 farmers supplying grain to POET facilities. A refinery also creates approximately 40 new jobs, provides an annual payroll of $1.8 million, and drives "revenues of restaurants, hotels, entertainment and other businesses."[60] Ultimately, with such local economic development benefits accruing to farmers, it is unsurprising that South Dakota policy-makers have developed or supported state and federal policies incentivizing development of the ethanol industry. It is worthwhile to note that the right state and federal policies could drive similar benefits for other farm-based renewables in South Dakota, especially wind energy. South Dakota's combination of federal resources, state resources, a focus on farmer ownership, and the production of a commodity that can be both sold in-state and exported could serve as a useful benchmark and roadmap for wind power.

South Dakota Wind Partners

Despite the state's excellent wind resources, and the successful policies that have helped develop South Dakota's ethanol industry, state leaders have not developed policies to support local ownership and development of wind power. As a result, South Dakota's wind market is relatively small, ranking 16th in the nation in terms of total capacity. Moreover, the projects that are developed are large, commercial-scale wind projects, driven largely by corporate demand for federal performance tax credits and energy demand (and transmission access) to neighboring states. By contrast, in states like Minnesota, state policy-makers have supported community wind by "creating demand for renewables among the state's utilities, and by encouraging supply through cash production incentives for small wind projects selling power to third parties. As a result, community wind in Minnesota is dominated by projects that sell power to utilities through long-term contracts."[61] Similarly, nearby Iowa offers net metering policy with no size limit, which has encouraged "behind-the-meter utility-scale wind projects (most often sited at public schools) as the dominant form of community wind development."[62] In both cases, local residents and communities experience significant benefits from the state's wind resources.

In the absence of standard long-term contracts or net metering policies to support local development of community wind projects, South Dakota farmers and local investors recently piloted development of a community-based limited liability company (LLC) to increase local participation in and ownership of South Dakota's commercial wind projects. Known as South Dakota Wind Partners LLC, the cooperative partnered with a subsidiary of Basin Electric Power Cooperative and the Mitchell Technical Institute to develop and operate 108 (1.5 MW) turbines at the $363 million Crow Lake Project. South Dakota Wind Partners owns seven of the turbines, which generate about 10.5 MW of power.[63] Managers of the South Dakota Wind Partners note that the investment is a "first-of-its-kind partnership for wind development,"[64] which has proven to be very popular with community investors.

The SD Wind Partners raised $16 million in a little over two months[65] from local South Dakota investors. The investment fund was made possible following passage of the American Recovery and Reinvestment Act in February 2009, which enables eligible tax payers to claim a treasury grant in place of the performance tax credit. As a result of the grant program, small investors, who lack the large tax appetite necessary to monetize tax credits, can access the government

incentives and tax benefits that make public wind ownership possible.[66] Going forward, project participants indicate that the South Dakota Wind Partners will seek to take equity stakes, in collaboration with corporate developers, in future wind projects across South Dakota.

Recommendations for South Dakota's Farm-based Renewable Market

With its enormous technical potential for wind and small domestic electricity load, South Dakota is uniquely suited to be a major exporter of wind energy. The state will need to connect with major load centers to do so as well as develop more aggressive policies (at either the state or federal level). Recommendations are provided below.

Extend Federal Funding and State Incentives to Promote Farm-based Wind Development. South Dakota has a tremendous opportunity to increase economic development opportunities for farmers by creating farm-based wind incentives. Historical support for the ethanol industry at both the federal and state level provides a template for the role that policy can play in market development. Specifically, the state or federal government should develop stable and consistent public policy, which provides modest financial incentives or investment support to farmers seeking to develop wind projects. In the short term, this should include extending REAP funding and the 1603 tax grant extension at the federal level.

In addition, state policy-makers could develop premium energy incentive payments for farm-based wind energy. For example, Steve Wegman, a former Public Utilities Commission (PUC) analyst in South Dakota and current director of the South Dakota Wind Energy Association, suggests that a simple 2 cent/kWh renewable energy tariff would be sufficient to drive significant wind energy development across the state. Moreover, it is likely that the costs of a renewable energy tariff or incentive would be more than paid back by the economic development benefits to the state's farming community.

A recent analysis in South Dakota showed, for example, that a proposed 1,000 MW South Dakota wind project has an estimated economic development output multiplier of 1.6. This means that a "direct investment of $334.7 million [in a wind project] will have a $538.8 million total economic impact as money makes its way through the economy."[67] Economic benefits from wind development would be even greater if corporate profits are distributed to South Dakota residents, as they would, for example, if investors such as those from South Dakota Wind Partners owned part of the project.

The cost to ratepayers of a new wind tariff could be managed through a cost cap or other predictable limitation. For example, a number of states impose cost caps to protect end-use consumers from excessive costs, protect the state's economy from unintended impacts, and impose discipline on the market. In Montana, for example, utilities are not obligated to purchase energy from a renewable energy project if the cost of the renewable resource is more than 15% above the cost of alternative resources.[68] Alternately, in a number of other states and communities, regulators have determined that if rates increase by more than 1 or 2%, then the program will be revisited.

Spearhead Transmission Grid Development Initiatives. In order to expand its wind energy market, South Dakota needs to upgrade its transmission grid and provide wind developers access to new energy markets. To this end, South Dakota state regulators and policy-makers should prioritize development of grid transmission initiatives, coordinating efforts with regional and federal entities. Leadership for transmission will likely need to come from regional organizations, like Midwest Independent System Operator (MISO), or the federal government. Moreover, the state should work with federal and regional planners to create and standardize smart grid and power storage initiatives, with special focus given to assisting rural electric cooperatives manage this transition. Going forward, South Dakota policy-makers will need to work with these organizations in order to increase likelihood that farmers and rural communities can develop wind projects and export renewable power to the load centers that need it.

Conclusion & Recommendations

The recommendations described in this report build on lessons learned from the dialogue between German energy farmers and Midwestern agricultural stakeholders. It benchmarks Germany's success in encouraging energy farming by examining the unique political and market context of three Midwestern farm states – Wisconsin, Minnesota, and South Dakota – and identifying opportunities for US farmers and rural communities to increase development of renewable energy projects.

Recommendations are intended to increase economic development opportunities and create value for farmers and rural communities. They include encouraging greater direct policy support through mechanisms like the CLEAN contract, as well as approaches that work within the existing policy environment such as the financial innovation and organizational efforts of private farm-based organizations. Though a thorough analysis for renewable policy and market development in each state was beyond the scope of this report, policy-makers may wish to consider the recommendations as a menu of options from which to pick and choose.

Recommendations are summarized below.

Extend federal funding for REAP grants and 1603 Treasury grants

USDA's REAP grant program and the 1603 Treasury grants have expanded the opportunities for farmers and rural businesses to benefit from federal incentives promoting renewable energy, especially in places with few renewable energy incentives like South Dakota. Moreover, federal renewable energy incentives – like the investment tax credit (ITC) or production tax credit (PTC) – have primarily supported corporate investors with large tax liabilities. By developing grant programs that increase participation among small and medium-sized farms and businesses, the federal government encourages economic development opportunities that strengthen local rural and agricultural communities from the ground-up.

Create CLEAN contracts to drive technology specific renewables

A key strength of Germany's CLEAN contracts (feed-in tariff) is that they provide both small and large renewable energy developers transparency, longevity, and certainty (TLC).[69] This enables small farmers and corporate entities to use CLEAN contracts to raise relatively low-cost debt from banks, thus minimizing the upfront equity needed to build projects. Policy-makers should develop CLEAN contracts to encourage farm-based renewable energy development, focusing on specific technologies like biogas in Wisconsin or community wind in Minnesota. In such a manner, local farmers can cost-effectively develop renewable energy projects and create economic development opportunities that strengthen the health of rural and agricultural communities.

Develop farm-based renewable energy cluster & market transformation initiatives

Development of formal cluster initiatives focused on specific renewable energy sectors, like biogas in Wisconsin, can have significant impact on market development. Clusters bring together actors across the market value chain to identify market barriers, develop strategies, address technical issues, and collaboratively leverage economies of scale. In some Midwestern communities, cluster initiatives could be developed from the ground-up by local communities through the establishment of aggressive renewable energy goals.

Additionally, clusters can engage private-sector organizations to develop, leverage, or expand resources to increase renewable energy opportunities for farmers and rural businesses. Groups such as Organic Valley and South Dakota Wind Partners are leading private-sector development of renewable energy resources among farmers and rural communities. Going forward, farmers, policy-makers, and farm advocates should support and seek to expand the impact of these private-sector efforts to integrate energy farming into the US agricultural sector.

Create nutrient trading systems and other conservation-based incentive schemes to support biogas

In many cases, farm-based renewable energy projects create secondary, though significant, environmental and conservation benefits. Biogas, for example, provides organic waste (nutrient) management and water quality benefits. With this in mind, policy-makers should explore market-based land conservation and water quality regulatory schemes, like nutrient-trading systems for biogas in Wisconsin, to support renewable energy development. Significant opportunity exists to accelerate cost-effective renewable energy technology development within the agricultural sector to minimize nutrient loading from other point or non-point source pollutants.

Invest in transmission to encourage greater renewable energy development

In order to fully develop wind and other renewable energy technology development, the electric transmission grid could be strengthened in states like South Dakota that have large technical wind resources but little electricity demand. As such efforts move forward, state, regional, and federal stakeholders will need to address landowner rights and NIMBY issues. Within Germany, many of these issues have been resolved by enabling landowners to directly share in the economic benefits of grid expansion, though smart grid and power storage challenges persist as Germany pursues a share of 80% renewable electricity. Going forward, US stakeholders should explore potential for sharing and/or increasing economic benefits for landowners affected by transmission projects. Additionally, regional and federal policy-makers should explore potential for smart grid and power storage initiatives and how they affect rural electric cooperatives.

Set ambitious renewable energy targets in rural areas

Around the world, communities are setting increasingly ambitious renewable energy goals as previously "impossible" goals are met and surpassed. Rural communities are often rich in under-utilized renewable resources and there are opportunities to set ambitious, community-based renewable energy goals and then work with federal and state partners to pursue them. Within Germany, a number of towns and communities have pursued strategies to become 100% energy independent, which provides a model that may be appealing to US farming communities – provided that the proper support structures are in place. By establishing local goals for renewable energy production, progressive farm communities will position themselves to increase economic development opportunities through renewable energy project development.

Federal, state, or local governments as well as private foundations could assist communities by providing basic support to help organize a campaign. Initiatives funded at the federal level under the Department of Energy's Solar America Cities program, for example, helped cities across the US develop initiatives to drive solar energy development. Similar resources should be deployed to assist rural communities develop a renewable energy community program in collaboration with their rural electric cooperatives.

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