To close the knowledge and information gap between the United States and Germany on key issues of the transition to a cleaner energy system, the Worldwatch Institute organized a strategic dialogue on key issues relevant to the transition to sustainable energy systems. Funded by the Transatlantic Climate Bridge of the German Embassy, the event, “Energy Transitions in Germany and the United States,” took place at Worldwatch’s headquarters in Washington, D.C. on December 9–10, 2013. It consisted of three individual roundtables, focusing on the topics of renewable energy support mechanisms; energy efficiency and demand-side management; and the future of the electric power industry.

At this first-of-its-kind strategic dialogue, more than 20 leading experts from Germany and the United States met and discussed current trends, opportunities, and challenges of the transition to sustainable energy systems in both countries. The presentations, the agenda, and the list of participants are available at the Worldwatch Institute Project Webpage. This document summarizes the discussions and findings of the roundtables.

Renewable Energy in Germany and the United States

On both sides of the Atlantic, renewable energy capacity continues to grow vigorously. The steps taken in both Germany and the United States toward sustainable energy systems have generated substantial benefits, such as new jobs, technological innovations, cleaner local environments, and a reduction of greenhouse gas emissions. In Germany, about 10,000 new solar photovoltaic (PV) installations are added each month. Germany’s new government is committed to continuing the energy transition (“Energiewende”) and is aiming to achieve a 40–45% share of renewables in the electricity sector by 2025. The renewables share has risen from 3.1% in 1990 to 23.4% in 2013. In Denmark, the share passed 40% in 2011, and the EU as a whole has a target of 20% by 2020.

U.S. energy policy is more decentralized than in Germany. But the current administration is firmly committed to growth in renewable energy. The share of renewables in generation, including hydropower, has grown from 11.84% in 1990 to 13.02% in 2013. Several states have adopted ambitious targets on par with those in European countries, even without a mandatory goal for renewable energy use at the federal level. California, for example, is aiming for a 33% renewable share by 2020. The state’s current share is already 20%. Renewables accounted for 49% of all new electrical power capacity added in the United States in 2012. Not only “blue” states, but also Republican strongholds such as Texas and states in the U.S. Midwest are fueling that development. There is bipartisan support for renewable energy, despite some public perception to the contrary.
The year 2013 saw record demand for solar PV in the United States, resulting in more than 4.2 gigawatts (GW) of new installed capacity, about 12% more than in 2012, and a new total of more than 10 GW. Installations have increased 13-fold over the past five years. For wind power, after a record year of 2012 with 13.1 GW of new capacity, 2013 was a much slower year. This setback stems from Congress hesitating until January 2013 to renew the wind power tax credit. Now the wind market is poised to rebound strongly. An increase in wind capacity of 9% to a total of over 65 GW is forecasted, and currently 125 GW is awaiting approval. Still, the future of U.S. renewable energy development is somewhat uncertain, as future federal and state policy support remains unclear.

**Communication of Trends and Policies**

As the cost of renewable energy continues to decline, solar and wind power are starting to be cheaper than fossil fuels in many parts of Europe and the United States. Yet despite the many benefits, misperceptions about sustainable energy technologies have entered the mainstream in both regions. These represent obstacles to the understanding and public acceptance of the transition to a sustainable, modern energy supply. The three roundtables addressed three prominent misperceptions.

1. **Impacts of Sustainable Energy on the Economy**

   From 1990 to 2012, Germany’s gross domestic product (GDP) rose by 37% when adjusted for inflation, while greenhouse gas emissions declined from 1,042 million tons to some 800 million tons during this period of time. Despite ongoing financial challenges in the Euro-zone, Germany’s GDP is forecasted to rise by at least 1.7% in 2014. Jobs in the country’s newly created clean energy sector are projected to reach 500,000 by 2020. The adjusted U.S. GDP rose 69.4% between 1990 and 2012, but the country’s carbon dioxide (CO₂) emissions are now about 10% higher than they were in 1990. The U.S. green economy, meanwhile, employs around 450,000 people in the renewable energy industry, excluding hydropower.

   In 2012, Germany invested USD 22.8 billion in clean energy in 2012, Europe invested USD 79.9 billion, and the United States invested USD 44.2 billion. Moreover, since 1990 increased energy efficiency
has reduced the energy intensity of the economy by 55% in Germany and almost 59% in the United States, resulting in substantial savings in the long term as well as in increased energy security.

![Figure 2. Green Energy Jobs in Germany, 1998–2012, with Projections for 2020](image)

**Figure 2. Green Energy Jobs in Germany, 1998–2012, with Projections for 2020**

*Source: BMU, DLR, Prognos et al., March 2013; © Worldwatch 2014*

2. **Impact of Renewables on Electricity Prices**

Although the cost of electricity for private households in Germany is currently over USD 36 cents per kilowatt-hour (kWh), the renewable energy surcharge, a fee on consumers to pay for the feed-in-tariff for renewable energy producers, is only about 4% of households’ overall cost of energy; other factors include taxes, cost of sale, and profit margins of utilities, and heating oil (35%) and gasoline (41.5%) are much bigger cost drivers. The country’s energy-intensive industries are largely exempt from the surcharge, in order to protect their competitiveness. They also purchase electricity in larger quantities and directly at the energy exchange. There, the growth of renewable energy has caused prices to fall to **below EUR 4 cents** per kWh in 2013, a drop of 26.4% compared to 2011.

Electricity tariffs in Germany were higher than in the United States long before the energy transition. High historical prices, while having some negative effects on poorer households, have created an economy-wide incentive to reduce energy consumption. The German economy currently needs only 0.09 tons of oil equivalent (toe) per USD 1,000 of GDP, as compared to 0.14 tons in the United States. For most U.S. households, current electricity rates vary from below USD 9 cents in North Dakota and Washington State to around USD 16 cents in California. But their consumption is more than three times that in Germany, effectively resulting in monthly electricity bills that are comparable.

3. **Energy Security and Coal Power Usage**

Germany has witnessed no increase in blackouts, as the stability of electricity supply remains very high, with an average of **less than 16 minutes** without power in 2012, compared to **214 minutes** in the United States. Despite the nuclear phase-out and the shelving of plans for six coal-fired power plants, a strong buildup of electrical capacity including solar, wind, and natural gas has made Germany a steady net exporter of energy, even on winter days. A temporary increase in the use of coal of almost 13% since 2009 is being caused by the availability of very cheap coal, displacing natural gas,
as well as by increased heating demand during the long, cold winter season. Even so, Germany used 8% less coal power in 2013 than it did in 1990, and CO₂ emissions from electric power generation dropped from 357 million tons in 1990 to 317 million tons in 2012. Installed coal power capacity in Germany decreased from more than 60 GW in 1990 to less than 55 GW in 2013, and the share of coal in Germany’s electricity generation shrank from 60 percent in 1990 to around 45 percent in 2013, while nuclear power has been replaced by renewable energy.

In the United States, coal power capacity remained largely constant with 302.3 GW in 1990 and 314.8 GW in 2011, but coal-powered generation has varied strongly, from 1,600 billion kWh in 1990 to around 2,000 kWh in 2008 and 1,750 kWh today, while CO₂ emissions from electricity generation rose from 1,820.8 million tons in 1990 to 2,158.5 million tons in 2011. Recently, coal has been losing shares to other fuels, including natural gas. In 2013, the coal share of U.S. electricity generation was an estimated 39.5%, down from some 52% in 1990 and 51% in 1995.

The Challenges Ahead

The three roundtables also discussed challenges and likely future trends in the energy sector, including a continuation of renewable energy growth and the need for massive new generation capacities. There is a need to reshape electricity markets to achieve continued deployment of sustainable energy technologies, smart grids, and more efficient consumption while guaranteeing the stability of supply and achieving support from all stakeholders. The following key challenges were identified and respective solutions discussed:

1. Creating reliable support mechanisms for renewable energy

The roundtable discussed which support policies are needed following the current feed-in-tariffs and tax credits, and what enabling frameworks are needed to create reliable long-term investment climates. In the United States, tax credits have contributed to substantial growth of renewable capacity installations. Twenty-nine states have introduced Renewable Portfolio Standards (RPS), and several have implemented additional and progressive policies. But because several sustainable energy support mechanisms, including tax incentives, are expiring repeatedly, the renewable energy market remains hampered by uncertainty. National carbon pollution standards for new power plants, proposed by the U.S. Environmental Protection Agency and aimed at limiting emissions from these plants, could help the renewables industry. Utilities have started investing in renewable energy as a means to meet existing and future emission and portfolio standards.

Many roundtable participants advocated for feed-in-tariffs (FITs) as the most effective method to stimulate the continuous growth of renewable energy technologies. Germany’s national FIT is widely perceived as instrumental in stimulating the renewable energy boom in the country. There is no single solution suitable for all regions; rather, a lasting and reliable portfolio of support mechanisms, such as FITs and tax incentives, is needed to reinforce the market and to create a sound investment climate for renewables.

2. Supporting wise energy consumption through standards and regulation

The group of experts discussed efficiency measures with different returns on investment, and incentives and business models that could facilitate “real” structural change. Energy efficiency was stated as the most abundant potential source of “new energy” in the United States. For example, new
efficiency standards have caused appliances to reduce use by 50–75% between 1987 and 2010. Despite these substantial gains, a large part of the total energy consumed in the country is still being wasted. Studies estimate that overall energy consumption could be reduced 40–60% by 2050. Large buildings can save an average of 15–20% of their energy consumption without any major investments, just by using optimized building management. But additional measures are more intrusive and require substantial upfront investments and means of verification and reporting. Minimal standards exist but need to be tightened and extended. Enormous potentials for energy savings and more efficient use also exist in Germany and across Europe. The EU has a goal to increase energy efficiency 20% by 2020.

Although a majority of U.S. states has now adopted Energy Efficiency Resource Standards (EERS) or goals requiring or urging utilities to assist their consumers to be more efficient, some utilities actively oppose such policies. Reducing volumes of electricity sales through efficiency conflicts with the traditional utility business model of increasing profits by selling greater volumes. The challenge lies in making the utilities financially indifferent to this reduction in revenues.

At the same time, U.S. homeowners often sell or move from their houses before they recoup any longer-payback (but cost-effective) investment in energy efficiency, such as heating system upgrades; the most common measures taken are improved lighting and appliances offering shorter-term payback. A public education campaign similar to the anti-smoking movement was suggested, promoting efficiency as a healthy goal to pursue, because the economic benefits are not yet sufficient by themselves. Benchmarking, including disclosure, also could provide market incentives. Smart meters, now being installed across the United States, represent a tool to establish potentially collaborative relationships between utilities and customers, aiding utilities with system operations and saving customers money.

Utilities were seen as well positioned to provide capital and to recoup efficiency investments by means of billing: when occupancy changes, the new owners or tenants could continue to pay the utility for the efficiency measures, and still profit from them. Already-existing approaches involve rebates and discounts for efficiency-related products or services. Another approach is separating or “decoupling” of the sale of energy by volume from system management services, for example by creating separate efficiency utilities, as has been done in Vermont.

3. Improving demand-side management

The experts conferred about the principles of demand-side or load management and measures necessary to incentivize their implementation. Demand-side management modifies demand profiles to help match the intermittent generation from renewables, thereby reducing strain on the grid. In the United States, more than USD 2.6 billion in direct revenues could be generated using demand-side management, for example through bill savings. This source of revenue could also be made available to Europe. Since the cost-benefit ratio of options varies greatly, load management should first be implemented in sectors with high potential, and regions that are affected by power plant or grid congestions.

For southern Germany alone, a first-of-its-kind study estimates the load management potential of industry in that region to exceed 1 GW for between 30 minutes and 2 hours. Moreover, it has been found that load management could be a cost-effective alternative to conventional peak-load power
plants. To unlock that, new market structures as well as new business and tariff models are needed. Initial studies indicate that electricity rates that vary with load or time of day could create the needed incentives, provided that they offer tangible and transparent cost savings. Innovative companies have started to study examples in the United States. There is great need for the combination of demand-side management with storage and flexible generation.

4. Creating new energy market structures

Topics of this roundtable were the challenges to the electricity market; future business opportunities for generation, distribution, and storage; and the institutional structures needed for the future energy system. Utilities on both sides of the Atlantic are seeing their business models threatened by the increasing generation of renewable energy owned by private entities. While the Energiewende is proceeding in Germany, the United States is undergoing a transition from a cost-of-service model to a market-driven model in many regions. This is driven by Federal Energy Regulatory Commission regulation and technologies such as cheap PV power, which make consumer-owned generation affordable and manageable. Self-consumption reduces electricity bills, but also utility revenues, thereby raising the question of funding maintenance and upgrades of the grid. In addition, older renewable power installations, once depreciated, can generate electricity at very low marginal costs. Growing numbers of these installations are lowering the market price of electricity, but also reducing incentives for investments in additional installations, creating a “missing money problem.”

Challenges like these are not yet fully solved. Initiatives such as the Regulatory Assistance Project are advising U.S. utilities and officials on economic and environmental sustainability. Different models are being tried. “Co-op” models, where several households own distributed installations, have been tested. Changes in laws might be necessary so that power providers other than regulated public utilities are allowed to sell electricity across public streets. A market-driven capacity mechanism needs to be installed in order to provide sufficient generation capacity at all times. One model that was suggested at the roundtable would require distribution providers, instead of utilities, to buy capacity and negotiate with load-serving entities. Overall, changes will involve and create new business models and roles for utilities, grid operators, and energy service providers, as well as for private individuals. Companies will be compensated not only for the sale of energy per kWh, but also for their services in providing efficiency, capacity, and demand-side management to their customers.

Looking Ahead

The participants considered the dialogue a success in bringing together experts from key sectors and in exchanging promising ideas and approaches to move forward. In a second phase, it is envisioned to organize three individual events to present and further discuss the findings of the roundtables. These events, piggy-backed on signature meetings, will specifically target key multipliers and target groups including energy and industry representatives, federal regulators, state utility regulators, and regional grid operators.

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