HEINRICH BÖLL STIFTUNG
The Green Political Foundation

Three Hundred Thousand Clean Energy Jobs

Low carbon growth in Germany and the U.S.

By Christine Wörlen

THE CLIMATE NETWORK
Transatlantic Solutions for a Low Carbon Economy

www.TheClimateNetwork.org

Three Hundred Thousand Clean Energy Jobs

Low carbon growth in Germany and the U.S.

Christine Wörlen is the Midwestern Green Jobs Fellow 2010. From February to September 2010 the former Head of the Renewable Energy Division of the German Energy Agency dena, supports the Midwestern Green Jobs Project of the Heinrich-Böll-Foundation and the Blue Green Alliance.

Based on research and discussions with stakeholders from the Midwest, Christine asseses current and future measures of job creation in the field of renewable energies and energy efficiency. The policy measures will be presented and discussed during the Midwestern Green Jobs Tour 2010. Key findings from the tour will culminate in a report of policy recommendations that will be presented in Washington, DC prior to the Congressional elections.

The Climate Network-Transatlantic Solutions for a Low Carbon Economy
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.

The Heinrich-Böll-Foundation
The Heinrich-Böll-Foundation is a 501c3, non-profit organization striving to promote democracy, civil society, human rights, international understanding and a healthy environment internationally. Headquartered in Berlin, HBF has 28 offices worldwide. The Washington D.C. office was created in 1998 to support HBF's international efforts. Today, HBF cooperates worldwide, with over 200 partner organizations in more than 60 countries. As a think-tank, HBF provides expertise on issues related to the foundation's mission and in promoting transatlantic exchange in different program areas, in particular on energy and climate policy.

For more information on the Midwestern Green Jobs Project please contact Mr. Till Kötter at +1 202 464 4930 or mail to till@boell.org .

www.TheClimateNetwork.org

Three Hundred Thousand Clean Energy Jobs

Low carbon growth in Germany and the U.S.

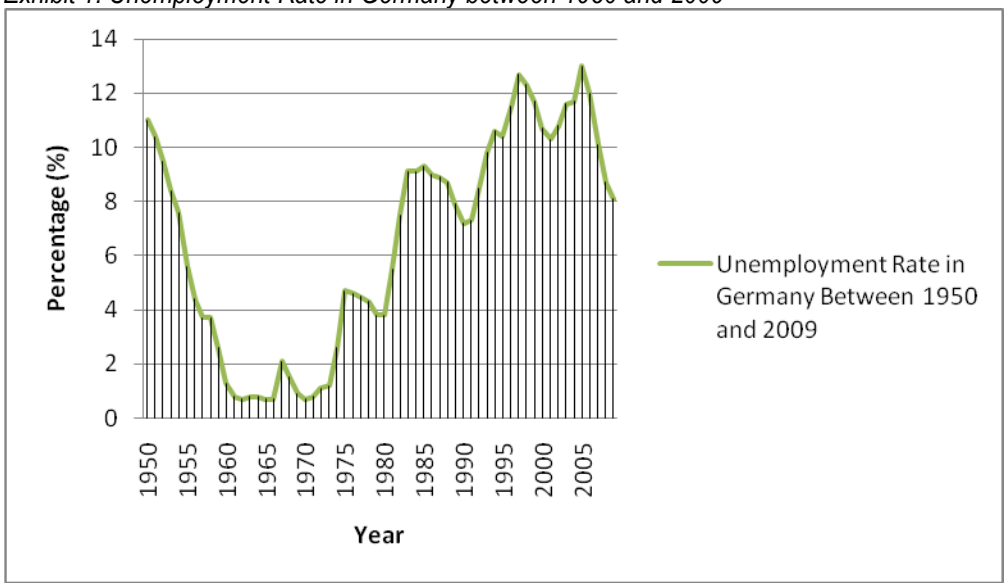
Germany has managed to create a resilient industry in a forward looking policy arena and technology sector that "does well by doing good": Renewables created at least 300,000 jobs according to the official statistics. In reality, the numbers are almost certainly higher. Renewables can create income in many more ways than traditional energy systems, and give jobs to many more people per unit of energy used.[1] In addition, they are good for the environment and improve energy security: all renewables are local.

I. The Renewable Sector has made the German economy more resilient

1.Germany after the World Financial Crisis

Based on the International Monetary Fund, World Economic Outlook Database released in April 2010, Germany is the world's fourth largest economy in terms of Gross Domestic Product, after the U.S., Japan, and China. Like the Midwest regions in the U.S., Germany is traditionally export-oriented, and has a strong manufacturing sector in the capital goods and car industries. In fact, the auto industry claims that every other job in Germany depends on the automotive supply chain. Unlike the U.S., however, the German economy has already overcome a major transformation in the 1990s with the integration of the Eastern 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 high unemployment figures. At times, up to 13% of the workforce were out of a job (cf. Exhibit 1).

Exhibit 1: Unemployment Rate in Germany between 1950 and 2009[2]



The Bundesländer (states) of the former East, the so called "New Bundesländer" were hit hard by this transformation, but the old West German economy was also severely affected by the

[1] Wei et al. (2010)

[2] Source: Bundesagentur für Arbeit

integration in the 1990s. In some areas in the East, unemployment hit as much as 25%. As a result, unemployment is a politically sensitive topic in Germany, and a number of policy instruments were developed to help safeguard the German work force against short-term fluctuations of the economic activity. Examples of these instruments are policies that make energy more expensive as an input to economic activity, and make labor more affordable in order to promote employment and energy efficient economic activity. Other sets of policies and incentives directed at green technologies projected to be in future demand have also contributed to putting German industry on a growth path.

In the most recent financial downturn, these policies have helped Germany minimize the job losses. In fact, as of June 2010, the first signs of an end of the recession come in sight when 21,000 jobs were created, while 38,000 were generated in May and 62,000 in April.[3] This was seen as a sign that this recession has not damaged Germany's economy as badly as other economies. The aforementioned statistics also imply that when the global economy recovers from its current downturn, Germany is in a position to benefit more quickly than other economies. For these economies are not as ready and its businesses will incur longer lead times between increased demand for their goods and services and their readiness to deliver them. Moreover, Germany has a number of important industrial sectors that have shown to be quite resilient towards the global recession.

2. Germany's renewable energy sector

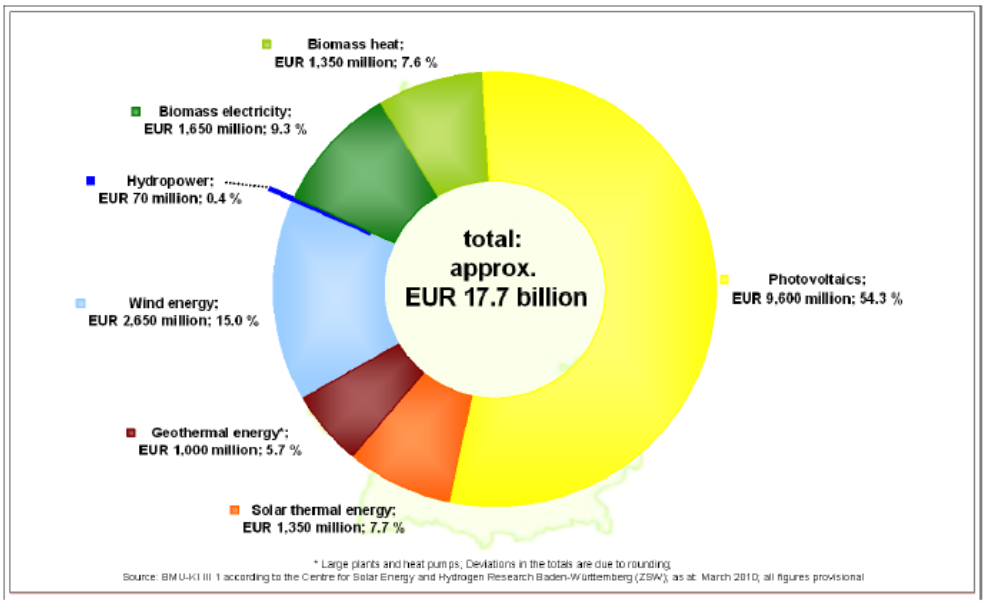
One of these sectors is the renewable energy sector. In fact, the historic growth trend of the industry in Germany has continued unabatedly, and has been called "solid as a rock" even in times of a global economic crisis by the German Minister of Environment, Norbert Röttgen.[4] As Exhibit 2 shows, new generation and conversion facilities have attracted a total investment of €17.7 billion in 2009. This level of investment came 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.

Exhibit 2: Investments in plants for the use of renewable energy sources in Germany in 2009[5]

[3] Corrected for seasonal effects. Uncorrected: 88.000 jobs more than in May. According to the Press Release of the Bundesagentur für Arbeit. 30. June 2010, http://www.arbeitsagentur.de/nn_27030/zentraler-Content/Pressemeldungen/2010/Presse-10-038.html

[4] Press Release, German Ministry for the Environment, Nr. 041/10, Berlin, 24.03.2010

[5] From: BMU (2010): Development of Renewable Energy Sources in Germany 2009. Published: 18 March 2010



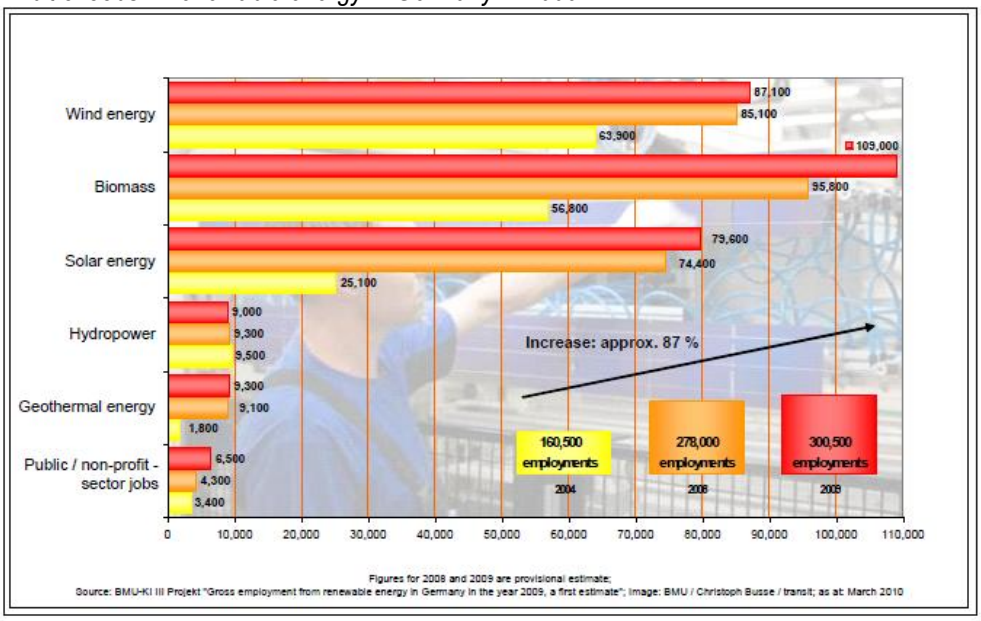
Over the last 20 years, Germany has built up a complete supply chain for many renewable energy technologies in the country. Some of the German companies that build wind turbines and solar panels are among the biggest in the World. The global market leaders for solar power inversion technology come from Germany. In the area of biogas, a whole industry has developed building biogas fermenters and specialized CHP 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 plant and biofuels conversion technologies.

Apart from large companies, a large number of small and medium size suppliers produce equipment like solar collectors, integrate various components to make solar power systems and actually mount and install these systems. Another specialized industry has developed in the service sector, 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. Energy is also a big job creator in the agricultural sector as more and more people use biomass energy to heat their homes and generators.

As Exhibit 3 demonstrates, the narrower field of specific renewable energy-related jobs employs around 300,000 people. According to the official statistics, biomass energy alone generated 109,000 jobs. This is more than Germany's only domestic energy source – lignite – can provide with its whole supply chain. In the lignite industry, from mining the coal in open pit mines to electricity coming out of the power plant, only 50,000 people are employed[6]. Biomass is in fact the only type of renewables that is comparable in its value chain with fossil fuels: here the fuel production is a separate step, and can possibly generate jobs and revenues. All other renewable technologies do not.

[6] DEBRIV (2010): Bundesverband Braunkohle. http://www.braunkohle-wissen.de/#arbeitspl [07-06-2010].

Exhibit 3: Jobs in renewable energy in Germany in 2009[7]



Experts concur in the assessment that this figure underestimates the actual number of jobs relating to renewable energy by a significant amount. A number of classic trades like electricians are not systematically included in this study. However, a recent survey by the Central Association of Electricians ZVEH shows that an astonishing 37% of the German electric contractors are active in the field of solar energy. They claim that electric contractors alone generated around €13 billion with solar energy in 2009 – which again demonstrates that the official statistics underestimate the actual economic impact of renewable energy deployment in Germany greatly.

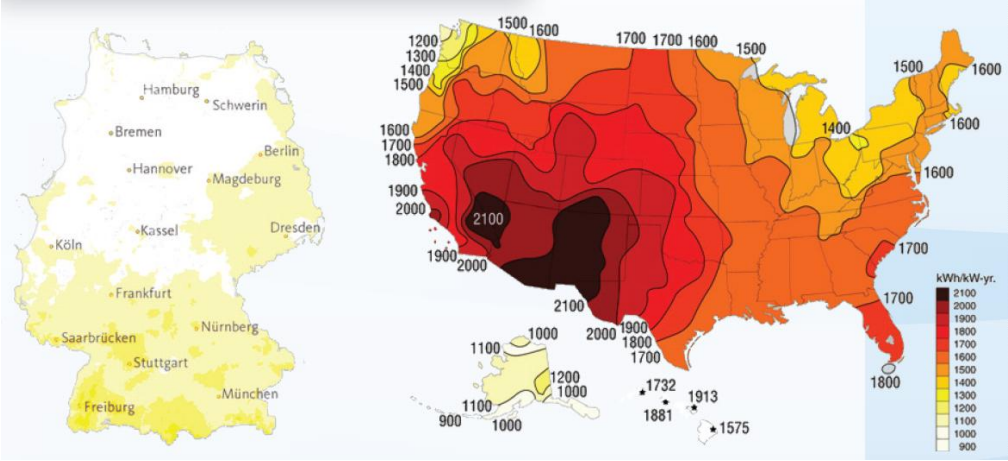
II. What makes Germany so successful in renewable energy?

Germany is a resource-poor country. Its only domestic energy resource that can be exploited without government subsidies is lignite – a high-sulfur low-calorific coal and a small amount of natural gas. Most of Germany's energy comes from abroad: oil from European neighbors, Russia and OPEC countries, natural gas is mostly imported from Russia. In terms of energy security, Germany's dependence on foreign energy resources is comparable to the situation in the U.S.

Unfortunately, Germany is also not blessed with renewable energy resources. In terms of area, Germany (137,847 sq miles) is smaller than North and South Dakota combined (140,878 sq miles). In terms of its renewable energy resources, Germany is much worse in comparison to the U.S. Midwest region. For example, the sunniest places in Germany are comparable with Seattle, Washington (cf. Exhibit 4). Even Ontario's solar radiation regime is 25-30% better than Germany's. The German wind resource is average in its best locations. Last but not least, only 4.9 million acres of agricultural lands can be used for biomass energy production to safeguard Germany's environment and food security. In comparison, Iowa alone grows corn on more than 12 million acres of agricultural lands.

[7] From: BMU (2010): Development of Renewable Energy Sources in Germany 2009. Published: 18 March 2010

Exhibit 4: Solar resources of Germany and the US compared[8]



Germany has a number of other factors that make it difficult to deploy renewables. For example, in North and South Dakota there are on average about 10 people per square mile, while there are 593 people per square mile in Germany who share that living space. A total of approximately 82 million people share the same space as North and South Dakota's 1.46 million. Therefore, space is scarce in Germany. So how was it possible that Germany became a global leader in renewables? The answer lies in the German legal framework, which allowed its industry to grow, deploy and innovate in the field of renewable – a field that always held the promise of providing safe and sustainable energy that can grow locally. This framework exist not only in industrial development – in fact, in this field there was little distinction between renewable energy technologies and other industrial segments – but rather in downstream development and the creation of market demand for these technologies.

1.Policy frameworks for renewable energy deployment in Germany

The development of the German renewable energy industry was triggered and sustained by a steady support of the deployment of renewable energy technology in the German national energy system. A set of legislative and policy measures 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. The accommodating environment for using the renewable energy technologies in Germany also attracted a significant number of foreign companies to set up manufacturing facilities (e.g. for solar modules in Germany).

The electricity sector

This is particularly true for the renewable electricity generation. 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 the utility had to purchase power from hydro and wind power plants, modeled on 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 law was expanded and amended regularly so as to ensure continuous growth of installations and produced amounts of electricity. In 1999, the law was expanded to include solar photovoltaics which until then had been supported through a subsidy program for the first

[8] Wörlen, after NREL

"100,000 solar roofs". In 2000, 2004 and 2009, further versions of the law included additional specifications and differentiations. The law contains a detailed tariff schedule. Tariffs are guaranteed for 20 years for most technologies, vary by technology and other aspects (e.g. size of plant, resource quality). By the rules of "degression", tariff for new plants go down every year by a pre-specified percentage.

There is no overall limit to the capacity that can be installed under this system. The law contains a priority grid access provision which specifies that the grid operator has to provide grid access to the renewable energy power plant. If necessary, the grid operator has to reinforce the grid in order to evacuate the power. In addition, the grid operator has to purchase the power generated at the plant at the specified rate, and has to sell it at the power exchange. The difference between the power price at the exchange and the tariff can be charged to a virtual nationwide pool that is reimbursed from the "EEG-Umlage", a surcharge on every power customer's bill. Energy intensive industries can apply for a cap of 0.05 Cents per kWh on this surcharge. Household customers in 2009 paid an additional €3.5 per month for electricity under this law.

The EEG, aka "Feed-in-Tariff", was very effective in deploying renewable electricity generation. It has been supported by other legislation, for example a federal provision that allowed communities to implement zoning changes that favored the deployment of wind power in specifically zoned areas and kept it out of nature reserves. Loans were made available through a federal program that allowed the national development bank KfW to lend at a fixed below-market rate.

Heating with renewable energy

In the renewable heat sector, Germany's main policy instrument was a federal subsidy program that supports several residential and industrial heating technologies. The catalogue of eligible technologies is adjusted annually, to account for changes in the market that made technologies more competitive. For example, specific types of wood-based heating systems were at some stage excluded from the list. And solar water heating was always supported by this program. The biggest challenge of this program is to secure a steady and reliable flow of funds from the federal budget. Almost every year the program discontinues the funding activity midyear when it runs out of funds. Sustainable market introduction and a sustained reduction of equipment costs – the actual objectives of the program – thus could not be achieved in an optimized fashion for the German national market, and the market did not develop as fast as for renewable power production. In order to strengthen this market, the Renewable Heat Law was introduced in 2008. It requires that home owners who renovate or refurbish their house, have to start covering a share of their heat requirements from solar, biomass or district heating.

Biofuels

The policy support for biofuels was less consistent. The German government's objective in this area was to make Germany less dependent on energy imports. The first support measure taken in 2004 was a tax exemption for biofuels in transport and heating. Particularly transportation fuels are taxed very strongly in Germany - more than 2 Euros per gallon – and the tax exemption put biofuels slightly cheaper than fossil-based car fuels. In 2006, the tax exemption was replaced step by step by a fixed quota of all transportation fuels to be covered from biofuels. In 2007, only pure biofuels were eligible for tax exemptions. By the end of 2007, biofuels already accounted for 7.6 % of total fuel consumption in Germany. 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. A binding EU target exists for all member states for a minimum share of 10% of biofuels of all fuels consumed in the transportation sector. In 2009, the EU Directive on Renewable Fuels, started to require a

reduction of at least 30% in lifecycle GHG emissions from a fuel in order to be classified as a biofuel.

2. Action on the State level or on the Federal level?

The Midwestern States have identified Green Jobs as a paradigm for adapting the Midwestern industry structure to a changing economy. This is a timely and well placed strategy. As the German example shows it can make the local economy more resilient to global trends and keep money in the State. But would the State or Federal level be the right place to act? Surprisingly, the State level in the US compares much better to the country level in Europe than the Federal level, which in turn compares well to the EU level.

Looking at the European example, the Federal level in the US is most comparable to the EU level in Europe. First of all, the geographic size and scope and some other descriptive factors are much more comparable between the EU and the US, as Exhibit 4 demonstrates. That comes along with a significant variation in value systems and cultural trends and habits that are both to be found in the EU as well as the USA.

Exhibit 4: Statistical comparison between the US and the EU

	EU	US
Population (2006)	494 million people	300 million people
Area	4.3 million km²	9.6 million km²
GDP	16.8 trillion $ p.a.	13.78 trillion $ p.a.
GDP per capita	27,750 $ p.a.	41,770 $ p.a.
Energy demand (2006)	1,722 Mtoe	2,319 Mtoe
GHG emissions from energy (2006)	3983 million metric tons	5697 million metric tons

In terms of energy policy, the EU governing bodies are setting overall goals and targets and force the EU member states to cooperate and potentially coordinate their national policies. For example, the renewable energy goal is set for all member states, but it is up to the member states to decide which policy instruments and tools they want to employ in order to reach their goals. Transnational harmonization of e.g. transmission infrastructure takes place mainly through decisions on grant support for specific lines. In fact, the EU even has a common electricity and gas market. The EU electricity market directive of 1999 requires unbundling of generation, transmission and retail of the electricity markets in all countries. The continental EU is covered by one big electricity grid (UCTE) in which the transmission system operators follow a common set of rules.

Similarly, the US federal level is not prescribing many details in terms of policy. It is not even detailing what renewable share each state should strive to achieve. The U.S. Department of Energy is focusing on energy technology development and the administration of grants. The only regulatory agency with significant regulatory authority is the FERC which deals with transmission issues if they affect more than one state. Washington does not have a mandate to regulate state power markets, just like Brussels does not. With regard to energy policy, the action is on 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. Looking at historical figures, this is a staggering

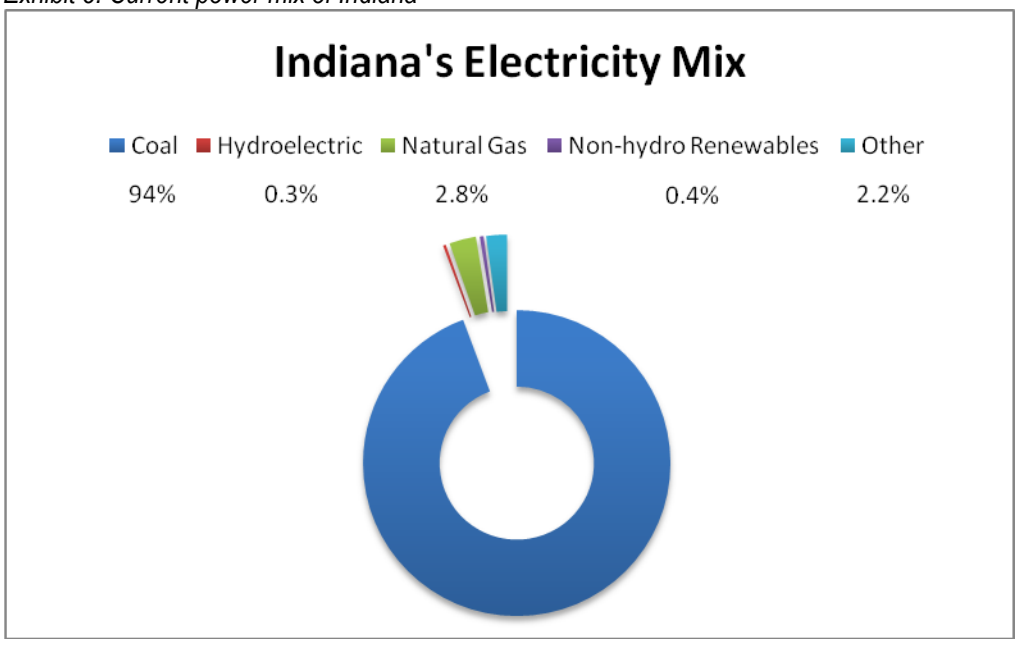
increase. In 2005, Germany's share of renewables in final energy consumption war 5.5%. In fact, all EU member states have such targets, and for all of them, considerable effort is necessary to reach that target. Germany is about to submit its plan on how to do that to the EU. In this action plan, Germany will specify that most of this increase will take place in the renewable electricity area. The feed-in tariff has been much more effective than any of the other policy schemes (investment subsidies, RPS) that have been employed in Germany that the government feels most confident about this instrument. It trusts that this scheme will be able to more than double the share of electricity coming from renewables by 2020. Almost 40% of Germany's electricity will then come from wind, solar, hydro and bioenergy.

III. Which of the lessons learned could be applied to the states of the U.S. Midwest?

1. Indiana

According to a recent ranking, Indiana is the sixth most coal dependent state of the U.S. In fact, it is a member of the "Billion-Dollar-Club", which means that the state's annual net expenditure on coal imports is larger than $1 billion per year.[9] This means that for every person living in Indiana, $178 are exported to other states for importing coal (see Exhibit 5). Despite the aforementioned, Indiana has already achieved remarkable growth particularly in the area of wind deployment. For the state is blessed with two major factors that help towards successful wind deployment: factor number one is its relatively good wind resource. Even though Indiana's wind resource is not quite as good as in some other areas in the United States, it is good enough to generate wind power at commercially viable costs. This wind power is then exported to other states, thanks to the second blessing factor – the Midwest ISO in Carmel, Indiana. This geographic advantage ensures that transmission capacity is available and that wheeling fees are kept relatively low.

Exhibit 5: Current power mix of Indiana[10]

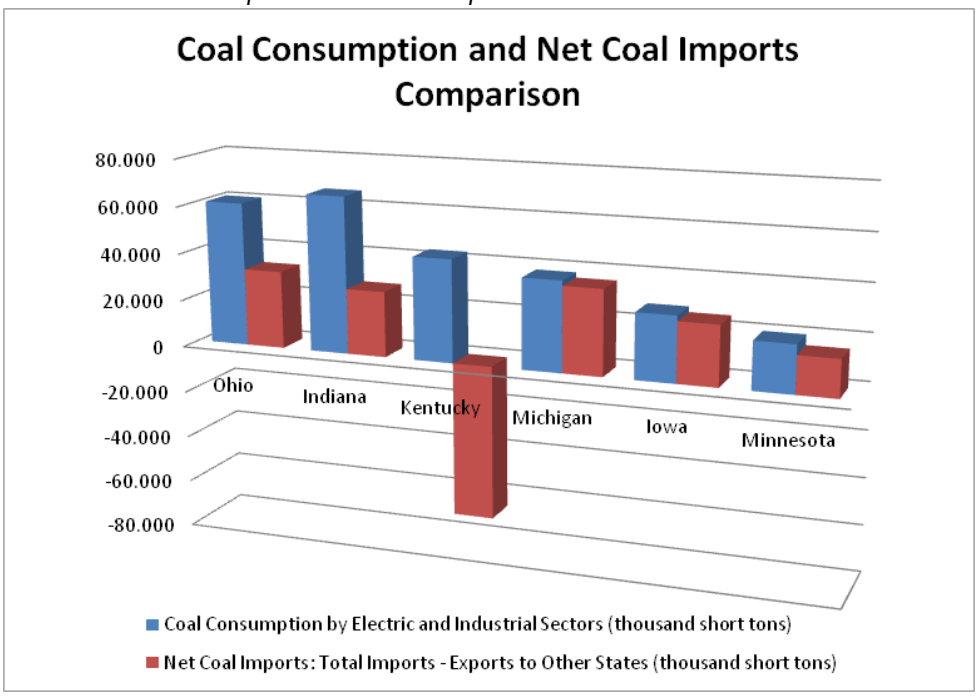


[9] "Burning Coal, Burning Cash: Indiana's Dependence on Imported Coal." *Union of Concerned Scientists* (2010): 1-2. Web. 7 Jul 2010. <http://www.ucsusa.org/assets/documents/clean_energy/UCS-BCBC-factsheet-Indiana.pdf>.UCS – Burning Coal (2010)

[10] UCS – Burning Coal (2010)

Due to the aforementioned factors, Indiana has been able to attract more than $2 billion in investment in wind turbines without any policy support for wind. A kW of wind costs around $2000 to erect. The fuel is free which makes for very low costs of operating wind farms. In fact, potentially this wind power is cheaper than power produced by new coal power plants. And if Indiana manages to retool its automotive industry to make wind parts, the value chain could be completely localized so that all revenues from wind parks remain in the state.

Exhibit 6: Coal consumption and net coal imports[11]



In order to maximize the benefits from the link between green jobs and energy, residents in Indiana could look at their electricity bills and do the math. The average electricity bill of an Indiana household is $91.94 per month[12]. This is lower than in Kentucky, but it is 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 lower (896 kWh in Wyoming compared to 1,036 kWh per month in Indiana). The weather in Indiana is cold in winter and hot in the summer which makes for a large amount of this going into heating and cooling. Weatherizing your home would put you at a cost advantage much faster, and employ a couple of local contractors - with a solar roof these benefits multiply. In 2007, Indiana spent less than 10% of the national average on electricity efficiency programs, if that is any indication of the priority that energy efficiency takes in the state.[13]

---

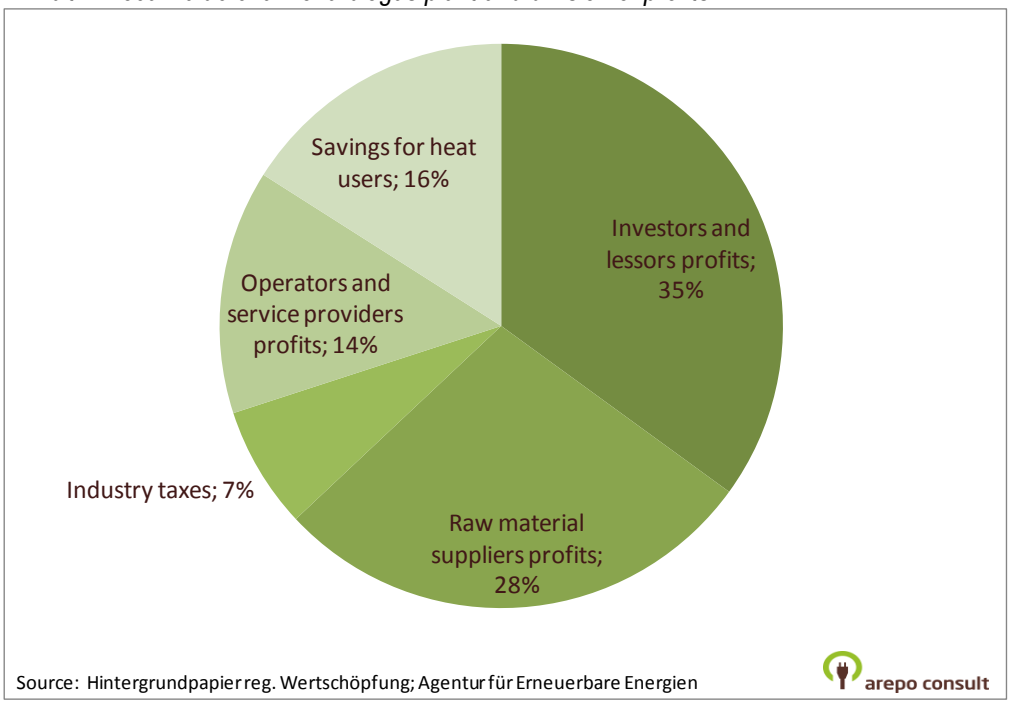
[11] Deyette, Jeff, and Barbara Freese. "Burning Coal, Burning Cash: Ranking the States that Import the Most Coal." *Union of Concerned Scientists* (2010): 49-53. Web. 7 Jul 2010. <http://www.ucsusa.org/assets/documents/clean_energy/Burning-Coal-Burning-Cash_full-report.pdf>.

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

[13] UCS- Burning Coal 2010

Last but not least, Exhibit 7 uses the example of a biogas-based combined heat and power plant to demonstrate how local renewable energy can help keep revenue local.

Exhibit 7: Local value chain of a biogas plant and division of profits[14]



The data in the above-referenced exhibit demonstrates that thirty-five percent of the revenues go to the investor of the plant and the owner of the land on which the biogas plant is located. Twenty-eight percent of the revenues go to the supplier of the feedstock. Fourteen percent go to local service providers. Sixteen percent are the original investment and go to the plant suppliers. Finally, seven percent of the revenues go to the local tax authority which can then improve schools and infrastructure. Thus, if the plant production is done locally, 100% would go to local communities and support economic and job growth. Without the support of local policies, though, some of these funds will leave Indiana for the respective home states of e.g. the wind turbine manufacturer or the power plant investor.

2. Minnesota

Minnesota has taken important steps towards reaching this goal. The 25x'25 initiative demonstrates public leadership and works with a multi-pronged approach combining sticks-and-carrots: an effective Renewable Energy Standard with grant programs (e.g. for solar or weatherization, among other things from ARRA funding). In Minnesota, wind energy deployment is a little further advanced than in Indiana and it has also achieved a few percent of its PV target. The Office of Energy Security states that on the basis of Minnesota's solar resource, solar PV is a viable energy option in the state.

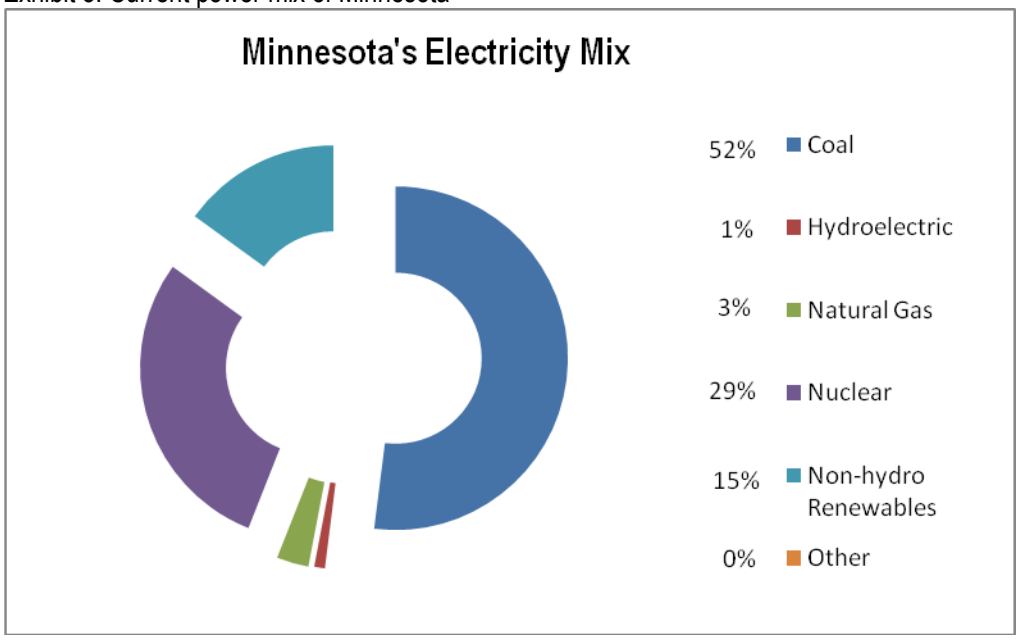
Local ownership of energy facilities is already a more common model than in Indiana.[15] Here, the potentially beneficial impacts of feed-in tariffs have already been analyzed in recent papers that show that in order to produce 5% of the State's power consumption by wind and solar –

[14] Based on Agentur für Erneuerbare Energien 2009, p.10

[15] Farrell, 2009.

resulting in 1,040 MW of wind and 151 MW of solar PV by 2024, the cost to Minnesota ratepayers would be peaking at 41 Cents per month and household.

Exhibit 8: Current power mix of Minnesota[16]



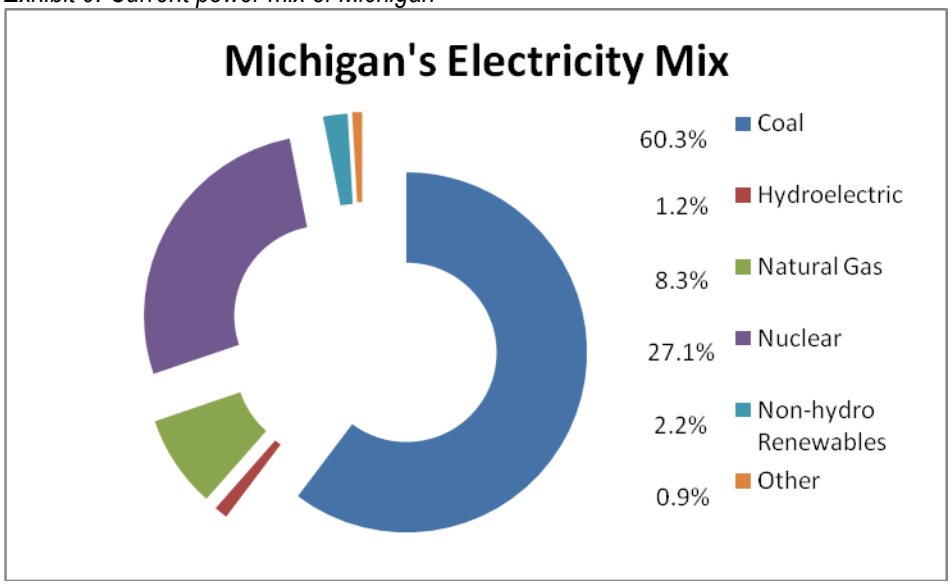
Feed-in tariffs should always be technology-specific and calculated based on cost recovery. Using a feed-in tariff for a relatively moderate deployment target allows to keep feed-in rates low and their impact on electricity rates minimal. It also allows to reap some of the benefits from the overall downward cost trend in renewable energy. Renewable energies are currently the only form of energy that shows a consistent downward trend. They are also the only form of energy where this trend is not generally threatened should climate legislation happen. Thus, they are the ultimate energy security insurance – self-reliance on a downward cost trajectory.

3. Michigan

Michigan's current power mix is dominated by coal and nuclear power (Exhibit 10). Under the impression of the downturn of the automotive industry, the parting governor has initiated a comprehensive transformation program in terms of workforce development. Michigan has an ambitious renewable portfolio standard in place but the administration considers introducing standardized and cost recovering rates under PURPA to facilitate a more open market access of independent renewable energy generators.

[16] "State Energy Profiles, Minnesota Quick Facts." *U.S. Energy Information Administration Independent Statistics and Analysis*. U.S. Energy Information Administration, 01jul2010. Web. 8 Jul 2010. <http://tonto.eia.doe.gov/state/state_energy_profiles.cfm?sid=MN>.

Exhibit 9: Current power mix of Michigan[17]



A recent paper using NREL's JEDI model has estimated that 780 MW of wind will be deployed per year to reach a total of 16,000 MW in 2029 and that this will create around 3000 recurring or permanent jobs in managing and maintaining wind turbines, as well as 110 construction jobs per year over the next two decades. The German experience illustrates that this is a realistic if conservative assessment, as it leaves out a number of associated job opportunities and innovation options and a considerable number of the side benefits that renewable energy can generate. 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 Feed-in-tariff 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 (for example a money management account). This kind of financing scheme can provide additional benefits for pension funds or private retirement schemes and maximize local benefit.

Another lesson from Germany could be adopted by Michigan's excellent academic and research capabilities. Many of the growing pains in German wind turbine manufacturing have been mitigated by the 250MW wind measurement program that sponsored a monitoring program for the operation of the first 10 years of a large sample of wind turbines. Today, the technical challenges have changed, but technology 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.

CONCLUSION

Germany has managed to create a resilient industry in a forward looking policy arena and technology sector that "does well by doing good": Renewables created at least 300,000 jobs according to the official statistics. In reality, the numbers are almost certainly higher. Renewables can create income in many more ways than traditional energy systems, and give

[17] "Burning Coal, Burning Cash: Michigan's Dependence on Imported Coal." *Union of Concerned Scientists* (2010): 1-2. Web. 7 Jul 2010. <http://www.ucsusa.org/assets/documents/clean_energy/UCS-BCBC-factsheet-Michigan.pdf>.

jobs to many more people per unit of energy used.[18] In addition, they have less negative impact on the environment than traditional energy systems. Last but perhaps most importantly they improve energy security. The benefits stay in the neighborhood as all renewables are local.

Furthermore, renewables are happening in the Midwest already. The question is, how can this technology be guided so as to bring out the maximum amount of local benefits. This paper provides some starting points for discussion, and where Midwestern States could leverage some of the experiences from Germany to replicate their own success stories. But the German story shows: the benefits can be on the side of the industrial development, create jobs and economic growth, as well as in innovation and technology leadership. If renewables are done right, many other aspects can be leveraged, and their benefit can go beyond manufacturing and installation to providing revenues for homeowners, small energy entrepreneurs and farmers. In short, with renewables, energy can become an element of the local economic cycle where it used to be a drain on local economies.

The challenge is out. But without a joint objective and cooperation between government and the private sector, green jobs will not become a reality. Civil society has a strong role to play in bringing the partners together and facilitating the environment for green jobs to grow.

REFERENCES

Agentur für Erneuerbare Energien, 2009. Regionale Wertschöpfung durch die Nutzung Erneuerbarer Energien. Hintergrundinformationen. http://www.unendlich-viel-energie.de/uploads/media/21_Hintergrundpapier_Dezember_2009_Regionale_Wertschoepfung.pdf.

"Arbeitslosigkeit seit 1948." *Spiegel Online* 06July2010: n. pag. Web. 6 Jul 2010. <http://www.spiegel.de/flash/flash-12125.html>.

BMU, 2010a. Development of renewable energy sources in Germany 2009. Graphics and tables, http://www.erneuerbare-energien.de/files/pdfs/allgemein/application/pdf/ee_in_deutschland_graf_tab_2009_en.pdf.

BMU, 2010b. Pressemitteilung Nr. 041/10 vom 24.03.2010: Erneuerbare Energien behaupten sich in der Wirtschaftskrise - Anteil am Endenergieverbrauch erstmals über 10 Prozent. http://www.bmu.de/pressemitteilungen/aktuelle_pressemitteilungen/pm/45805.php [06.07.2010].

Bundesagentur für Arbeit, 2010. Arbeitslosigkeit geht zurück, Beschäftigung steigt. http://www.arbeitsagentur.de/nn_27030/zentraler-Content/Pressemeldungen/2010/Presse-10-038.html [06.07.2010].

Bundesagentur für Arbeit - Statistik, 2009. Arbeitslosigkeit im Zeitverlauf. http://www.pub.arbeitsagentur.de/hst/services/statistik/detail/z.html?call=l.

"Burning Coal, Burning Cash: Indiana's Dependence on Imported Coal." *Union of Concerned Scientists* (2010): 1-2. Web. 7 Jul 2010. <http://www.ucsusa.org/assets/documents/clean_energy/UCS-BCBC-factsheet-Indiana.pdf>.

[18] Wei et al. (2010)

"Burning Coal, Burning Cash: Michigan's Dependence on Imported Coal." *Union of Concerned Scientists* (2010): 1-2. Web. 7 Jul 2010. <http://www.ucsusa.org/assets/documents/clean_energy/UCS-BCBC-factsheet-Michigan.pdf>.

DEBRIV - Bundesverband Braunkohle, 2010. Braunkohle Wissen. http://www.braunkohle-wissen.de/#arbeitspl [06.07.2010].

Deyette, Jeff, and Barbara Freese. "Burning Coal, Burning Cash: Ranking the States that Import the Most Coal." *Union of Concerned Scientists* (2010): 49-53. Web. 7 Jul 2010. <http://www.ucsusa.org/assets/documents/clean_energy/Burning-Coal-Burning-Cash_full-report.pdf>.

Farrell, J., 2009. Feed-in Tariffs in America. Driving the Economy with Renewable Energy Policy that Works, Heinrich Böll Stiftung. http://www.boell.de/downloads/ecology/FIT_in_America_web.pdf.

U.S. Energy Information Administration, 2010. U.S. Energy Information Administration Independent Statistics and Analysis: State Energy Profiles, Minnesota Quick Facts. http://tonto.eia.doe.gov/state/state_energy_profiles.cfm?sid=MN [8 Jul 2010].

U.S. Energy Information Administration, 2008. Average Monthly Bill by Census Division, and State 2008. http://eia.doe.gov/electricity/esr/table5.html [06.07.2010].

UCS (Union of Concerned Scientists), 2010. Burning Coal, Burning Cash, http://www.ucsusa.org/assets/documents/clean_energy/Burning-Coal-Burning-Cash_full-report.pdf.

Wei, M., Patadia, S. & Kammen, D.M., 2010. Putting renewables and energy efficiency to work: How many jobs can the clean energy industry generate in the US? Energy Policy, 38(2), 919-931. http://www.sciencedirect.com/science/article/B6V2W-4XP8TBH-2/2/6e2ca2787c7fa7f01b7c90dfa53d7bb1.

www.TheClimateNetwork.org

Washington Office
1638 R Street, NW, Suite 120
Washington, DC 20009
T +1 202 464 4930
F +1 202 462 5230
E till@boell.org
www.hbfus.org

Prague Office
Spálená 23,
CZ-110 00 Praha 1
T +420 2 51 81 41 75
F +420 2 51 81 41 74
E siegl@boell.cz
www.boell.cz

Brussel Office
Rue d' Arlon 15
B-1050 Bruxelles
T +32 2 743 41 00
F +32 2 743 41 09
E waltersdorf@boell.eu
www.boell.eu

This paper has been supported by the European Commission.
The European Commission is not responsible for the content of the paper.