

# Germany and the United States: A Comparison of Support for Wind Energy

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**Abstract-** Germany leads the world in per capita wind energy production and public acceptance for wind energy is very high compared to a lack of support observed in the United States. A comparative study delineates many reasons for this difference. First, the U.S. has recently gained economically through hydraulic fracturing and off-shore oil development, while Germany lacks oil and natural gases and views renewable energy as its economic driver. The formation of coalition governments in Germany has provided a voice for the Green Party and resulted in significant renewable energy policy legislation, while the U.S. has a more winner take all two party system in which lobby groups, particularly those for the fossil fuel industry, have greatly influenced energy policy away from renewables. Germans, in general, widely accept global climate change and a need to mitigate its causes, while both Bush presidential administrations in the U.S. attempted to discredit government scientists' warnings of the effects of climate change. In addition, the difference in ownership of television channels between the two countries and what may be advertised influences people's opinions of what energy sources are best. Perhaps the greatest reason for the success of wind energy in Germany, however, is the development of community wind farms, in which all citizens are involved in the siting of systems and have equal access to invest and profit and for which tax revenues return to the hosting community. Because of this there is no such thing as Wind Turbine Syndrome and the German saying is "every flicker is a euro."

**Index Terms-**wind energy, U.S. energy policy, Germany

## I. INTRODUCTION

Despite recent gains in renewable energy investment made by the Obama administration, Germany leads the world in per capita wind energy generation. In 2012, installed capacity in Germany, a country of approximately 81.4 million, was 29,060 MW and that of the US, a country of approximately 312.8 million, was 46,919 MW. That is an average of 357 watts per person in Germany compared to only 150 watts per person in the United States. In 2012, over 9% of Germany's electrical energy production came from wind energy, primarily on-shore, and there are plans to expand off shore production on the North Sea with a goal of 35% of electrical energy coming from wind energy (Ropenus and Kempe-Samsami 2013).

There are many reasons why wind energy has achieved greater success in Germany than in the United States. On-shore wind energy development in Germany occurs at the community level with community ownership (Hentschel 2012), which fosters public support for and acceptance of local wind farms.

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In addition, Germany does not have the petroleum and natural gas resources that the United States does, especially with the recent implementation of hydraulic fracturing creating a second fossil fuel peak across the United States (Hinrichs and Kleinbach 2013). In addition, the oil, natural gas and coal lobbies in the US have considerable power to influence energy policy at both the state and national levels. The multi-party government system in Germany leads to coalition governments that are more likely to compromise and work together, while the present bipartisan dysfunctional behavior of the US government has inhibited meaningful progress toward sustainable energy. Germany as one of the signatories of the Kyoto Protocol more widely accepts an imminent need for mitigation of climate change, while the US failed to sign the protocol and has made only minimal gains in reducing climate change emissions (German Federal Ministry for the Environment 2013). Finally, what and how advertising and dissemination of information occurs in each country has an impact on people's perceptions of various energy resources.

## II. GOVERNMENT COMMITMENT TO CLIMATE CHANGE AND THE ENVIRONMENT

For the first time, at the Conference on Environment and Development in Rio de Janeiro in 1992, the potential for renewable energies was placed in the context of climate protection. Subsequent global conferences in Kyoto in 1997 and Johannesburg in 2002 began the international political process for the promotion of renewable energy. Germany's federal chancellor invited participants in Johannesburg to a meeting in Bonn at which the International Action Program specified action and commitment toward the promotion of renewable energy. The German Federal government made available over 500 million euros over a period of five years starting in 2005 to expand the use of renewable energy. This event kicked off an international political process with Germany's energy policy serving as a model (Bruns et al. 2011).

The 1997 Kyoto protocol created the first legally binding international commitment by industrialized states to reduce climate change emissions. The Copenhagen conference in 2009 resulted in the Copenhagen Accord, which lists key elements of future climate protection policy including specific emission reduction targets for 2020. More than 100 countries, including all European Union member countries, signed the Kyoto protocol and joined the accord. Noticeably, the United States did not. Germany, on the other hand, is leading the way with ambitious emission reduction targets of a 40% reduction by 2020 compared to

1990 levels. In conjunction with this, the International Renewable Energy Agency, IRENA, was founded in Bonn, Germany, in 2009 to promote widespread and increased adoption and sustainable use of all forms of renewable energy (German Missions in the US 2013). In 2000, the German government adopted a climate protection program with a goal of reducing Germany's carbon dioxide emissions by up to 70 million tons by 2005 and co-founded the German Energy Agency. While Germany did not meet these targets, it came close. In 2004, greenhouse gas emissions had dropped 19% below the balance of 1990 (Ohlhorst et al. 2011).

In Germany, the emergence of the Green Party in the early 1980s marked a period when numerous citizen and environmental initiatives were founded. The oil crises of the 1970s and the later Chernobyl disaster in 1986 triggered interest among Germans in renewable energy generation. The Chernobyl disaster, in particular, initiated a German desire to move away from nuclear energy because parts of Germany were directly impacted.

The German electoral process and a multi-party political system with six major parties (SPD, CDU, CSU, FDP, Greens, Linke) makes it very difficult for one party to form a government on its own. This leads to an alliance of parties and the formation of coalition governments that must cooperate and compromise. Representation on the Bundestag also comes from any party with 5% of the electoral vote and, by 1983, this included the Green Party, whose strong concern for environmental issues forced other parties in the Bundestag to deal with these issues. The Greens were instrumental in establishing environmental politics in the Bundestag during this phase (Bruns et al. 2011). In 1998, the Green Party helped the Social Democrats into the Chancellery. After this change of government, climate protection and renewable energy policy was institutionalized within the Federal Environmental Ministry.

While the environmental movement in the United States also started in the 1970s and many positive gains were made with passage of the Clean Air Act and Clean Water Act, attempts were made during the presidency of George H. W. Bush to dismantle environmental policy, via administrative implementation of regulatory policy (Furlong 2007, Korte and Jorgens 2012). Even before this, since the 1980s conservative republicans favoring deregulation have adopted an increasingly critical stance toward environmental protection acts adopted earlier (Kraft 2004) and this strong anti-environmental position became especially visible in the policy agendas of Presidents Ronald Reagan and George W. Bush (Vig 2010). Almost immediately after taking office, the George H. W. Bush Administration engaged in efforts to dismantle the New Source Review's (a program to control air pollution from stationary sources) regulatory measures and to hamper its enforcement (Buzbee et al. 2004). Because of simultaneous partisan politics in the US Congress, many of these direct attempts to weaken environmental legislation failed, but efforts made through administrative agencies succeeded in reducing the power of policy implementation.

The US Congress has in recent decades delegated regulatory tasks to highly specialized agencies, such as the

Environmental Protection Agency, which gain far reaching quasi-legislative competencies by proposing, filing, and adapting rules. The president also exercises the prerogative of appointing top administrators and, hence, has the opportunity to install loyal followers in federal agencies (Kraft 2004, Vig 2010). These administrators manipulate the intensity and enforcement capacities of environmental legislation, thereby weakening implementation. It has been stated that these agencies now act as servants of the organized interests that they regulate rather than of the general public (Golden 1988)

This occurred under President H. W. Bush in the New Source Review (NSR) which allowed for policy decisions decidedly friendlier to business interests, particularly the coal and petroleum industries. During this period, business groups enjoyed a significant advantage over environmental or citizen groups in lobbying federal agencies (Webb Yackee et al. 2004). In many cases, supporters of the President during his campaign, often representatives of business interest groups, were asked to participate as advisors and members of task forces to administrative agencies. For example, there are claims that Vice President Dick Cheney's energy task force included mainly representatives of the oil and gas industry and also that environmental organizations were excluded. While not all of these attempts to roll back environmental gains were successful, it is clear that between the 1980s and 2008, except for during the Clinton presidency, environmental and energy policy in the US were heading in a different direction than they were in Germany.

### III. ENERGY RESOURCES AND CRISES AS A DRIVER

In Germany, environmental and energy crises have served as drivers for a commitment to renewable energy development. The 1970s were dominated by two oil supply and price crises that entailed a shortage of coal and oil. The supply crises of 1973 was accompanied by soaring prices for oil and gas and is why renewable energy began to be viewed as economically competitive. The beginning of the second Gulf War in 2002 resulted in a temporary price spike that soon fell, accompanied by a dwindling interest in renewable energy in the US. However, after 1999 a series of price increases caused by global increase in consumption and, to some extent, by insufficient drilling capacities, led to the historic mark of \$100/barrel gas in 2008. Germany saw this as an indicator that oil would only become more expensive, or at least subject to strong variation over time. Reliable supplies and independent energy began to emerge as guiding themes of German energy policy. Acceptance of nuclear energy in Germany also suffered a massive setback after the 1986 Chernobyl incident. Detailed media coverage of this event revealed the risks of nuclear energy production, leading to a strong anti-nuclear movement that advocated a phase out. Germany linked this phase out with proactive activities in support of renewable energy and greenhouse gas emission reduction. Finally, because of disputes between Russia and the Ukraine, the Russian gas supplier, Gazprom, repeatedly discontinued gas supplies to the Ukraine between 2006 and 2008. Numerous European countries, including Germany, were affected by these cuts.

The Federal Government, Biogas producers, and gas grid operators used this supply uncertainty to lower import dependencies with domestic renewable energy (Bruns et al. 2011).

While German response to the 1973 energy crises was to begin the process of renewable energy development, the United States sought domestic sources of oil. The US government opened Prudhoe Bay, Alaska, to oil companies for oil exploration and development. Construction of the Alaska pipeline facilitated transport of crude oil to Valdez, Alaska, from where it could be shipped to oil refineries in the lower forty-eight states. In addition, better technology began to allow for deep sea extraction in the Gulf of Mexico.

During the later 1990s and into the 21<sup>st</sup> century, hydraulic fracturing in the United States has greatly increased proven reserves of petroleum and natural gas. Significant reserves of these resources are being extracted throughout the country. Newer technologies, including horizontal drilling, have increased natural gas reserves by about one-third. In 2011 the US became a net exporter of refined petroleum products. Several studies have predicted that by the end of this decade, the US will surpass both Russia and Saudi Arabia to become the world's largest producer of oil and natural gas (Zakaria 2012). The United States also has some claim to valuable Arctic oil resources. The economic benefit of this new oil boom in the United States has led to decreased interest in and development of renewable energy technologies and, hence, reduced concern in the United States for global climate change and its impacts (Dobb 2013).

Both Germany and the United States seek ways to meet the energy needs of the future and support strong economies. In general, concern for climate change coupled with few domestic oil and natural gas resources has led Germany to invest in the renewable energy market while the United States has benefitted economically from significant new domestic reserves of oil and natural gas. Germany, on the other hand, sees investment in wind energy as an economic driver. Just as the US looks to become a net exporter of oil, Germany in 2010 had a turnover of 3.27 billion euros in the wind energy export markets. The German Wind Energy Association estimates that in 2011, over 100,000 direct and indirect jobs resulted from the wind power industry ((Ropenus and Kempe-Samsami 2013).

An interesting difference between the two countries commitments to climate change and reducing the environmental impacts of fossil fuels while balancing economic interest is the reduction in the use of coal use to generate electricity by both countries. Germany and the United States both have significant coal resources. Since about 2007, for primarily economic reasons, coal use has declined in the US and has been largely replaced by less expensive natural gas obtained through hydraulic fracturing. Interestingly, partially because of this, the US's greenhouse gas emissions in 2011 were 9% less than they were in 2007, a larger reduction than that of the European Union (Hinrichs and Kleinbach 2013 and Zakaria 2013). In Germany, wind power and other renewables have begun to replace coal generated electricity because of awareness of

climate change and strategies to abate carbon dioxide emissions. The oil crises, the Chernobyl accident, and concern for damage done by acid precipitation all shaped public perception and raised awareness towards a more sustainable energy supply (Ohlhorst and Bruns 2011). So, while market forces and respective fuel prices could easily drive the United States back to higher coal use, Germany's commitment to the environment has fostered a long term transition from coal to wind energy.

#### IV. EFFECT OF LOBBYING AND OTHER INTEREST GROUPS

Lobby and special interest groups exert political influence in both Germany and the United States. However, there are fundamental differences between the two countries in the types of lobbies, their participation in the political process and the power they hold. The practice of lobbying is widely accepted in the U.S., while Europeans in general are more skeptical of it as a part of the political process (EurActiv 2005). In fact, in the US a "revolving door" between government and lobby interest groups has created a problem of government agency personnel moving into business and using their former contacts to influence policy making or business and industry members being appointed to government agencies in which they can influence policy towards their particular industry.

One of the biggest drivers in the slow movement towards wind and other renewable energy sources has been the power of the fossil fuel lobby in the United States. Particularly, during the George W. Bush administration, an investigation by the Observer (Harris 2003) showed the pervasive influence of the oil industry on this administration. The investigation concluded that collusion between the Bush administration and conservative groups funded by the oil industry, who lobby against efforts to control carbon dioxide emissions, led to White House officials undermining their own government scientists' research into climate change to play down the impact of global warming. Central to the investigation were the influence of the Competitive Enterprise Institute (CEI), an ultraconservative lobbying group that received more than \$1 million in donations between 1998 and 2003 from the oil giant Exxon. The CEI called for firing of Christine Whitman, head of the US Environmental Protection Agency (EPA). Environmental groups in the US pointed out that President Bush and Vice President Dick Cheney are both former oil executives, National Security Advisor Condoleezza Rice was a director of the oil firm Chevron and Commerce Secretary Donald Evans once headed an oil and gas exploration company.

The Observer investigation further showed that Bush's staff insisted on major amendments to a climate change report by the EPA. Sections of the ecological effects of climate change and its impact on human health were removed. White House officials added qualifying words, such as "potentially" and "may," leading the EPA to complain that, "Uncertainty is inserted where there is essentially none." Under pressure to publish information that was not scientifically credible, the EPA removed the entire section on global warming. A former EPA climate

policy advisor painted a picture of scientists afraid to conduct research for fear of angering their White House paymasters or of just having their work buried.

At the same time that Germany was investing in renewable energy infrastructure, the fossil fuel lobby was working to maintain the energy status quo in the United States. In the previously discussed dismantling of air pollution policy and new source standards during the Bush administration, the utility lobby, mainly coal and natural gas interests, lobbied for Bush's administrative weakening of environmental legislation. Most importantly, utilities offered immense financial support to the electoral campaign of Bush and Cheney. In exchange, they gained significant and almost immediate influence on the Bush administration's energy policy through the Energy Task Force. There are claims that Vice President Dick Cheney's Energy Task Force included mainly representatives of the oil and gas industry. Lobbyists for the fossil fuel industry were also named Acting and Assistant Administrators for Air and Radiation at the EPA between 2001 and 2007, giving utilities easy access to those EPA offices that were in charge of proposing and drafting New Source Review regulations.

It is well known in the US that campaign contributions play a role in interest groups' access to and influence in government (Furlong 2007). Campaign contributions buy access and those privileged with access have the ability to influence policy. While environmental and renewable energy groups in certainly have the ability to raise money, contribute to campaigns, advertise, and influence policy, they have nowhere near the money raising capacity of the fossil fuel industries in the US. In the mid-1990s Republican leadership in the US Congress made a deal in which, if lobbyists would help raise hundreds of millions of dollars to support Republicans, they would be invited into the legislative process and be allowed to propose bills and suggest changes to legislation proposed by others. As a result Republicans in Congress reported contributions of \$782 million in 2003-2004, a 220 percent increase from a decade earlier. Lobbyists for corporate interests then won countless legislative provisions favoring their clients from the Republican controlled House and Senate (Kaiser 2009).

In 2012, the combined oil and natural lobby contributions were over \$139 million with 195 clients employing 767 lobbyists. That is more than one lobbyist per US Senate and House representative. The top campaign contributors were Royal Dutch Shell, Exxon Mobil, Koch industries, Chevron Corporation, and BP with contributions ranging from almost \$15 to \$8.5 million (Center for Responsive Politics 2012). To keep fossil fuel prices low compared to renewables, this lobby has benefitted from multi-billion dollar taxpayer subsidies, which the American public overwhelmingly wants eliminated, and a Republican party whose pro-drilling campaign rhetoric has become nearly indistinguishable from those of big oil (Froomkin 2011). In addition, in 2009, the American Coalition for Clean Coal spent more than \$4.65 million lobbying the federal government, while the combined oil, gas, electric utilities, and mining industries spent \$142 million.

Under the Obama presidency, increases in campaign contributions in the renewable energy sector have occurred with \$30 million spent in 2009, of which \$5 million alone came from the American Wind Energy Association. The number of alternative energy industry associations that employed lobbyists increased from twenty to two hundred in this same time period (LaRussa 2010). While this is a positive sign for investment in renewable energy infrastructure and implementation in the US, the \$39.6 million spent on lobbying efforts by the renewable energy industry in 2010 still pales in comparison to the almost \$112 million spent by the oil and natural gas industry. Either the power of lobbyists in Washington will have to decrease or the contributions from the renewable energy lobby will have to significantly increase to make them competitive with the fossil fuel industry.

In Germany far fewer interests groups are registered formally as lobbyists with the federal government, however since the 1980s, the institutionalization of interests groups in the renewable energy sector was regarded as this sector becoming increasingly established in the economy (Bruns et al. 2011). The German Renewable Energy Federation (BEE) is described as consensus oriented, which is most likely reflective of the need to cooperate to form coalition governments in Germany compared to the bipartisan winner take all behavior of the US government.

The closest that an interest group has come in recent years in Germany to greatly influencing energy policy toward maintaining the status quo was the 2008 assertion by the federally owned energy agency for power station and grid planning, known as dena, that planned phase out of nuclear power stations and postponed construction of modern coal-fired and gas-fired power stations would create an electricity gap by 2012. The Federal Ministry of the Environment as well as members of renewable energy associations and the Greens rejected the debate and labeled it a "fear campaign." The Federal Environmental Agency performed a study refuting the assertion as did the Federal Ministry of Economics (Bruns et al. 2011).

## V. THE ROLE OF MEDIA

It may not be possible to overstate the effect that media, especially television, advertising has on the American public. Many people's awareness and acceptance of new products, technologies or ideas come from television. This is also true in Germany although, perhaps not to the extent that it is in the US. The differences in television between the US and Germany provides an understanding of what television advertising is viewed in each country and how this affects public perception. This is noticeable in the energy sector. Turn on a television on Germany and you are likely to see commercials for wind energy and biofuels. On the other hand, the major networks in the US have in the past few years aired commercials from the fossil fuel industry for "clean coal" and hydraulic fracturing, although the term hydraulic fracturing is avoided. Public perception of what forms of energy are acceptable and even the best energy solution for a country

are shaped by these advertisements. One also never sees in Germany advertisement for large SUVs or other energy intensive products.

Until 1987 German television viewers did not have the option of anything other than three public broadcasting corporations, ARD, ZDF, and the Land broadcasting corporation. ARD covers eleven regional public television and radio stations. These channels are funded by monthly fees paid by television and radio owners. Each household pays a single fee of about 25 euros per month. Each of the three broadcasting corporations governs itself under the direction of a broadcasting council consisting of representatives from the major social, political, economic, and cultural groups including political parties, churches, unions, and business organizations. Public television is allowed to devote no more than thirty minutes per day to commercial advertisements and no advertising is allowed after 8 pm on weekdays or on Sundays. The type of advertising allowed is also limited. This public television has the ability to offer greater coverage of public service activities and cultural events (german-way.com 2011).

Private broadcasting became available after 1987 and, like American television, is funded by advertising. Private broadcasters do not have an internal supervisory council, but each of Germany's sixteen states can exercise supervisory rights, which controls some of the advertising allowed. These private broadcasters also have to rely on satellite and cable transmission because the airwaves have limited capacity. This means that viewers must pay additional fees for access to these channels. The barrage of advertising on these channels is similar to that in the US. While these public channels are prospering, many Germans still get news and broadcasting via the public stations (germanculture.com 2012).

The US, on the other hand, has only one public broadcasting station, PBS, with affiliates in each state. Unlike Germany, less than 20 percent of its funding comes from the federal government. In the last decade, between 50 and 60 percent has come from private donations, either individual citizens or businesses (PBS 2011). While advertising is not a part of the PBS mission, the foundations and businesses that are major contributors are recognized in what often appears like advertisements (Fact-index 2013). In comparison to Germany, a much smaller percentage of Americans turn to PBS for their news and entertainment. It is perceived by many as a provider of educational programming for children and, because of who has traditionally made major contributions, it is also perceived to have a liberal left bias.

Most Americans view one of the major private network channels; ABC, NBC, CBS or FOX, or one of many cable channels and get their news from one of the network or one of the major cable news providers; FOX, CNN, or MSNBC. Deregulation in the 1980s has allowed mega-mergers and the emergence of media conglomerates (Fact-index.com 2013), in which one company may own multiple stations. These conglomerates also extend beyond the media. ABC, for example, is owned by the Walt Disney Company, NBC is owned by General Electric, and CBS is owned by Viacom. Members of these conglomerates often advertise for each other. General Electric is involved in oil

and natural gas, mining, power and energy technology businesses. It is not surprising, then, that advertisements selling "clean coal" and the benefits of hydraulic fracturing are often seen on NBC, while advertisements for wind and other renewable energy are not and that wind and other renewable energies are not even considered as significant parts of the US's future energy picture.

#### VI. THE GERMAN MODEL: COMMUNITY SUPPORT VIA COMMUNITY OWNERSHIP TO PROMOTE SOCIAL ACCEPTANCE

Land based wind farms are often set up in areas close to where people live and, therefore, public acceptance of wind turbines is crucial. Germany realizes that its energy transition will not be possible without public acceptance and that the transition is not just technological and ecological, but mainly societal. Hermann Albers, president of the German Wind Energy Association, states, "Even in the field of power grids and storage, community ownership should be taken seriously as an alternative to conventional models" (Albers 2012). Germany has found a model of community ownership that has resulted in much greater acceptance than has been experienced in the United States. Because of this, in particular, wind turbine syndrome, a health syndrome involving a range of disorders, claimed in the US anywhere wind turbines are considered, is not an issue.

Since the 1990s, many wind farms in Germany had funding and input from people in the areas affected. Community wind farms continue to be attractive to this day. These are joint ventures by citizens for citizens to help communities reach local climate protection targets and promote municipal independence in energy supply. Wind power with community ownership increases local acceptance, partly because individuals are able to monitor the situation so well. People have the right of codetermination, which allows each community's special needs to be taken into account early on in the planning stage. Leasing contracts can be tailored to the needs of locals and this citizen input democratizes the impact on landscapes. An additional benefit of direct citizen input is that management of the wind farm company is usually in the hands of local shareholders, not out-of-town power firms.

While in the US citizens are concerned with reductions in property values, in Germany when properly designed, wind farms create positive effects for local value creation. A local developer usually plans the wind farm, local firms take part in construction, and local banks provide financing. These all create jobs in the community. In addition, long term jobs are created for the servicing and maintenance of the wind turbines. Local citizens also handle the technical and business management. Finally, and critical to project success, at least seventy percent of trade tax revenue generated by the project is paid to local governments. Hence, the community that houses the wind farms sees the economic benefit returned to their community (Hentschel 2012). For these reasons, polls show that support among people for wind farms actually increases

in the surrounding community after the wind farm is in place (Azau 2011).

There are strategies that are followed in creation of a community wind energy project in Germany that have ensured their success and should be used as a model elsewhere in the world. First, local citizens must be included early on, continuously and intensively (Azau 2011). In particular, it should be possible for locals to take an active part in financing, planning, project implementation, and plant management. Once a site has been established, leasing agreements must include property owners, owners of directly adjacent properties and those properties that must be crossed for access to the wind farm for construction and maintenance. After a turbine manufacturer is chosen, an environmental impact assessment during the construction and operation phases is performed. Finally, where power cables need to be installed and where the least expensive interconnection points to the grid are is determined. This step requires close cooperation with grid operators and the local power provider.

A community owned wind farms feasibility study is made and includes investment costs, operating costs, financing parameters, and future income. The next phase involves project financing. Roughly twenty percent of the amount that needs to be invested should be available as equity from citizens in the local communities and local citizens may begin to purchase shares. This should be done in a way that ensures each resident has an opportunity to purchase equal shares such that shares are spread as widely as possible in the community rather than being concentrated in the hands of a few shareholders with deep pockets. In this way, the cost of a project is democratically spread across a large number of shoulders. Following these steps and guidelines, community owned projects democratize local energy supply. Community ownership turns citizens into entrepreneurs with “green” goals (Hentschel 2012).

### VII. WIND TURBINE SYNDROME

One of the positive outcomes of community owned wind farms is that Germany does not experience the adverse health effect claims that fall under the alleged Wind Turbine Syndrome array that has been experienced in the United States. Several studies have associated proximity to wind turbines with health effects including sleep disturbance, headache, visceral vibratory vestibular disturbance, dizziness, vertigo, tinnitus, ear pressure or pain, external auditory canal sensation, memory and concentration deficits, irritability and anger (Pierpoint 2009). In response to growing concern, academics, professional groups, and governments have conducted many studies of the available evidence and concluded that, while there is some evidence of annoyance from noise, there is no evidence that Wind Turbine Syndrome exists (Ellenbogen et al. 2012). Nevertheless, in the United States opposition groups have successfully used fear of this syndrome to delay or completely halt wind power projects.

On the other hand, studies in Germany and Denmark, two countries with a combined 30,000 wind turbines in 2012, show no evidence of Wind Turbine Syndrome. In a survey conducted by Neil Barrett (Barrett

2012), of politicians and academics in Germany, Hans Josef Fell, energy spokesman for the Green Party states, “The difference between Germany and Australia may be that here neither the political parties nor the media are making a big topic out of it. We have millions of people living within a distance of 10 kilometers to a turbine and tens of thousands who have lived near turbines for up to twenty-five years without health problems. Wind energy relieves us from bad health effects caused by nuclear and coal.” Similar statements were made by several other Germans politicians and academics on wind energy and human health.

A study, performed in the Netherlands, found that among people who benefitted economically from the turbines – who were much more commonly in the higher noise categories – there was virtually no annoyance (3%) despite the same pattern of noticing the noise as those who did not benefit economically. These factors explain the lack of Wind Turbine Syndrome in Germany. Community owned wind farms allow those who will be affected to receive compensation. In addition, because communities decide to whom construction and maintenance contracts go, there is potential for employment created by wind farms. Dr. Dorte Ohlhorst, a professor at the University of Halle-Wittenburg, states, “There is no wind turbine syndrome. In Germany, every flicker is a euro.” Finally, because of transparency, fair compensation, and community involvement in every step of projects, people are much more likely to feel they have been treated fairly and with respect.

### VIII. INFRASTRUCTURE FOR WIND ENERGY

Before wind energy can be implemented on a large scale, the infrastructure for feeding this energy into existing grids and or development of new grids must be in place. Additionally, there must be a mechanism by which this energy is purchased profitably by energy consumers. In 1990, the German Bundestag adopted the electricity feed in act, StrEG (Stromeinspeisungs-gesetz), a step in creating an important stimulus for the introduction of renewable energy to the market. This program created a feed-in tariff in the form of fixed subsidies per kilowatt hour of wind energy fed into the grid and served as the basis for the feed-in act initiative.

By 2000, the governing coalition no longer felt that the compensation defined in StrEGs sufficed to achieve doubling the share of renewables in the electricity mix, so the Renewable Energy Sources Act (EEG), with the Green Party acting as drivers, was adopted by the Bundestag. This act strengthened StrEG by first specifying fixed compensation rates per kilowatt hour, which aimed to create security for investment independent of the development of the electricity price. The Ministry of Economics and the Environment Ministry agreed on a joint bill that legally gave priority to renewable energies. Further revisions to the Renewable Energy Resources Act in 2004 and 2009 relieved electricity intensive and railroad companies from additional costs arising from green energy and created the IEKP, Integrated Energy Climate Program, to focus on both energy efficiency and the fraction of

electricity produced by renewables. To accelerate the dynamic, the remuneration rates in 2009 were adjusted upwards for renewables. The EEG continues to be examined and modified to meet Germany's goals for renewable energy, but thus far, it indicates that the German government is willing to put into place the infrastructure required to make wind energy a viable and competitive energy source (Bruns et al. 2011).

## IX. CONCLUSIONS

While improvements in the expansion of wind energy in the US electrical market have been observed under the Obama administration, the presidencies of both George and George W. Bush enforced continuance of a fossil fuel based economy. Germany, at the same time, invested extensively in the renewables market and began a transition away from nuclear and fossil fuel energy. The power and influence of the fossil fuel lobby in the US, particularly when coupled with the dysfunctional bipartisan politics that have dominated the US since the 1990s, helped delay and obstruct implementation of renewable energy. The administrative attempts to dismantle environmental legislation and discredit government scientists' warnings of the effects of climate change along with subsidies for the fossil industry under George W. Bush also contributed to continued support for the fossil fuel industry. Lobbying is less a part of German government and the multi-party system that necessitates forming coalition governments better served the interests of wind energy proponents. The emergence of the Green Party particularly supported actions to alleviate climate change. The German government also passed legislation to create the infrastructure for feed in of wind energy to existing grids.

Much of the reason for high US use of fossil fuels is that, unlike Germany, the US has recently found new petroleum and natural gas resources through hydraulic fracturing, deep sea drilling, and access to Arctic oil. Hence, while Germany views renewable energy as a strong economic driver, the US is poised to become the next Saudi Arabia in terms of oil production. In addition, the marked difference in types of energies presented to German and American citizens by the television media influences peoples' opinions of what energy sources are best.

Perhaps the greatest reason for the success of wind energy in Germany, however, is the development of community wind farms. When all citizens are involved in the siting and design of systems, when all citizens have equal access to invest and profit, and when the tax revenues mostly return to the hosting community, people are strongly in favor of wind farms. In fact, Germany has not experienced wind turbine syndrome. Rather, the presence of local wind farms results in a more favorable view of this energy.

If the US wishes to produce more electricity via renewables, much can be learned from the German model. One locally owned small wind farm in Montana has already shown greater understanding and acceptance of wind energy (Huber et al. 2010). There will also have to be either a strengthening of the renewable energy lobby at all

government levels, but particularly at the federal level to compete with the fossil fuel lobby or a restructuring of government to reduce the power and influence of lobby groups. Greater education of citizens and dissemination of positive information about wind energy and the negative impacts of climate change will also have to occur. Altering US perception towards renewables and making structural changes to support wind energy present great challenges, but certainly not insurmountable ones and certainly ones worth overcoming.

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