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Understanding

the Energy Transition

in Germany

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# Realizing the Vision

It began in 1980 with a manual typewriter and a call to end Germany's dependence on nuclear and petroleum energy sources. Two decades later, after Chernobyl, climate change, and Kyoto became household names, Germany made it official: The Renewable Energy Act of 2000 (EEG) would lead the way to a sustainable energy system and economy. The now-famous Energiewende, or energy transition, had gone from manifesto to mandate, and the transformation to a clean energy future was underway.

The timing of the decision was quickly questioned. The Berlin Wall had been down barely a decade, the costs of reunification – the other 'Wende' – were weighing on the country's growth, and 2002's introduction of the Euro, resulting in stagnating purchasing power and lowering domestic demand. Restructuring the energy sector, and with it the entire economy, at such a precarious moment in time seemed to many like a risky endeavor.
But the Energiewende is not about taking risks; rather, it is a coordinated, strategic approach to confront the climate, economic, and geopolitical realities that threaten the safety, reliability, and affordability of the energy system now and in the future.

It is a process to democratize and decentralize the energy markets, producing interdependencies through a hybrid of cooperation and competition.

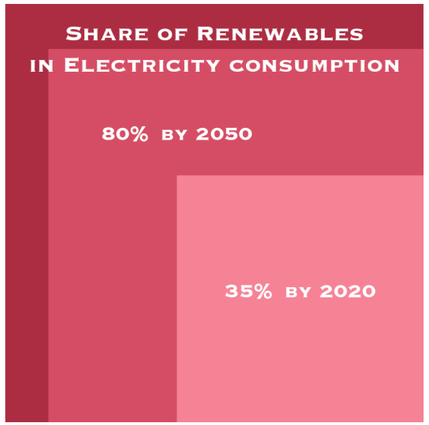
And it is a modernization of the way energy is sourced, distributed, and used, that focuses on agility, adaptability, and flexibility, essential components of a 21st-century energy system.

The core of the Energiewende is engagement: from individual households to large manufacturers, family farms to capital investors, energy producers to government officials, all segments of society are engaged in transforming Germany's energy system. The key to this engagement is communication of the progress made and the next steps to be made.

We hope you find this booklet helpful in understanding how Germany is realizing the vision of creating a clean energy system that will power a sustainable future.

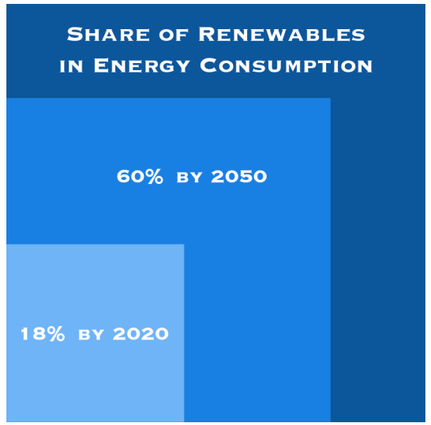
# What is the Energiewende?

**The Energiewende can be seen as a series of federal laws that build on each other, each one adapting to current realities while maintaining focus on the long-term vision.**




### 2000

The Renewable Energy Act (EEG) implements a fixed feed-in tariff for renewables, paid for through a surcharge on consumption, creating a reliable market to support greater investment and participation in renewable energy generation. The EEG also prioritizes renewable energy, ensuring access to the grid.

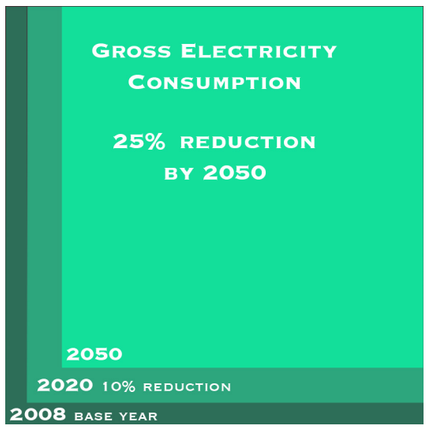



### 2010

The Energy Concept becomes the next iteration of the Energiewende and establishes specific milestones for the integration of renewable energies and climate change mitigation strategies by 2020 and 2050. Targets and methodologies for measuring and assessing energy efficiency are introduced.

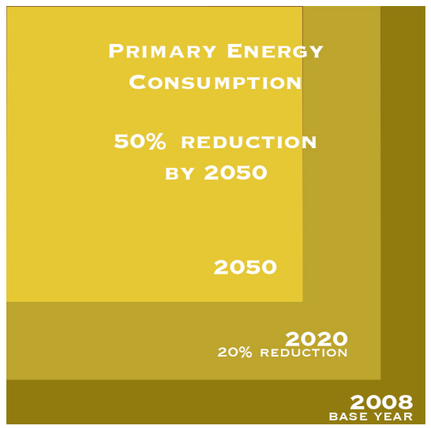

### 2011

After reversing a 2001 decision to abandon nuclear power generation and in response to renewed public opposition following the Fukushima disaster in Japan, the government recommits to closing all German nuclear power plants by 2022, igniting worries about the ability of the country to meet its emissions reductions targets.



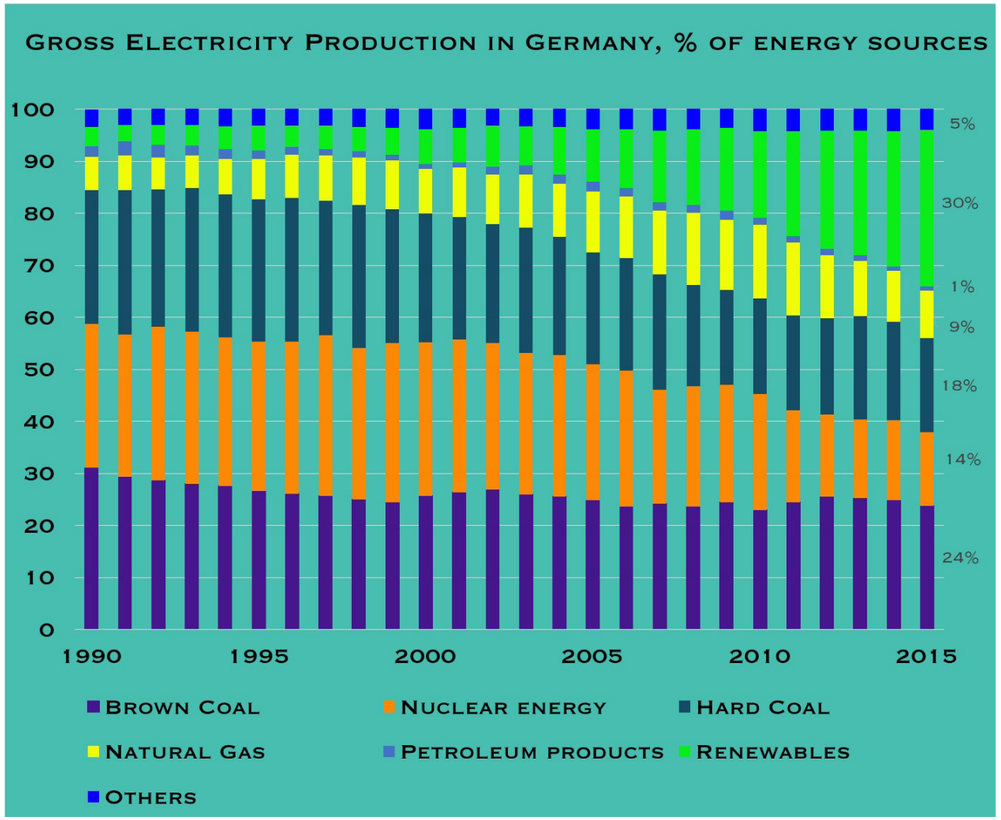

### 2014

EEG 2.0 introduces measures to manage the growth and competitiveness of renewable energy. Reducing fixed tariffs, creating auctions for most solar producers, recalculating the surcharge to assist large industry, and forcing self-suppliers to pay a surcharge are among the most consequential reforms.




**And continuing in 2016...**

Preliminary drafts of EEG 3.0 suggest that market auctions could soon replace fixed feed-in tariffs for nearly all renewables installations, a 'deployment corridor' would help ensure new capacity growth is compatible with grid expansion,and a further liberalization of the auctions markets, including opening up to international producers, might be tested.

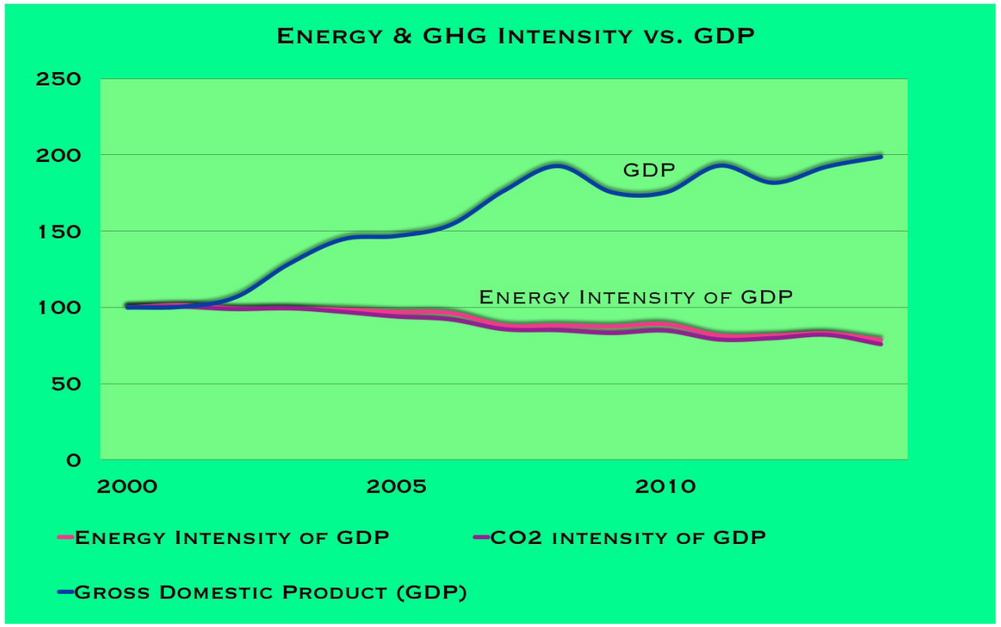



***Since 2000, 4 different political parties making up 3 distinct governing coalitions have supported the Energiewende.***
***The consensus is not limited to politicians: 90% of German citizens believe the Energiewende vital to the country's future.***

# Impacts on Industry & the Economy

At the time the Energiewende became national policy, media outlets across the world had labeled Germany "the sick man of Europe." Reunification, the introduction of the Euro, and a significant contraction in emerging markets led to widespread doubts about the country's economic fundamentals. Then came the Energiewende.

Long-term, the Energiewende will improve the competitiveness of Germany's production economy through vast improvements in energy efficiency and cutting the costs of energy imports. A significant step toward achieving this lies in decoupling GDP from greenhouse gas emissions and energy intensity. Doing so increases energy productivity, measured as an economic indicator, which in turn reduces overall energy costs relative to production output. Although the trends have already begun to bear this out, it does not happen overnight. Crises, however, can.



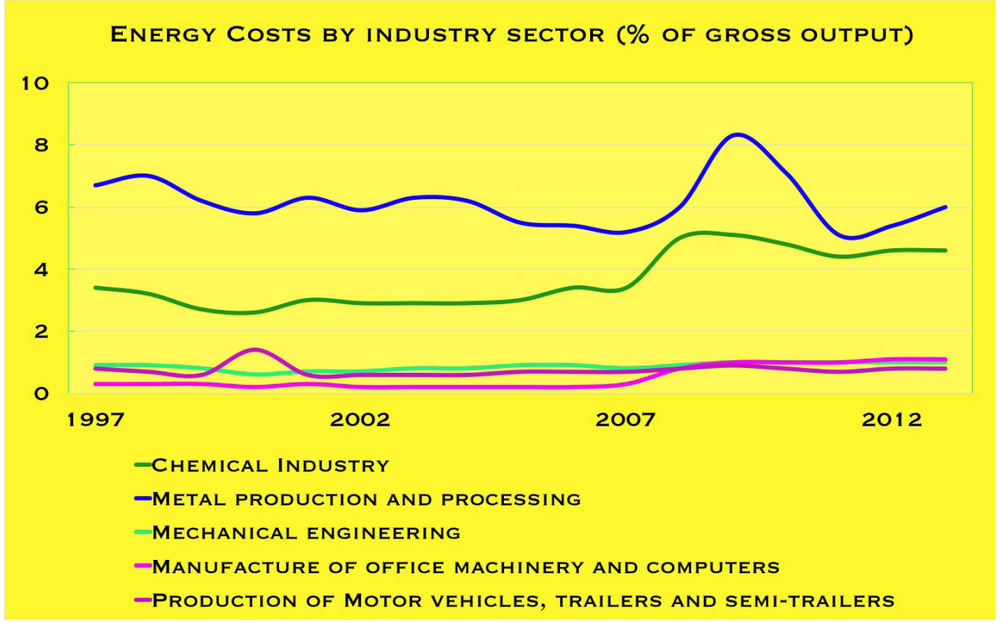

The dynamic nature of the Energiewende allows it to adapt to short- and medium-term business and economic needs. Many credit this dynamism and the willingness of governments to respond to the business community's fears as a prime factor in the Energiewende's success.

For example, in order to ameliorate increased cost burdens on industry after the rollout of the first EEG, the government introduced exemptions for energy-intensive industries and also put forward reforms to the tax code that transferred labor costs to energy costs, ensuring that companies that continued to hire, or at a minimum did not layoff employees, would not face a higher tax bill from the energy transition.

More recently, as part of EEG 2.0, in response to the lags in exports and dips in demand for large-scale manufacturing, the government reformed the criteria for exemptions from the surcharge and significantly altered its calculation for the most energy-intensive industry, calming concerns that Germany was becoming unfavorable for long-term business investments. It is worth noting that energy intensity in industry as a whole has made significant progress in efficiency efforts: from 1990-2014, its has decreased from 3.9GJ – 2.3GJ per 1000 Euros.

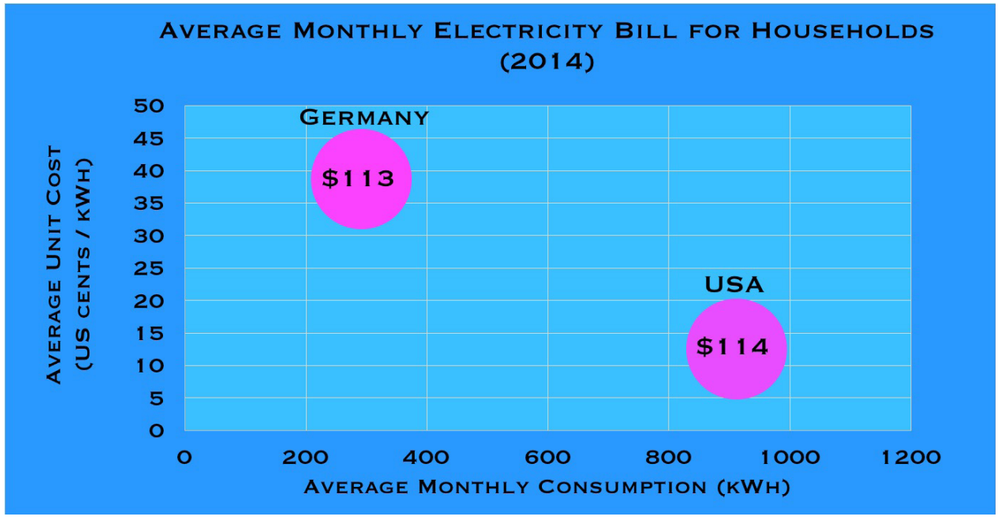
Essential to this dynamism are priorities. The clear targets of the Energiewende enable governments and businesses to make amendments and alterations to the process, knowing where that process will ultimately lead. As the Energiewende evolves from a function of government regulations to a market-based system, that dynamism will continue to increase, allowing for continued responsiveness to real-time needs.

Germany has long-since shed the label of "sick man of Europe." Even after the uncertainties at the turn of the millennium, Germany has faced the global financial crisis, the Euro crisis, geopolitical crises, and, most recently, a humanitarian crisis. Through it all, Germany was able to sustain its economic competitiveness, contain federal spending, and grow workforce participation while consistently moving forward with the Energiewende.



# Localized Impacts of the Energiewende

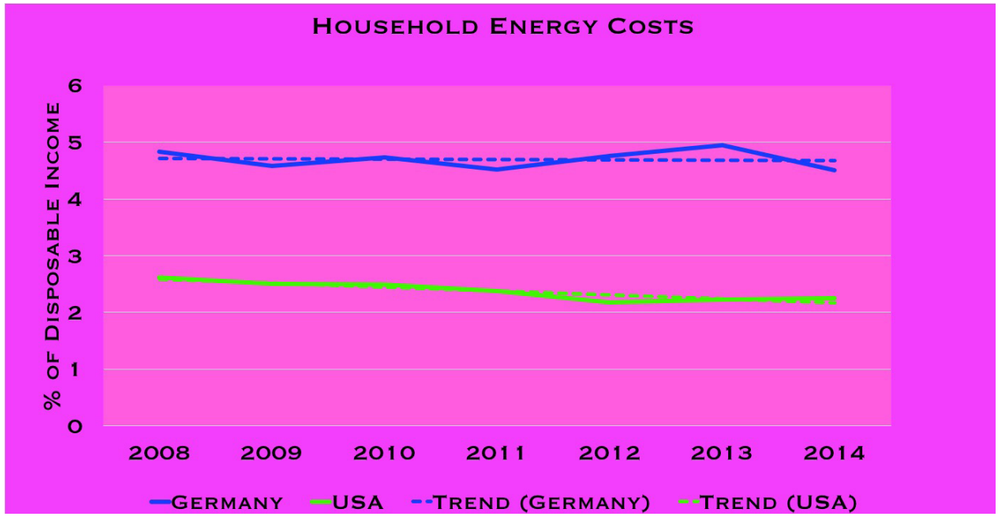
When over 90% of Germans agree that the Energiewende is important to creating a clean, sustainable energy future, it can also be assumed that they are willing to share the burden of the costs. That is certainly what the most recent reforms would confirm. The surcharge reduction for large energy-intensive businesses is not subsidized by the government; rather, it has been transferred via a new calculation to smaller consumers, including households.




One long-term benefit of not using government funds to subsidize the Energiewende is to keep the market as self-reliant as possible. But another reason for increasing the surcharge on households is unique to the Energiewende experience: in many cases, they are paying themselves. Due to the push to build capacity on the front end of the Energiewende, a large number of private citizens joined in the effort. In 2012, the last year for which data are available, 46.6% of renewable power capacity was owned by citizens. This has laid the foundation for a decentralization of the energy system, engaging citizens and communities in the process.

The surcharge has, however, impacted monthly household expenses, accounting for more than 22% of the average monthly electricity bill in 2016. This is where the focus on energy efficiency and overall reduction in energy consumption begins to pay off for households, just as it does for businesses.

Although the electricity rate in Germany is triple that for households in the United States, the overall bill is slightly higher in the US, due to Germany's low consumption levels. Even with overall power costs relative to disposable income, Germany's trend has remained steady. It is precisely the comprehensiveness of the Energiewende's approach that makes it affordable for households.




## *How the surcharge works...*

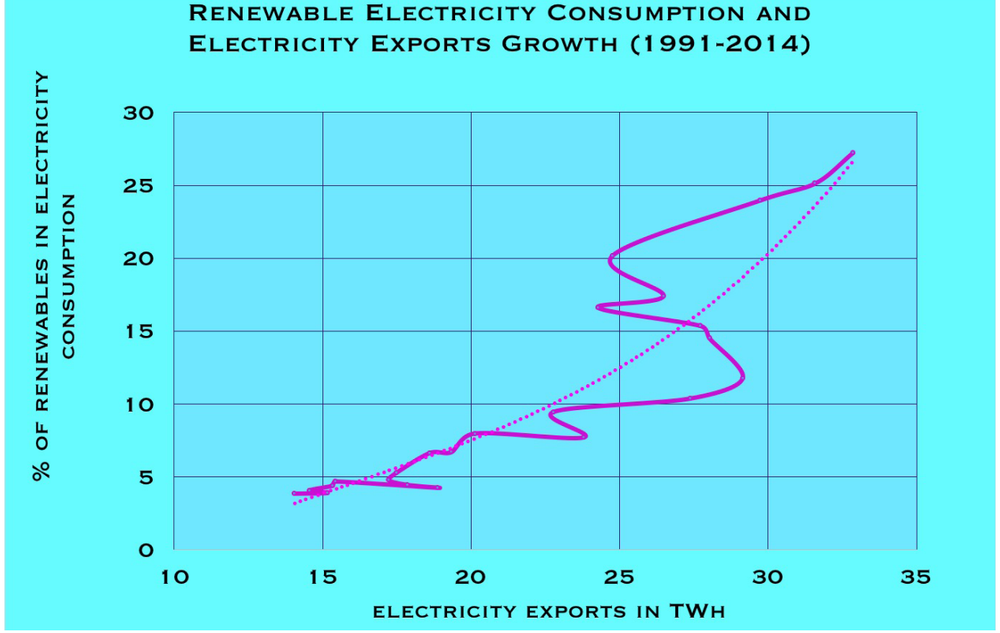
The 'EEG-Umlage' is a surcharge or levy paid by electricity consumers in Germany to finance the feed-in tariff guaranteed by the government to renewable energy suppliers to the grid. It appears on the utility bill and is calculated based on individual energy consumption, with variations in the formula depending on the type of customer. The 2016 surcharge for households, for example, is 6.35ct/kWh. For energy-intensive industry or other 'privileged' consumers, exemptions are made to maintain viability and economic stability. With the transition to auctions in setting the feed-in tariffs for renewable energies, the surcharge may experience increased volatility in the short term, though the government will likely continue to set the formula and exemption rules to reduce uncertainty and driving down costs.

# Reliability & Security of Supply

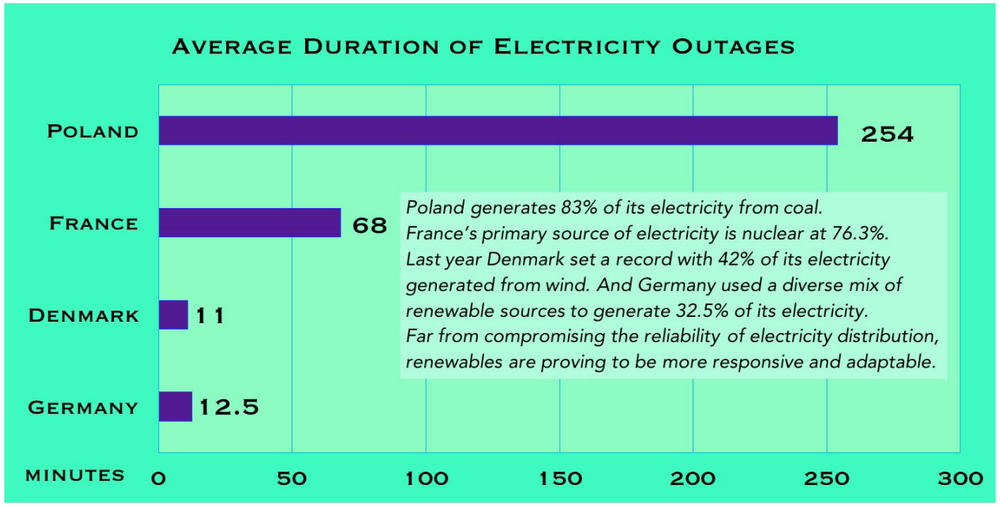
It has always been understood that transforming the energy system in Germany would also alter every sector of the economy and every segment of the society. That is why the Energiewende has always been about transitioning, each stage building on the progress made before, thereby striving to create as seamless a process as possible.

As the Energiewende advances to the next phases of implementation, the energy grid will transform. This is when localization efforts and distributed generation technologies will help in building a more agile, adaptable, and flexible system of energy delivery. These characteristics of renewable energy systems have proven themselves to be far better than conventional and nuclear energy systems in overcoming service interruptions and supplying reliable energy. Furthermore, the productivity of renewable energy generation has led to large growth in net power exports from Germany.

Decentralization has also created unprecedented competition, with more than 900 retail electricity suppliers now in Germany, a complete paradigm shift compared to the 'Big Four' providers that previously controlled all electricity distribution in the country.



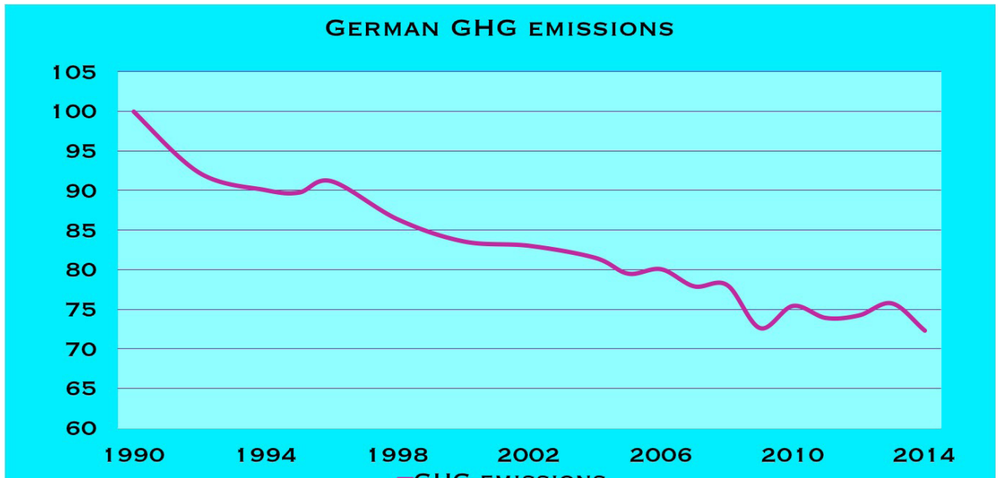

But the most frequent question about the reliability of renewable energy continues to be the oldest: What happens when the sun doesn't shine and the wind doesn't blow? 2015 provided one of the most conclusive answers to those concerns.




On March 20, 2015, a partial solar eclipse darkened up to 80% of the German sky from 9-11am, a peak time of industrial and social activity. Within just a few minutes, solar generation decreased by 7GW, but the system rebounded with 15GW by the end of the eclipse. System operators were able to prepare for the event, avoiding any power outages and showcasing the resiliency of the grid.

# The Next Steps

What began as a typewritten manifesto calling for the end of nuclear power and the dependence on oil has evolved into a highly-technical, comprehensive restructuring of one of the world's largest and most industrialized economies. The Energiewende is a work in progress. It was founded on the understanding that a clean, sustainable energy system is necessary for a vibrant, 21st-century economy. The process is dynamic, but measurable progress of the primary goalsis being made.




Central to this dynamic process are three phases:

1. Build renewables capacity while increasing efficiencies. Introducing feed-in tariffs and prioritizing grid access spurs investment in capacity creation. The surcharge not only motivates consumers to reduce consumption, it also provides the system opportunities to adjust the burden for certain consumers to minimize consequences for the broader economy.

2. Manage capacity growth to maximize potential of an expanded, modernized grid. A decentralized grid allows for more efficient and more adaptable delivery of electricity. Managing growth to fit the needs of the grid ensures stability in market prices and continued improvements in efficiencies.

3. Allow markets to create a self-regenerative environment for continued innovations. Markets are better able to adapt to the real-time needs of the system. Allowing a liberalized market to set prices will create more certainty in short-term prices, as well as promote competition and further innovations.

Successful achievement of the third phase is, essentially, the beginning of the first. The Energiewende has as its ultimate goal a clean, self-renewing system powered by clean, renewable energy. Yet throughout each of these phases, engagement will continue to be the primary driver toward realizing the vision of a sustainable future.



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