HEINRICH BÖLL STIFTUNG
The Green Political Foundation

Clean Energy Jobs for the U.S. Midwest

Lessons Learned from the German Success Story of Low Carbon Growth

Christine Wörlen

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Heinrich Böll Stiftung

Washington D.C. Office
1638 R Street, NW
Washington, DC 20009
United States
T +1 202 462 7512 **F** +1 202 462 5230
www.hbfus.org

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For more information please contact Mr. Till Kötter at +1 202-464 4930, mail to till@boell.org, or visit our website at www.TheClimateNetwork.org

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EXECUTIVE SUMMARY

Germany has become the world leader in the development, manufacturing, and deployment of renewable energy technologies. In early 2010, 16% of the country's electricity was generated from sources such as biomass, wind, and sun, driving a forward-looking industry that already employs more than 300,000 people. The global financial crisis has impacted this sector much less than most others, hence strengthening Germany's economy on the whole.

This is reason enough to look at the German renewable sector in more depth: What are the driving forces behind this economic success story? What lessons can be learned and which of these could be transferred to the United States? This report analyzes the growth of the renewable energy sector in Germany and suggests policy measures for the debate in the U.S. By applying some of these lessons learned, Midwestern states such as Indiana, Michigan, and Minnesota could strengthen their renewable policies, build truly local industries, and create new, well-paying jobs.

The report presents the final findings from the *Midwestern Green Jobs Fellowship and Tour 2010*. Based on research and discussions with stakeholders from the Midwest, fellow Christine Wörlen assessed current and future measures of job creation in the field of renewable energy. Her findings were presented to and discussed with stakeholders during the *Midwestern Green Jobs Tour* in July. Christine Wörlen is the former Head of the Renewable Energy Division of German Energy Agency (dena) and now owns and manages Arepo Consult.

The report is issued as part of a two-year program of the Heinrich Böll Foundation's offices in Brussels, Prague and Washington: *The Climate Network – Transatlantic Solutions for a Low Carbon Economy* aims to build a transatlantic policy network to support key regions—the Midwest and Southeast of the United States as well as Central and Eastern Europe—in developing economic and policy tools that will enable them to successfully transition to a low-carbon economy.

ABOUT THE AUTHOR

Christine Wörlen

Christine is an independent expert in the field of national and international renewable energy policy. Besides Germany and the US, she is currently working on projects in Namibia, Kazakhstan and Mexico. Prior to starting her own consultancy Arepo Consult (www.arepo-consult.com) in April 2009, she was the Head of the Renewable Energy Division of the German Energy Agency (dena) where she supported the German efforts on integrating large amounts of renewable energy into the existing energy system.

Before joining dena she was the Program Manager for Renewable Energy and New Low GHG-emitting Energy Technologies at the Global Environment Facility in Washington DC. There she developed renewable energy projects for developing countries and economies in transition together with the World Bank and other international organizations.

Her activities in Germany focus on the evaluation of the National Climate Change Initiative of the Federal Ministry for the Environment. Internationally, she is advising countries and stakeholders on the implementation of renewable energy and energy efficiency policies and measures. Recently, she worked on projects in the USA regarding clean energy exports from the US. She is a regular speaker at public events in the US and Canada. In Ontario, she served as an expert witness in the process leading to the Ontario Green Energy Act. She also has been advising the Secretariat of the International Renewable Energy Agency IRENA.

Christine has degrees from Bayreuth University, Germany and a Ph.D. from Boston University, Boston, MA.

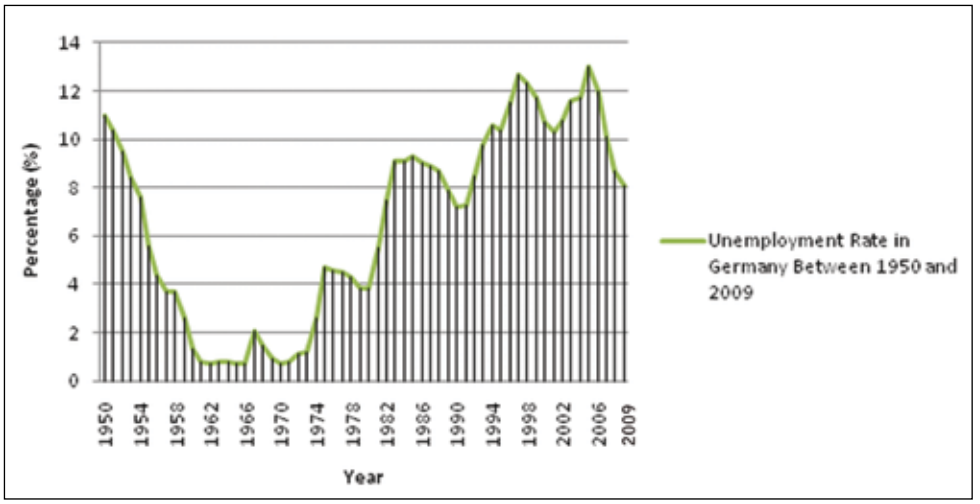
The German Success Story of Low Carbon Growth

With its renewable energy sector, Germany has managed to create a resilient industry in a forward- looking policy arena and technology field that "does well by doing good." According to the BMU, Germany's Federal Environment Ministry, (BMU 2010a), renewables have created at least 300,000 jobs, with actual numbers presumed to be much higher. Compared to traditional energy systems, renewables can generate income in a much wider range of ways and give jobs to many more people per unit of energy used (Wei et al., 2009). They are good for the environment, improve energy security and can drive locally controlled economic development that keeps jobs and wealth within communities. This paper argues that this industry would not have developed in Germany without the local framework to utilize renewable energy and compares this situation with three Midwestern states of the United States.

1. Germany after the World Financial Crisis

Based on the 2010 World Economic Outlook Database of the International Monetary Fund, Germany is the world's fourth largest economy in terms of gross domestic product, after the United States, Japan, and China. Like the Midwest of the U.S., Germany is traditionally export-oriented, and has a strong manufacturing sector in the capital goods and automobile industries. The German economy has already undergone a major transformation in the 1990s with the integration of the East German economy. Many of the industrial plants and economic structures in East Germany could not keep up with the pressures of globalization and had to be shut down, leading to a high unemployment rate. At times, up to 13% of the total German workforce were out of a job (see Figure 1).

Figure 1: Unemployment Rate in Germany between 1950 and 2009[1]



The Bundesländer (states) of the former German Democratic Republic, the so-called "New Bundesländer," were hit hard by this transformation, although the integration certainly did affect the old Bundesländer as well. In some areas in the East, the unemployment rate climbed up to 25% (Bundesagentur für Arbeit 2009). As a result, unemployment is a highly charged topic in Germany, and a number of policy instruments were developed to protect the German workforce against short-term economic fluctuations. Among these instruments are policies that make energy more expensive as an input to economic activity, and that make labor more affordable by cross-financing some of the social security taxes from energy taxes in order to promote employment and energy efficient economic activity at the same time. Other sets of policies and incentives pertain to green technologies that, expected to be in demand in the future, contribute to putting German industry on a growth path.

During the most recent financial downturn, these policies helped Germany minimize job losses. Moreover, following the first signs of an economic upturn in 2010, some 120,000 jobs have been created in the space of April, May, and June alone (Bundesagentur für Arbeit, 2010).[2] This is taken as a sign that the current recession has not damaged Germany's economy as badly as it has other economies. These figures also suggest that once the global economic recovery sets in, Germany will be able to take better advantage than other economies, who are not as prepared and whose industries will require longer lead times to meet the increased demand for their goods and services. In addition, Germany has established a number of important industrial sectors that have shown to be quite resilient toward the global recession.

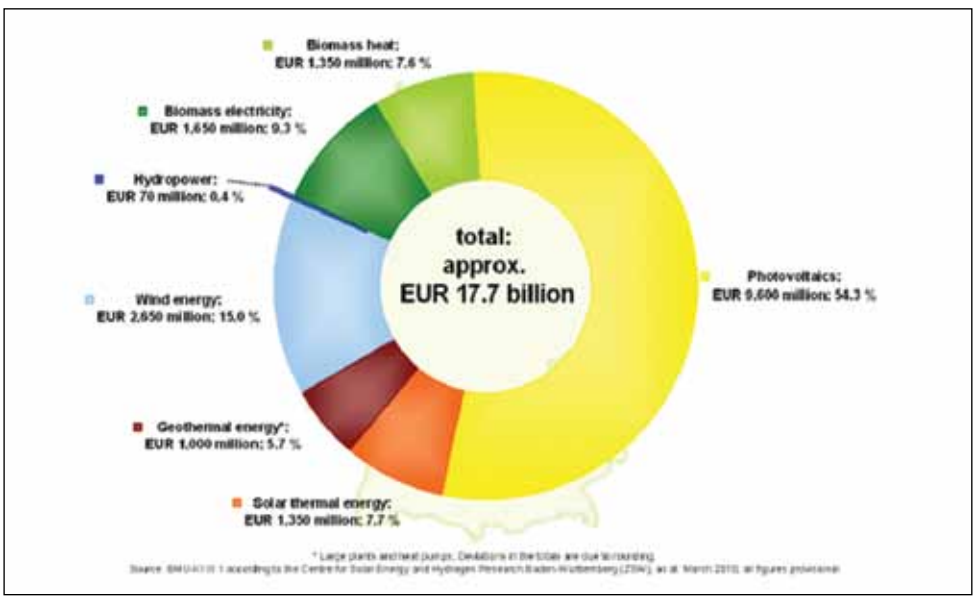
1 Spiegel Online, 2010

2 Corrected for seasonal effects.

2. Germany's renewable energy sector

One of these sectors is the renewable energy sector. In fact, the historic growth trend of this industry has continued unabatedly and the industry has been called "solid as a rock" even during the global economic crisis.[3] As Figure 2 shows, new generation and conversion facilities have attracted a total investment of €17.7 billion (around $25 billion) in 2009, even as German project developers complained that banks—due to the banking crisis and a lack of financial liquidity on the side of the banks—were not lending as much money as the renewable energy field could have absorbed.

Figure 2: Investments in plants for the use of renewable energy sources in Germany in 2009[4]



Over the last 20 years, Germany has established a complete supply chain for many renewable energy technologies in the country. German companies that develop and produce wind turbines and solar technologies in general are among the biggest in the world. In the area of biogas, a whole industry has developed, building biogas fermenters and specialized combined heat and power plants for turning agricultural waste and energy crops into electricity and heat. Germany also supplies some of the most important components for concentrating solar power (CSP) plants and biofuel conversion technologies. In addition, foreign companies, such as First Solar, have now established manufacturing facilities in Germany in order to build on the existing manufacturing know-how and the local market opportunities.

Apart from large companies, many small and medium size companies are also active in the field. Some of them are producers of equipment such as solar collectors. An even greater number, however, work downstream from actual manufacturing, assembling components for solar power systems or mounting and installing these systems. Alongside installing, a fully fledged service industry

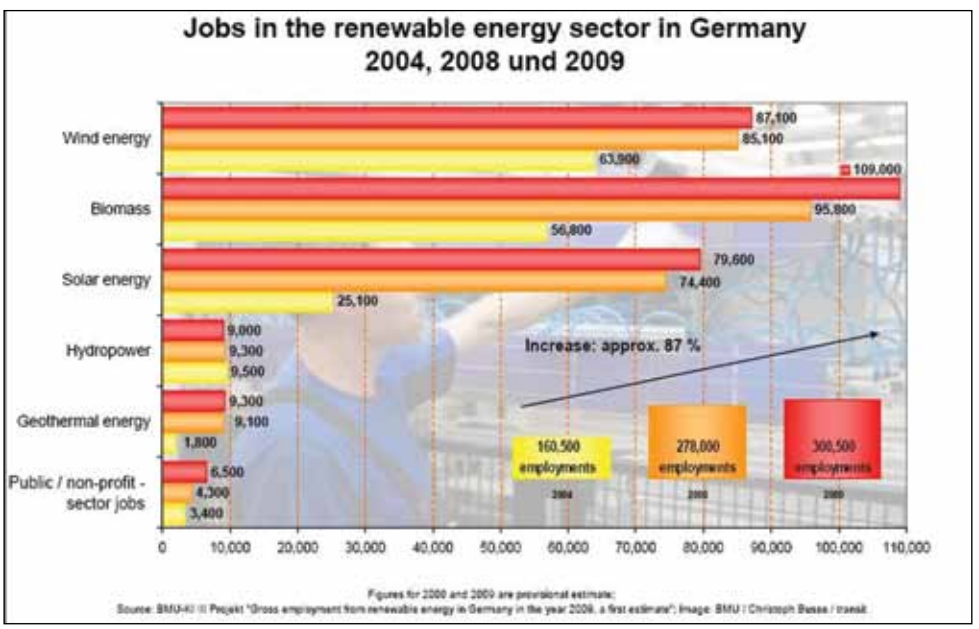
3 For example, by German Minister of Environment Röttgen, press release no. 041/10, German Ministry for the Environment, Berlin, March 24, 2010

4 BMU, 2010a

has evolved, analyzing wind and solar resources, designing and planning wind farms, and delivering operation, monitoring, and maintenance services to wind farm owner-operators. Specialized and general banking services have developed around renewable energy projects of various scales, creating jobs in the finance sector. Renewable energy is also providing jobs in the agricultural sector, as more and more people use wood to heat their homes and biogas for their generators (cf. Beyond Biofuels: Renewable Energy Opportunities for US farmers, HBS, 2010, available at www.hbfus.org).

As Figure 3 demonstrates, renewable energies proper employs around 300,000 people, of which biomass energy alone accounts for 109,000 jobs. By contrast, Germany's only domestic energy source—lignite—employs only 50,000 people along its entire supply chain, from mining the coal in open pit mines all the way to power generation in power plants (DEBRIV 2010). Biomass is, in fact, the only type of renewable energy that is comparable with fossil fuels in that its fuel production process, being a separate, labor-intensive step of the value chain, can generate jobs and revenues. By contrast, when wind and solar power technologies are used for power production, no costs, or jobs, are associated with providing the "fuel," i.e., the wind's movement or the sun's radiation.

Figure 3: Jobs in renewable energy in Germany in 2009[5]



The figures presented by the German government (BMU 2010) on the development of the renewable energy sector are extrapolations from a macro-economic study done in the early 2000s (BMU, 2006). However, this approach most likely underestimates the actual number of jobs relating to renewable energies by a significant amount. For example, a number of conventional trades, such as the electrician trade, are systematically underestimated by this study, and some other supplementary industries, such as that of the financing industry and the education sector, are systematically excluded.

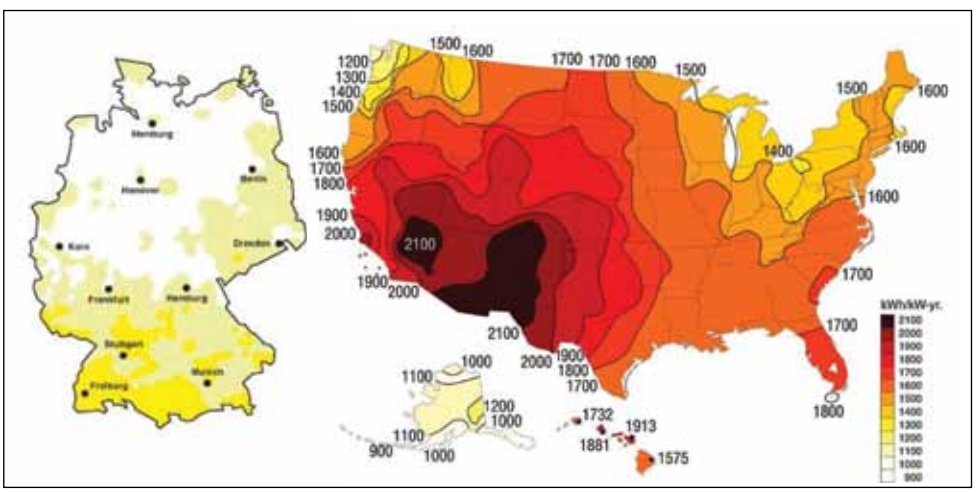
5 BMU 2010a

3. Energy resources in Germany

Germany is a resource-poor country. The major domestic energy resource that can be exploited is lignite and a small amount of natural gas. Most of Germany's energy comes from abroad: oil from European neighbors, Russia, and OPEC countries, and natural gas, mostly from Russia.

Nor is Germany blessed with renewable energy resources. The sunniest places in Germany are comparable with Seattle, which receives less energy from the sun than any other place in the contiguous United States (see Figure 4). Even Ontario, Canada, gets some 25% to 30% more sun than Germany. The country's wind resource potential in its best locations is only average. Finally, only 4.9 million acres of Germany's agricultural land can be used for biomass energy production, due to existing protective standards for the environment and food security. By comparison, Iowa alone grows corn on more than 12 million acres.

Figure 4: Solar resources of Germany and the United States compared[6]



Germany is also subject to a number of other barriers that make it difficult to deploy renewables, the biggest of which is space. Covering only 137,847 square miles, it is smaller than North and South Dakota combined (140,878 sq miles). At the same time, it is much more densely populated. A total of approximately 82 million people share the same space as North and South Dakota's 1.46 million inhabitants. This represents 10 people per square mile in the Dakotas, in contrast to 593 people per square mile in Germany.

So how is it, we may ask, that Germany became a global leader in renewables? The answer lies in the legal framework which Germany provided to its industry to deploy and innovate in the field of renewable energy. This framework includes, in particular, measures and policies to promote downstream development and the creation of market demand for renewables and their use in small and distributed facilities. As the framework provided a stable local market, it has also helped to provide a testing ground for new developments and has incentivized local technological development and innovation.

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6 Wörlen, after NREL

4. Policy frameworks for renewable energy deployment in Germany

The development of the German renewable energy industry has been driven and sustained by a steady support of the deployment of renewable energy technologies in the country's national energy system. A set of legislative and policy measures incentizing the utilization of renewable energy technologies paved the way for the industry to develop in Germany, to grow in size, scope and technological competence, and to attain a world leadership position. This conducive environment then also attracted a significant number of foreign companies to set up manufacturing facilities in Germany (e.g., for solar modules).

The electricity sector

The main instrument for supporting renewable electricity generation is the German Renewable Energy Sources Act (EEG). Its first version was established in 1990 and consisted mainly of a guaranteed rate at which a utility had to purchase power from hydro and wind power plants, modeled after the U.S. Public Utility Regulatory Policy Act (PURPA). At that time, the wind turbine industry was in a rather early stage of development. In order to generate a scientific database on the performance of the turbines and their impact on electricity grids, a scientific program for research and analysis accompanied the deployment of the first 250 MW of wind power.

The Act was expanded and amended regularly so as to ensure the continuous increase in the number of installations and the amount of generated electricity. For example, in 1999, the Act was expanded to include solar photovoltaics, which until then had been supported through Germany's 100,000 solar roofs program. New versions in 2000, 2004, and 2009 also served to further refine and differentiate the Act. A detailed rate schedule of the Act ensures that rates are adjusted to the current cost of renewable energy technology with every reauthorization of the Act. Rates are guaranteed for 20 years for most technologies and vary by technology and other aspects (e.g., size of plant, resource quality). Based on degression rates, rates for new plants also go down every year according to a pre-specified and technology-specific percentage.

There is no set limit to the amount of renewable energy that can be purchased by this system, and the Act obliges grid operators to give renewable energy power plants priority access to the grid. If necessary, grid operators are obliged to reinforce the grid in order to evacuate the power. In addition, they must purchase the power generated at the plant at a specified rate, and must sell it at the power exchange. Operators can charge the difference between this rate and the power price obtained at the exchange to a nationwide pool, which in turn is reimbursed by means of a surcharge to every electricity customer. Energy-intensive industries can apply for a cap of €0.05 per kWh on this surcharge. A household customer with an annual consumption of 3500 kWh in 2009 paid an additional €3.50 per month for electricity under this Act (cf. Figure 11).

Basically, the Act provides a standing offer to everybody to invest in renewable electricity generation. It provides very clear rules on power purchase agreements (PPAs), including stipulations concerning conditions under which power purchase can be rejected or within which time frame a grid connection has to be provided. A PPA for small installations can often be obtained within days. In this way, the EEG, aka "feed-in tariff," has been very effective in deploying renewable electricity generation. It has been supported by other legislation, for example, a federal provision that allows communities to implement zoning changes in favor of wind farms, under the condition that these remain in specifically zoned areas and outside of nature reserves. Loans were made available through a federal program that allowed the KfW Development Bank to lend at a fixed, below-market rate.

Heating with renewable energy
In the renewable heating sector, Germany's main policy instrument is a federal subsidy program that supports specific residential and industrial heating technologies. The catalogue of eligible technologies is adjusted annually to account for changes in these technologies. For example, specific types of wood-based heating systems were excluded from the list for a certain time. By contrast, solar water heating has always been supported by this program. Unfortunately, the program has to discontinue funding activities at midyear nearly every year, when it generally runs out of funds. Its biggest challenge is in fact to secure a steady and reliable flow of funds from the federal budget. A sustainable, continuous market introduction and a sustained reduction of equipment costs—the objectives of the program—were thus not achieved in an optimized fashion for the German national market, and the renewable heat market did not develop as fast as was intended.

In addition to this program, the Renewable Heat Act was introduced in 2008, which requires new construction projects to cover a share of their heat requirements from solar, biomass, or district heating.

Biofuels
Germany's policy support for biofuels has been even less consistent. The first support measure taken in 2004 was a tax exemption for biofuels used for transport and heating. Given that transportation fuels are heavily taxed in Germany—at more than €2 per gallon—the tax exemption rendered biofuels slightly cheaper than fossil-based passenger vehicle fuels. In 2006, the tax exemption on biofuels was gradually phased out (with the exception of pure biofuels) and replaced with a provision requiring a fixed percentage of all transportation fuels to be bio-derived fuels. Biofuels already accounted for 7.6% of total fuel consumption in Germany by the end of 2007. Further expansion will take place at a slower pace, mainly justified by concerns regarding the availability of resources for fuel processing and their sustainable production.

The production, consumption, and pricing of biofuels in Germany is also increasingly influenced by policy-making at the EU level. Biofuels are an important part of the overall renewables obligation applying to every EU member state as part of the EU Directive on the Promotion of the Use of Energy from Renewable Sources. This directive requires that, in the long run, only those biofuels be counted as renewable that contribute significantly to the reduction of the GHG intensity of the overall fuel mix. In addition, the directive requires member states to prove their compliance with EU-wide requirements for environmental safety and sustainability in the production of biofuels.

Action on the State level or on the Federal level?
In the US, many states have identified green jobs as a paradigm for adapting their industry structure to a changing economy—a timely and well-placed strategy. As the German example shows, renewable energies can make the local economy more resilient to global trends and keep money in the region. The next question would then be to identify whether lessons from Germany regarding green jobs are best implemented by the state or the federal level. Interestingly, the state level in the United States is more analogous to the country level in Europe than to the federal level, and the U.S. federal level corresponds more to the EU level. This is due to geographic size and scope but also some other more policy-related factors.

In terms of energy policy, the EU governing bodies are setting overall goals and targets requiring EU member states to cooperate and potentially coordinate their national policies. For example, while a renewable energy goal applies to all member states, it is left up to each state to decide which policy instruments and tools they want to employ to reach these goals. Moreover, the transnational harmonization of electricity transmission, among other infrastructures, takes place less through regulatory action and more through grant support for specific transmission lines and other

infrastructure projects. The EU even has a common electricity and gas market. The EU Electricity Market Directive of 1999 requires the unbundling of the generation, transmission, and retail of electricity markets in all countries. The continental EU is covered by one big electricity grid in which the transmission system operators follow a common set of rules.

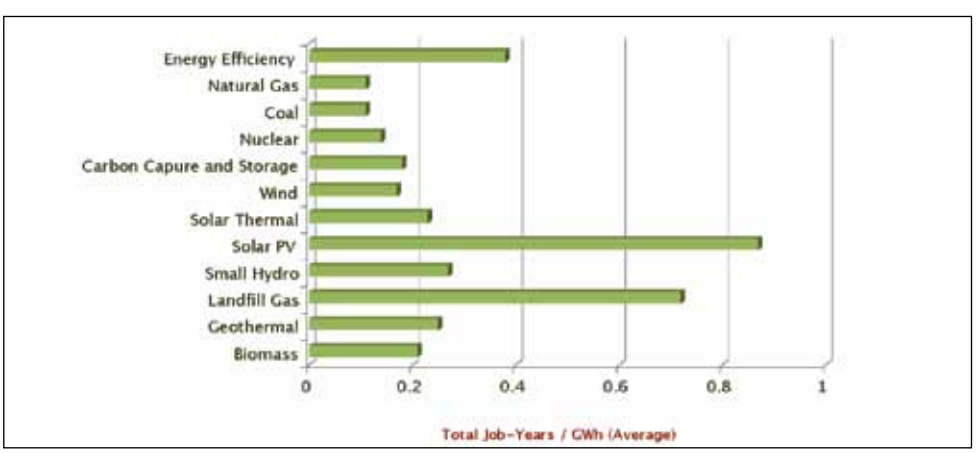
Similarly, the federal level of the United States does not prescribe many details in terms of policy. It does not specify which renewable share each state should strive to achieve. The U.S. Department of Energy focuses on energy technology development and innovation. The only regulatory agency with significant regulatory authority is FERC (Federal Energy Regulatory Commission), which deals with transmission issues if they affect more than one state. Washington does not have a mandate to regulate state power markets, just as Brussels cannot intervene in the power markets of EU member states. With regard to energy policy, the authority resides with the state level.

Under EU legislation, Germany has to prove how it will cover 18% of its final energy consumption from renewable energy by 2020—a daunting task considering that Germany's share of renewables in final energy consumption was only 5.5% in 2005. However, this plight is shared by all EU member states, with considerable effort necessary from each to reach that target. In its National Renewable Action Plan, Germany projects that the bulk of its renewable energy increase will take place in electricity generation. As the feed-in tariff has been much more effective than any of the other policy schemes employed in Germany to date, the government trusts that this scheme will be able to more than double the share of electricity coming from renewables by 2020. Ideally, some 38.5% of Germany's electricity will then come from wind, solar, hydro, and bioenergy.

Renewable energy as a local job generator

In Germany in 2009, an impressive number of renewable energy plants were in operation: 2.2 million solar plants, 22,000 wind turbines, 4,500 biogas plants, and several million wood-based boilers (Agentur für Erneuerbare Energien, 2010). This inevitably has an effect on the job market. Wei et al (2009) analyzes 15 job studies covering renewable energy, energy efficiency, carbon capture and storage and nuclear power in order to estimate the number of job-years needed for providing a GWh of energy using comparable methodologies. The results are displayed in Figure 5. As Figure 5 demonstrates, renewables are generally more labor-intensive, i.e., more job-producing, than other sources of energy, albeit such comparisons are not easy to draw.

Figure 5: Total job-years/GWh per energy technology in the U.S.[7]



7 Wei et al. (2010)

In addition, renewables add to the local job base, as renewable energy is almost always local energy. Coal and uranium are transported over long distances and the jobs are created in other locations. In contrast, solar and wind are harvested locally, where, converted in small units, they can be consumed on the spot. Thus, local energy serves local economic cycles. These small units can be built, owned, and operated by local business people.

The degree to which this renewable revolution is affecting Germans in their economic well-being is best demonstrated at the local level. Figure 6 uses the example of a biogas-based combined heat and power plant to show how local renewable energy can contribute to keeping the economy local.

Figure 6: Local value chain of a typical biogas plant in Germany and division of profits[8]

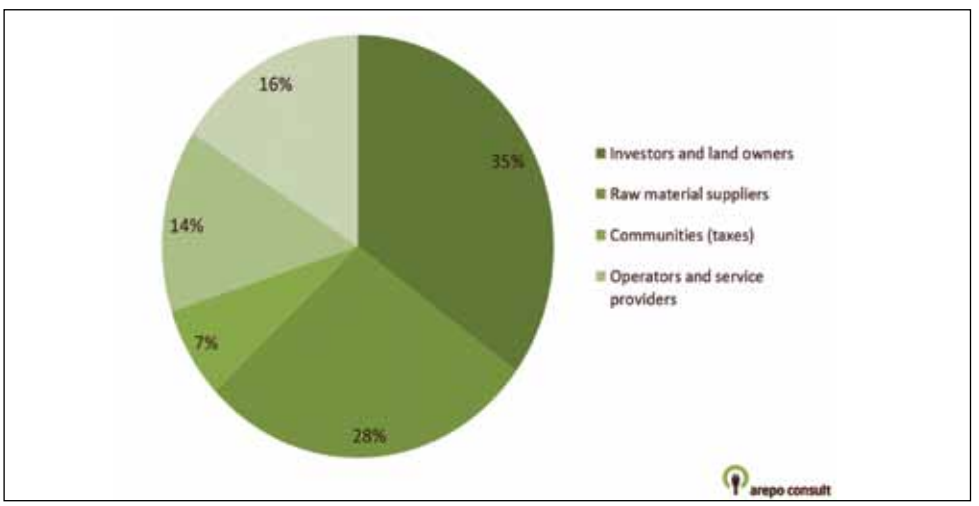


Figure 6 demonstrates that 35% of the added value benefits the investor of the plant and the owner of the land on which the biogas plant is located. Typically, this is the farmer or the agricultural cooperative that has invested in this biogas plant. Some 28% of revenues go to the supplier of the feedstock—again, 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 estimated 70% to 80% of added value remains in the local economic cycle.

While the large renewable power plants are built by specialized contractors, the more traditional construction trades are increasingly joining the renewable energy movement. According to a survey by the German Association of Electrical Contractors (Zentralverband, 2010), 37% of its 76,000 members are already active in solar energy production and have achieved a turnover of €13 billion ($16 billion) in 2009 alone.[9] During that year, each of these members have installed, on average, around ten photovoltaic systems and three solar thermal collectors, generating revenues of

8 Based on assessment of local value chain, Agentur für Erneuerbare Energien (2009)

9 This includes solar photovoltaic and solar thermal installations. A comparison with the figures of BMU as displayed in Figure 2 demonstrates that the BMU numbers underestimate the actual turnover generated.

€450,000 for each contractor. The total "solar share" of their revenues is now 28%, compared to 8% in 2003. Solar energy is thus generating a significant amount of additional income for these electricians. As they have close relationships with their clients, they feel responsible for their product, and eight out of ten of these installers say that they use mainly modules of German manufacturers.

A survey among plumbers and roofers would presumably yield comparable results. A recent study of Germany's Renewable Energies Agency on community-based added value distinguishes three different ways of how communities can benefit from renewable energy (Agentur für Erneuerbare Energien, 2010). First, through the income generated for households and businesses, most of which in turn flows back into the community in terms of goods and services consumed, the overall economic climate and wealth of the community improves. Secondly, municipalities in Germany get a significant share of their income from taxes on the profits of businesses in the community, and these taxes are used to finance public services like roads and schools, which in turn improves livability and well-being. In addition, a community can directly earn or save money by leasing the land to a project developer or saving on electricity purchases. The study demonstrates that the more steps of the value chain a community can integrate within its boundaries, the more it will benefit. However, it also demonstrates that producing the equipment is not the most important step in benefiting economically from renewable energy. A simulation of local value generation for some theoretical plant setups in the study showed that the biggest tax revenue for the model municipality over the lifetime of the plant was generated by hosting an owner-operator within the community rather than a manufacturer.

Low Carbon Growth Strategies for the U.S. Midwest

The German renewables job growth exemplifies the idea behind the green jobs objective currently pursued in many parts of the United States. As described above, energy policy at the United States federal level is comparable to the EU level in Europe, while the individual U.S. states compare with the German federal level with regard to the legislative power they have over their respective energy sector. Replicating the German success story would therefore boil down to applying approaches and policies applied at the German federal level to the U.S. state level. In the following, we will look into three exemplary states—Indiana, Michigan, and Minnesota—and discuss some of the efforts that are done in these states to attract green jobs. In many cases, more ambitious policies for clean energy could strengthen the promotion of well paying green jobs and help to enhance local economic benefits,

All the states studied in this report have been hit hard by the economic decline and the financial crisis. Two of these states—Michigan and Indiana—were and still are heavily dependent on the automotive industry. To respond to the severe decline in their industrial base, they are coping mainly by trying to attract new manufacturing sectors, in particular through investment grants from the American Recovery and Reinvestment Act (ARRA). The production processes for renewable energy hardware, such as wind turbines and their components, but also solar panels, are seen as technically similar to manufacturing processes in the automotive industry. Renewable energy and electric vehicles are therefore two important manufacturing sectors for green jobs in these states. In fact, both Indiana and in particular Michigan have been successful in terms of attracting manufacturing capacities in these fields. Minnesota, too, now hosts 14 solar component makers (Minnesota Solar Energy Industries Association, 2010).

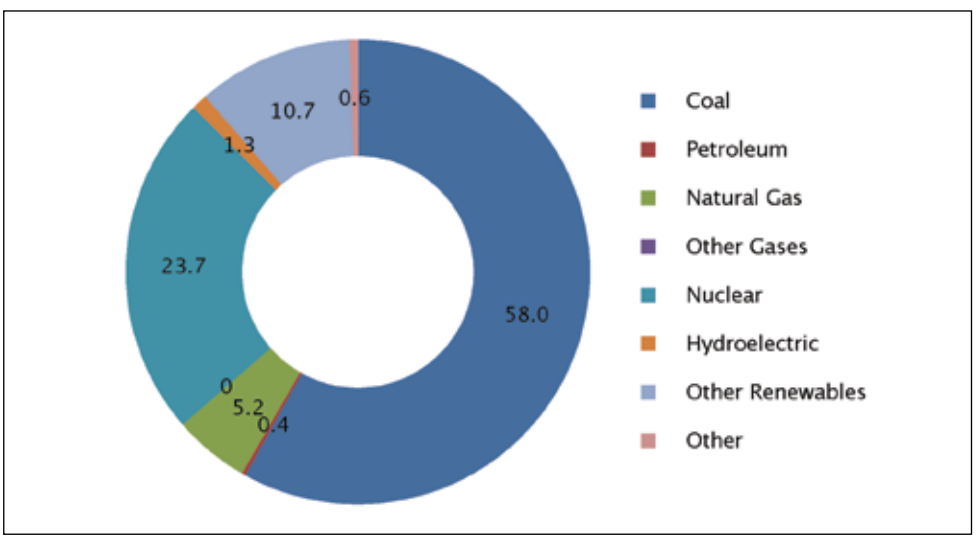
The energy situation in all three states is different, even if all of them to date still largely depend on coal. For many years economic development strategies were built around low electricity prices, attracting energy intensive industries. However, more recently, local leaders also see the need to diversify these strategies in order to secure a timely transition to the low carbon economy of the future. Renewable portfolio standards (RPSs) are in place in Michigan and Minnesota that force utilities to invest in renewable energy generation or to purchase renewable energy credits in order to satisfy a statewide goal. Of the three states, Minnesota has taken the most ambitious path to changing its energy mix.

1. Minnesota

Figure 7 shows the current energy mix in Minnesota. Like most Midwestern states, it is dominated by coal and has a significant share of nuclear power generation. All coal has to be imported into Minnesota.

Minnesota has taken important steps toward setting and reaching an ambitious renewables target. The 25x'25 initiative demonstrates public leadership and applies a multi-pronged approach, combining sticks, such as an effective Renewable Energy Standard (RES), with carrots, such as grant programs, e.g., for solar heating or weatherization, among other sources through ARRA funding. The RES requires most utilities to cover 25% of their electricity by renewables by 2025, and Xcel Energy to cover 30% of their electricity by renewables as early as 2020. The Office of Energy Security states that in 2007, Minnesota utilities seemed to be on track for reaching their 2010 renewable energy portfolio targets (MN Office of Energy Security, 2009).

Figure 7: Current power mix of Minnesota[10]



The local utility Xcel[11] received a wind mandate in the 1990s for the generation of 825 MW by 2006. When they applied for a Certificate of Need to construct four new high-voltage transmission lines, the Public Utility Commission requested that at least 60 MW come from small and

10 Data from the U.S. EIA

11 At that time NSP

local-owned wind generation projects. In 2003, the mandate was increased, and another 100 MW were to be provided from small wind projects of 2 MW or less by 2010. Xcel offered a standard power purchase agreement as well as a special rate at which they would buy power from small distributed wind generation plants at 3.3 cents/kWh for up to 20 years. Communities can benefit from the Community Based Energy Development (C-BED) legislation, which provides a framework for negotiating PPAs with all Minnesota utilities and which sets a price for the electricity that is based on the net present value of energy over a 20-year PPA. A government loan program moreover supports wind energy feasibility studies and transmission interconnection studies for these programs.

Local ownership of energy facilities is therefore already a somewhat common model in Minnesota. Xcel currently buys the total output of power from C-BED projects, of a rated capacity of 85.25 MW, and 142.5 MW from REPI projects, the predecessor of C-BED. Another 240 MW of C-BED projects have PPAs with Xcel, construction pending. Xcel expects to build 450 MW of wind farms and have 940 MW of independent power producers (IPPs) under contract to match their renewables obligation. Not all of that wind power will be generated in Minnesota though (Xcel 2007).

An incentive program, the Minnesota Solar Electric Rebate Program, had already been in place from 2002 through 2008, and resulted in 227 solar photovoltaic installations of an average size of 4.6 kW. Direct subsidies for grid-connected, customer-sited solar electric systems totaled $2.15 million from the Xcel Renewable Development Fund (RDF) and another $200,000 from the state general fund (MN Office of Energy Security 2009). It was continued in 2010, with a target of adding 2 MW annually over three years in small systems (Renewable Energy World, 2010). As mentioned, a number of solar firms already exist in Minnesota. John Wold, speaking for Xcel, is quoted as saying "We know that there's been a lot of anticipation for this in the installer community" (Allbusiness, 2009).

As an interesting new business model around solar energy, Xcel is putting out a pilot project to solar installers to enable them to work as lease-financiers for homeowners with good credit but little cash (Twincities Pioneer Press, 2010). Under the project, the solar installers can receive grants from Xcel's Renewable Energy Development Fund, which they leverage with bank loans in order to give homeowners a lease contract over 15 years. Instead of paying their electricity bill to Xcel, homeowners pay a monthly lease payment to the solar installer—in the published example this was $32 per month compared to the average Minnesota power bill of $79.

Similar business models have sprung up in Germany, without, however, capital grants from the utility. There, the mere standing offer of the so-called feed-in law was sufficient for the generation of these types of models. These rates paid by the utility are recognized as a bankable cash flow by the bank and as potentially more secure than the homeowner's discipline in paying his/her power bill. On that basis, a lease-financing industry has developed that helps finance medium-sized solar power plants. Under that scheme, farmers can utilize their barn roofs for solar power generation-based retirement investments.

In general, many of the beneficial effects of the Minnesota vision and momentum could be harnessed much more easily by a standing offer program (aka "feed-in tariffs") more similar to the German model. It would be offering easy-to-understand and utility-independent conditions under which a utility connects qualifying power plants without lengthy negotiations or permit processes and buys all power that these plants wish to sell. This would allow various market participants, including communities, non-governmental organizations, and private entrepreneurs, to play a more active role and to maximize the local economic impact as in the above-mentioned case of Germany.

Standard offer programs should always be technology-specific and calculated based on cost recovery. Using a feed-in tariff for a relatively moderate deployment target allows to keep feed-in rates low and their impact on electricity rates minimal. It also allows reaping some of the benefits from the overall downward cost trend in renewable energy. Legislation to that effect has already been proposed by the Minnesota state legislature. Renewable energies are currently the only form of energy that shows a consistent downward trend, with or without climate legislation. Thus, they are the ultimate energy security insurance—self-reliance on a downward cost trajectory.

A so-called standard offer scheme would also ensure that the money spent on the Minnesota RES flows into Minnesota projects. In order to incentivize low-cost procurement of renewable electricity, it is open for imported Renewable Energy Certificates (RECS) from other states. Today, judging from their compliance filing with the Public Utility Commission, Xcel intends to procure significant amounts of wind power from outside Minnesota, e.g., from North Dakota and Wisconsin.[12] Thus, the RECS system may ensure low prices, but at the cost of not reaping the full jobs and economic growth opportunities at a local level. Just like paying for coal from other states, Minnesotans pay other states for providing their renewable electricity. A local standard offer program, by contrast, would incentivize local project developers to invest in local capacities. In Germany, this also proved to be the most rapid way of adding renewables to the portfolio. By 2012, Xcel is expected to cover 18% of its electricity from renewables, the other Minnesota utilities 12%.

2. Michigan

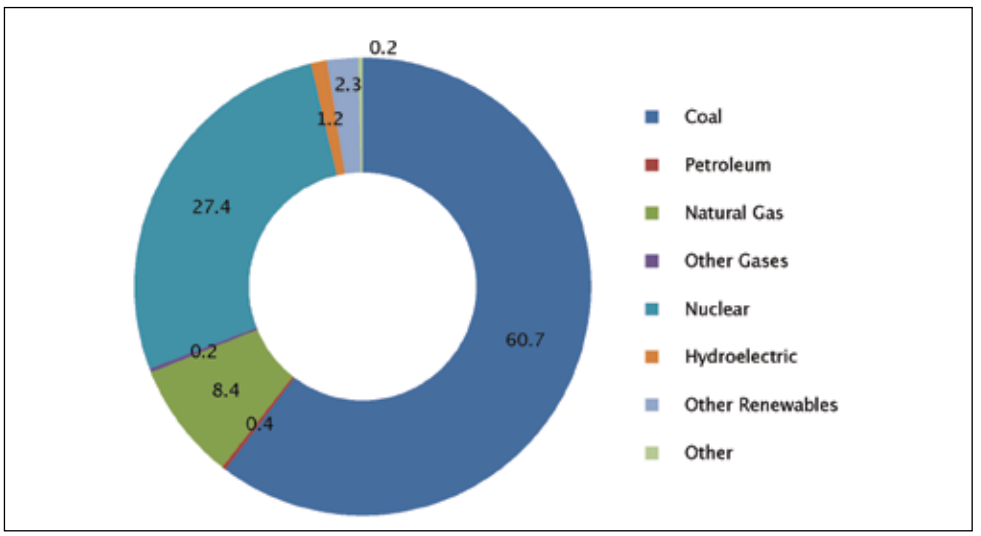
Michigan is suffering greatly from lay-offs following the severe crisis of the automotive industry. At 14% by the end of 2009, the unemployment rate in Michigan was one of the highest of all the U.S. states (Bureau of Labor Statistics, 2010). Although this situation is improving and economic activity is slowly picking up, the impact is still very significant. Of the Michigan workforce comprising some 5 million people, more than 630,000 are still out of a job. The state government has adopted a strategy for diversifying into a number of sectors. Alongside investments in tourism, the film industry, and health services, the government is also putting its stakes in alternative energy innovations, including biofuels and electric vehicles, as well as education. This includes emphasizing workforce development. Some $6 million of federal funding was combined with state funds for a "No Worker Left Behind" program which, by means of alliances among businesses, labor, government, and educational leaders, offers training programs for jobs in green sectors. The program moreover gives tuition support and partners with community colleges, universities, and training facilities (Michigan Government, 2010). The main focus of these measures is to reestablish Michigan's manufacturing base through innovation. Presently, Michigan is already generating innovation through the extensive use of its research capabilities at its two large state universities. In that context, a Centers of Energy Excellence concept has been developed where university research is supposed to be coupled with industry research needs in order to help industry innovate and to help university research find commercial market.

Concurrently, the automotive industry is looking into supplying parts for the wind industry. Some 100 companies are already active in the wind field. Michigan is also home of one of the biggest silicon producers, Hemlock Semiconductor. Another global brand—Dow Chemical—is also expanding into the solar industry. According to the Solar Energy Industry Association (SEIA), Michigan has attracted around 100 solar businesses. The Michigan Economic Development Council confirmed that solar companies ask for a feed-in tariff when they negotiate locational subsidies.

12 Hydro power imports from Manitoba are not eligible for complying with the MN RES.

When faced with the expected downturn of the automotive industry, the state government initiated a comprehensive transformation program in terms of workforce development. Michigan has a RPS in place, which aims to cover 10% of all energy production by renewables by 2015. However, Michigan's current power mix is still dominated by coal and nuclear power (Figure 5; Figure 8). The two biggest utilities, Consumers Energy and DTE / Detroit Edison rely mainly on coal power plants.

Figure 8: Current power mix of Michigan[13]



But, coal power generation has not necessarily proven beneficial for attracting investors at all times. While Michigan's coal share is already lower than that of some of the other Midwestern states, American Express abstained from an investment in a data services center in Michigan because of its large carbon footprint resulting from such a high reliance on coal. Also, Michigan pays around $2 billion per year for fossil fuel imports (Granholm, 2009), including automotive fuels as well as coal. Coal, of which the state has no local supplies, is imported in quantities of 36 million tons per year.

Michigan's 21st Century Energy Plan of 2007 has the objective of providing for the reliable, long-term, safe, clean, and affordable supply of energy. It intends to "strengthen the state's economy by enabling the growth and use of in-state generated resources, unleashing the entrepreneurial talent of developers of renewable and distributed resources and efficiency-related products, and by allowing the state to avoid undue reliance on energy produced by other states." The Plan moreover aims to compensate for potential future losses of power due to Michigan's aging power plant portfolio—in 2007, the average baseload plant was 48 years old (Michigan Public Service Commission, 2007). On the basis of power market simulations, the 21st Century Energy Plan demonstrates how energy efficiency measures and renewable energy can in fact defer coal or other non-renewable baseload additions until 2015. Meanwhile, projects for six new coal power plants have been cancelled due to negative environmental impact assessments. Michigan also has substantial natural gas reserves; however, natural gas has been rejected as an important option for baseload generation by the Plan.

13 Date from EIA website accessed in August 2010

The current law envisions an annual increase of the share of renewables by one percentage point. The regulated utilities need to demonstrate this either through capacity additions or through the purchase of RECs. These costs can be recovered in the form of a surcharge that may not exceed monthly fees of $3 per private household, or higher amounts for businesses. The Public Service Commission reviews these plans from a number of aspects, such as whether they are generally reasonable and prudent and how the cost for renewables compares to the avoided costs of new coal generation capacity, taking into account not only plants in Michigan but also new constructions in Ohio, Illinois, Indiana, Wisconsin, and Minnesota. Utilities are required to build 1,100 MW of plants by 2015, by means of which half of Michigan's 10% RPS obligation will be met by 2015.

Consumers Energy and DTE have developed standing offers for entities in their concession areas that want to invest in renewable energy facilities and sell the power to the grid. The Consumers Energy scheme was capped at 2 MW and filled up within 2 weeks. Residential systems of 1 to 20 kW and non-residential systems of 20 to 150 kW qualified for a rate of $0.65/kWh and $0.45/kWh respectively in a first round, and $0.525/kWh and $0.375/kWh in a second round. Consumers Energy has received applications for more than three times the program size, but has not expanded the program. Given the $3 impact limit on consumers' power bills, Consumers Energy has only limited incentive to procure and offer renewable power at cheaper prices.

A study by Michigan State University's Land Policy Institute (Adelaja and Hailu, 2007) has estimated the impact of a continuation of the growth track indicated by the RPS for the state. With some 780 MW of wind deployed per year, over a long period of time, Michigan could reach a total of 16,000 MW in 2029. On the basis of NREL's JEDI model, the authors estimate that this will create around 300 recurring or permanent jobs in operating and maintaining wind turbines in 2010, and 3,000 in 2029, as well as 1,100 construction jobs per year over the next two decades.

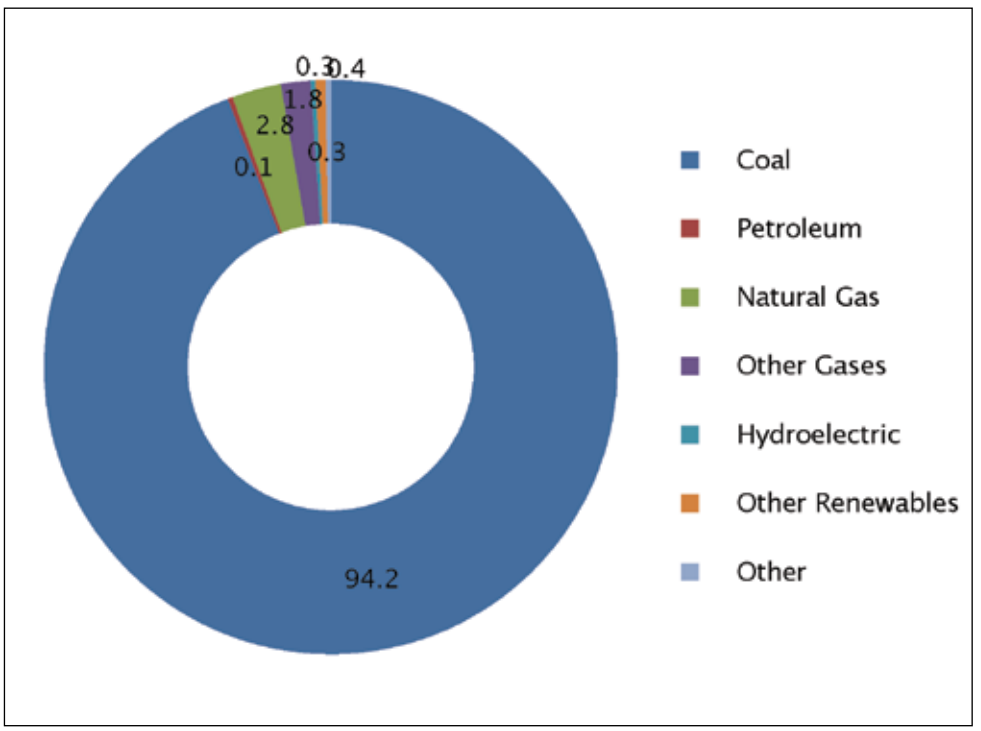
The German experience illustrates that this is a realistic assessment, if not conservative as it leaves out a number of associated job opportunities and innovation options as well as a considerable number of spinoffs. For example, a popular model for wind farm financing in Germany is based on a financial participation model where private households buy shares in the wind farm. The standing offer rate in Germany is calculated in such a way that it results in just a slightly better internal rate of return than a standard bank product with little risk and safe returns (e.g., a money management account). This kind of financing scheme can provide additional benefits for pension funds or private retirement schemes.

Another lesson from Germany could be adapted to Michigan thanks to its excellent academic and research capabilities: Many of the growing pains in German wind turbine manufacturing have been mitigated by the 250 MW wind measurement program that sponsored a monitoring program for the operation of the first ten years of a large sample of wind turbines. Although today's technical challenges are different, technological leadership for the 21st century poses new challenges, such as the integration of wind power and electric cars that would lend themselves to similar programs in Michigan and throughout the Midwest.

3. Indiana

Indiana's power mix according to EPA data is shown in Figure 9. The state depends on coal for more than 94% of its power consumption.

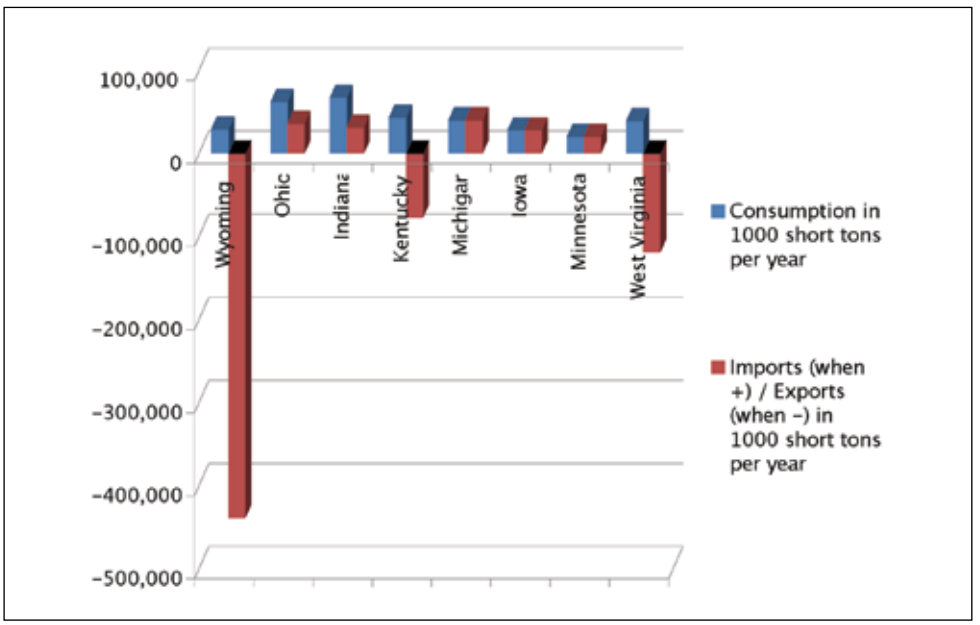
Figure 9: Current power mix of Indiana[14]



According to a recent ranking, Indiana is the sixth most coal dependent state of the United States. In fact, it is a member of the "billion dollar club," meaning that the state's annual net expenditure on coal imports is larger than $1 billion per year (Union of Concerned Scientists, 2010). This means that for every person living in Indiana, $178 are exported to other states for importing coal.

14 EIA electricity data for 2008, accessed August 2010

Figure 10: Coal consumption and coal imports and exports by several states[15]



Although Indiana has no renewable portfolio standard to date, a considerable push toward renewable energies does exist. A number of local associations pressure for a more renewable-friendly regulatory framework, along with a small number of local renewable energy technology suppliers. The governor's website points out that all Indiana utilities are to some degree active in the field. The Indiana Wind Working Group, supported by the Indiana Office of Energy Development, grew from 200 members in September 2008 to more than 450 by the end of 2009 (U.S. DOE, 2010). The Northern Indiana Public Service Company (NIPSCO) has PPAs with wind farms in Iowa and South Dakota. And, despite the absence of renewables obligations in Indiana, NIPSCO seems to see a market in wind power. Indianapolis Power and Light is preparing special incentive programs and standard offer programs in order to diversify their generation, comply with an anticipated portfolio standard, and include their customers in the opportunities for supplying renewable energy. While they found net metering to be ineffective, particularly for large customers, they do expect that a standard offer program similar to a "feed-in" provision will create business opportunities for Indiana suppliers and contractors.

Thus, regardless of the lack of an RPS, Indiana has already achieved significant growth in the area of wind deployment, particularly over the course of 2009.[16] Indiana is blessed with two major factors that contribute to the successful deployment of wind energy: One, a relatively good wind resource; though not quite as good as in some other areas in the United States, it is good enough to be able to generate wind power at commercially viable costs. Secondly, the seat of Midwest ISO is in Carmel, Indiana, making the state a transmission hub between the Great Plains and the load centers of the East Coast. Due to these two factors, Indiana has been able to attract more than $2 billion in investment in wind turbines without any policy support for wind. One kW of wind costs around $2,000 to erect. As the fuel is free, operating costs are very low. In fact, wind power

15 National Mining Associations. Statistics from their website as accessed in August 2010.

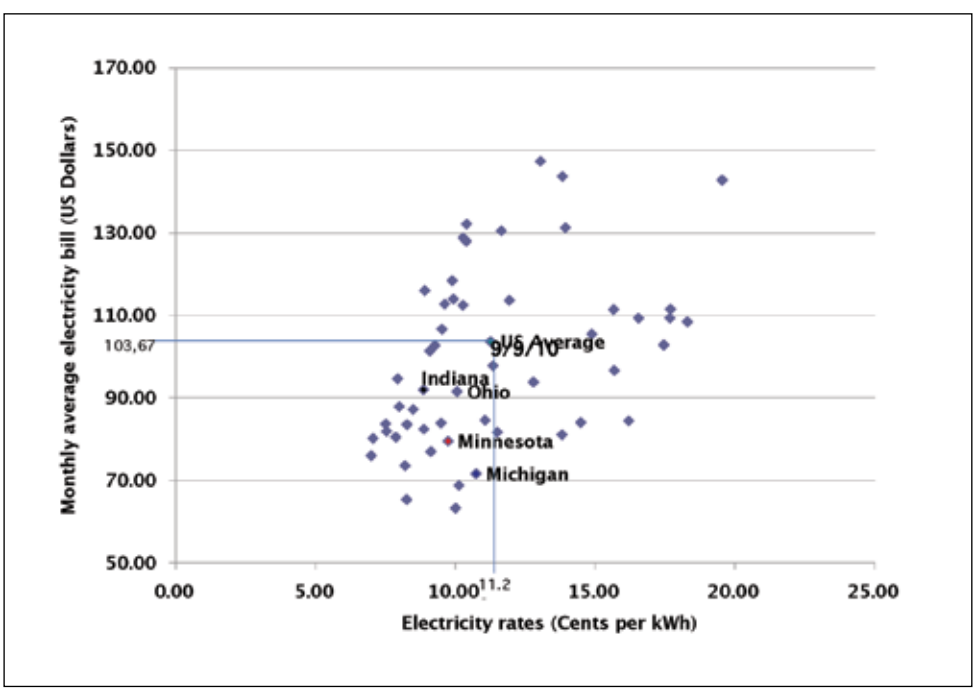
16 Please note that the data provided in Figure 9 are for 2008.

is potentially cheaper than power produced by new coal power plants. And, if Indiana manages to retool its automotive industry to manufacture wind parts, the value chain could be completely localized so that all revenues from wind parks remain in the state. This could be promoted by means of a local support policy providing a stable and long-term investment framework into renewable energy generation capacity and local markets for the electricity.

Currently, almost none of the wind power generated in Indiana is sold in Indiana. Most of it is contracted to out-of-state utilities that use it to fulfill their RPSs. No government mandate requires Indiana utilities to include renewables in their portfolio or to build wind farms.

As shown in Figure 11, the average electricity rate in Indiana is in fact rather low, at 8.87 cents/kWh. However, the average bill of an Indiana household amounts to $91.94 per month. Though lower than in Kentucky, it is still higher than in Ohio, Michigan, Minnesota, or even Utah. Coal states like Wyoming and West Virginia have average household electricity bills of $73.56 and $80.15, respectively. Electric rates there are cheaper (8.21 cents in Wyoming compared to 8.87 cents in Indiana), but monthly consumption is also lower (896 kWh in Wyoming compared to 1,036 kWh per month in Indiana). Minnesotans use 817 kWh per month and Michigan households only 666 kWh. The weather in Indiana is cold in the winter and hot in the summer; thus, a substantial proportion of this energy goes into heating and cooling. Weatherizing homes would put people at a cost advantage and employ local contractors. Yet, in 2007, Indiana spent less than 10% of the national average on electricity efficiency programs—to give an indication of the priority which energy efficiency holds in the state (Union of Concerned Scientists, 2010).

Exhibit 11 Average power bills and power consumption in various US states[17]



17 U.S. EIA statistics for 2008; http://eia.doe.gov/electricity/esr/table5.html

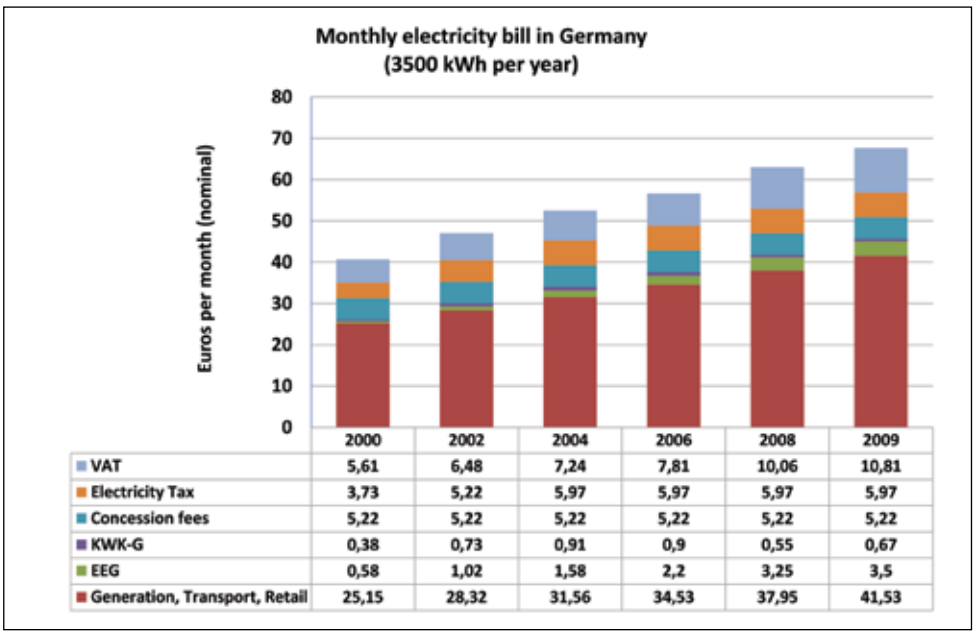
Conclusion

Renewable energies require more local labor than other energy industries. While some of these jobs are in manufacturing the renewable energy plants, the greater part pertain to installing and operating those plants—thus, jobs that stay in the area in the long run and that cannot be outsourced to other places.

Using renewables locally allows to close a local economic cycle. Most modern lifestyles require energy inputs, and therefore most people will incur energy expenses. Closing the local cycle of energy expenses allows to generate this revenue for communities rather than importing fossil fuels from elsewhere. Few locations can rely on their own fossil fuels. Most places, however, can generate some or all of their energy needs locally from renewables and thereby increase local energy security and local economic opportunities. The German example also demonstrates that a local industry for renewable energy equipment is easier to develop and maintain when there is a local market for their product. Without a consistent home market for renewable energy deployment, Germany would not be a world leader in manufacturing those technologies.

However, creating this local economic opportunity almost always requires making it a policy priority. Standard offer programs (aka "Feed-In Tariffs") as implemented in Germany or Ontario have proven to be the most effective policies so far. A number of design principles need to be observed in order to keep them cost-efficient. Most importantly, technology-specific purchase rates must be adjusted regularly to falling equipment prices, grid connection rules must be clarified, and red tape minimized. If heeded, everybody can invest in becoming an IPP. The hundreds of thousands of photovoltaic rooftops in Germany represent the many energy entrepreneurs who earn income off their investments, who are demonstrating their green conscience, and who are playing a role in energy policy as a new group of stakeholders. Finally, the income from these installations goes to local businesses rather than to foreign fuel suppliers.

Figure 12 Costs for renewable electricity scheme in Germany[18]



	2000	2002	2004	2006	2008	2009
VAT	5,61	6,48	7,24	7,81	10,06	10,81
Electricity Tax	3,73	5,22	5,97	5,97	5,97	5,97
Concession fees	5,22	5,22	5,22	5,22	5,22	5,22
KWK-G	0,38	0,73	0,91	0,9	0,55	0,67
EEG	0,58	1,02	1,58	2,2	3,25	3,5
Generation, Transport, Retail	25,15	28,32	31,56	34,53	37,95	41,53

This success begs the question for the price tag. The cost for the electricity rates that are paid to the producers of renewable electricity rates in Germany are borne by all electricity consumers with the exception of the electricity-intensive industries. Figure 12 shows the recent price increase that an average household with an annual power consumption of 3500 kWh has incurred over the last 9 years. The surcharge for renewable electricity has risen from 60 cents per month in 2000 to €3.50 in 2009 (see "EEG" in the figure). This rise is due to the rapid increase in renewable electricity production. However, the overall upward trend of the cost—from €40 per month in 2000 to almost €70 in 2009—is not determined by this surcharge. Rather, it is determined by rising costs in the generation of other types of electricity, including wheeling fees but also other costs of the utilities in Germany.[19]

In Germany, this legislation is implemented at the federal level with a policy applicable to all utilities. The discussion of the three U.S. states has demonstrated that some utilities in the Midwest use a similar policy instrument to fulfill their mandate or to diversify their supply portfolio. With that, they source from local suppliers and do not need to purchase renewable electricity from out of state or worry about transmission bottlenecks. However, most of these programs are pilots and extremely limited in scale, scope, and duration. In order to maximize the job benefits of these policies, it is necessary to make these frameworks stable and reliable and to have them implemented for as large a market as possible. This is where state policies can be more effective than initiatives of single utilities, and where a harmonization of economic growth policies and energy policy can be most beneficial.

18 Data from BMU, 2010a

19 The overall power price in Germany is not regulated but determined by a market process. Consumers in all concession areas can choose between a large number of retailers who often offer several different power products, including green power products.

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All online sources have been consulted between April and September 2010.

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This two-year program by the Heinrich-Böll-Foundation's offices in Washington, Prague and Brussels aims at building a transatlantic policy network to support key regions—the Midwest and Southeast of the United States as well as Central and Eastern Europe—in developing economic - and policy tools that will enable them to successfully transition to the low-carbon economy of the future. The program will function as a framework for maximizing policy exchange and mutual learning by comparing the economic and political strategies and approaches of the respective political systems, - bottom-up in the U.S., top-down in the EU. In particular the strategies will address the needs of regions that are currently facing economic downturn and structural change by identifying policy tools for generating new jobs and spurring investment in energy efficiency, renewable energies and sustainable transportation.

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