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A wind turbine operating next to the Niederaussem coal-fired power plant near Bergheim, Germany. LUKAS SCHULZE/GETTY IMAGES

Carbon Crossroads: Can Germany Revive Its Stalled Energy Transition?

Although Germany has been a global leader in moving to decarbonize its massive economy, the country's ambitious clean-energy transformation is faltering. Now, a broad spectrum of energy experts are working to revitalize the effort to make Germany nearly carbon-free by mid-century.

BY PAUL HOCKENOS • DECEMBER 13, 2018

Northern Germany, from the Polish borderlands in the east to the Netherlands in the west, is the stronghold of Germany's muscular onshore wind power industry. This is where the lion's share of the country's nearly 30,000 wind turbines are sited, a combined force equal to the power generation of about 10 nuclear reactors. Where Germany's northernmost tip abuts Denmark, soaring turbines crowd the horizon as far as the eye can see. And many more are coming as Germany strives to go carbon neutral by 2050.

Yet despite their impressive might, the north's wind parks are a reminder not only of how much has been accomplished in Germany's *Energiewende*, or clean energy

transition, but also of what remains to be done. Although the country has made a Herculean effort to shift to a clean energy economy – in just the past five years government support and costs to consumers have totaled an estimated 160 billion euros (\$181 billion) – Germany’s greenhouse gas emissions have not declined as rapidly as expected in response to the vigorous expansion of renewable energy, which now generates 40 percent of the country’s electricity. Germany’s politicians are even resigned to falling significantly short of the country’s 2020 goal of reducing emissions by 40 percent below 1990 levels.

Germany’s failings have come as a vexing shock to its environmentally conscious citizenry. While Germans still overwhelmingly back the energy transition – for years polls showed support in excess of 90 percent – about three-quarters say the government is not doing enough to slow global warming.

Today, the *Energiewende* finds itself stalled and floundering. Germany’s carbon emissions have stagnated at roughly their 2009 level. The country remains Europe’s largest producer and burner of coal, which generates more than one-third of Germany’s power supply. Moreover, emissions in the transportation sector have shot up by 20 percent since 1995 and are rising with no end in sight, experts say. German consumers have seen their electricity bills soar since 2000, in part because of the renewable energy surcharge.

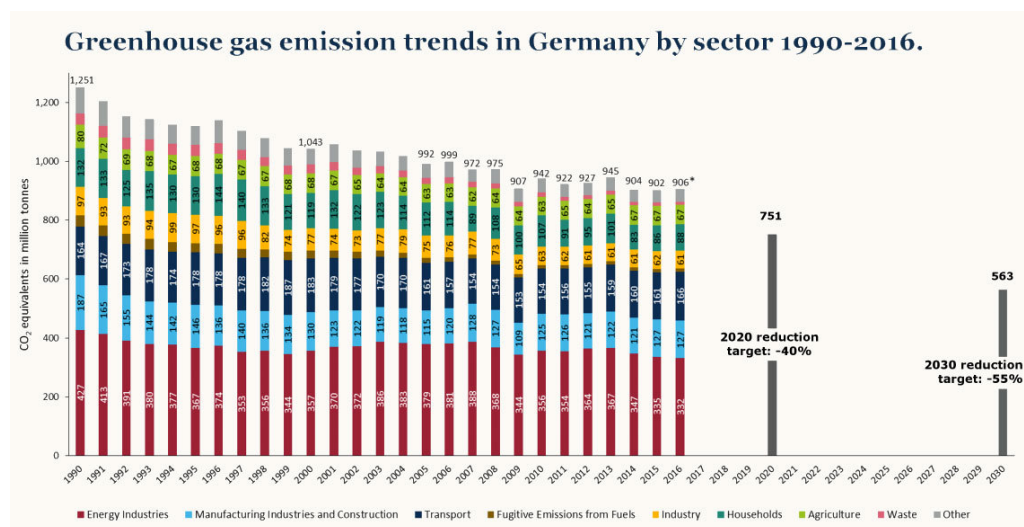
If Germany continues on its present course, its carbon emissions will fall by only 62 percent by 2050.

Now, complex, discomfiting questions loom about the way forward if Germany is to meet even its minimal targets and play the nation’s part in putting the brakes on global warming. From green groups on the left, to independent think tanks, to industry associations, experts have put forth numerous plans to regain the momentum of the *Energiewende* and decarbonize Germany’s economy. The issue is urgent: The German Energy Agency (DNA), a think tank supported by public and private funds, found that if the country continues along its present course, carbon emissions will fall by only 62 percent by 2050 – well short of the government’s goal of slashing emissions up to 95 percent below 1990 levels by mid-century. And analysts say that the challenges Germany now faces will confront other industrialized societies as they attempt to wean themselves off fossil fuels.

The *Energiewende* began as a bottom-up movement that took off in 2000 when

grassroots campaigns persuaded legislators to support renewable energy expansion through feed-in tariffs. In the aftermath of the Fukushima nuclear disaster in Japan in 2011, Chancellor Angela Merkel and her government got behind the energy transition and drafted blueprints to guide it. But in recent years, the government, in the face of auto industry opposition, backed off decarbonizing the transportation sector; has not supported a significant price on carbon; has dragged its feet on grid expansion; has declined to set a date for phasing out coal; and has not implemented significant parts of its own 2050 climate program. Some analysts say that Merkel's decision to step down in 2021 could be a boon for the *Energiewende*, as the Green Party is rising in the polls and will likely play an important role in the next government.

Against this backdrop, the German government's Climate Protection Program 2050, the *Energiewende's* current road map, has come under a barrage of criticism. "The goals set in the climate program aren't nearly ambitious enough," says Benno Hain of the Federal Environment Agency, referring to its vague aim of reducing emissions by 80 to 95 percent compared to 1990 levels. Germany must shoot for a 95 percent reduction and nothing less, Hain says, which means new big-picture scenarios and greater rigor in implementing them.



Tanja Gaudian, of the renewable energy utility EWS Schönau, argues that Germany is sorely in need of a new energy transition master plan. "It's not even clear whether this *Energiewende* will continue to be one driven from below, by communities and citizens as it has so far, or whether the big utilities will be given a special role, even though they don't deserve it," she says, referring to their decades-long opposition to

renewable energy. “There’s so much that’s up in the air.”

The government’s 2050 program, however, is not the only game plan in town for going climate-neutral. German industry, high-level research institutes, NGOs, and think tanks such as DENA have invested heavily in sophisticated analyses that sketch out alternative scenarios for decarbonizing Germany’s energy system. These scenarios address the nature of the technologies of the future; whether coal and other fossil fuels should be forced out of the energy supply or simply left to wither away through market forces; the role of synthetic fuels and hydrogen, as well as carbon capture and storage (CCS); and the extent and type of domestic renewable energy generation. All of these questions are complicated further by the ongoing phase-out of nuclear power, which is not contested in Germany.

The major studies – even those conducted with involvement from Germany industry – concur that Germany can hit its 2030 targets if it changes course. At the very least, these pilot studies can inject new ideas into Germany’s energy policy debates.

“These scenarios show that Germany’s climate and energy targets can be reached with current technologies and without breaking the bank,” says Toby Couture of the think tank E3 Analytics in Berlin. “We don’t have to pull rabbits out of hats or hope for technological miracles. There are two basic things needed to achieve these ambitious decarbonization goals: political will and investment certainty. In the early 2000s, Germany had both; now it arguably has neither.”

One expert says that if a carbon price hits 30 euros per ton, that would effectively spell the end of coal.

Not surprisingly, green organizations and parties – including Greenpeace, Environmental Action Germany, Friends of the Earth Germany, and the German Greens and the Left Party – are calling for a more rapid expansion of renewable energies, a quicker legislated end to coal generation, and the full-scale revamping of Germany’s transportation sector.

Greenpeace Germany has authored one of the most extensive models, which starts with the lofty premise that a 100 percent elimination of greenhouse gases (compared to 1990 levels) is possible in 30 years. Key to this scenario is that Germany can, and should, stop burning coal by 2030. Under this plan, the oldest and dirtiest coal-fired plants, one-third of Germany’s fleet, would have to shut down

by 2020. Another third would close five years later, and the rest in 2030. Greenpeace calls for a steep carbon-pricing scheme that rises to 40 euros a ton by 2030. (The EU's carbon-trading scheme currently lists a [ton of carbon](#) at 12 euros.)

The energy generation capacity lost by removing coal and nuclear power from the supply would be made up for primarily by renewables, argues Greenpeace – above all offshore wind, which is still in its early stages in Germany. While the massive rollout of offshore wind power – more than 12 times the current fleet of 1,170 turbines – is the central plank of Greenpeace's strategy, it also calls for a tripling of onshore wind generation and five times the solar photovoltaic capacity. In the interim, Greenpeace acknowledges that renewables would probably have to be aided by natural gas-fired generation. These ambitious goals would be achievable, argues Greenpeace, by reducing demand: dramatic energy efficiency measures could slash demand for electricity by 18 percent and for heat by 46 percent, compared to 2012 levels.

Moreover, decarbonizing the transportation sector by 2030 implies not only accelerating the transition to electric vehicles, but phasing out conventional, gasoline-powered cars between 2025 and 2035, Greenpeace says.

"It's definitely feasible to ramp down coal by 2030," says Jörg Mühlenhoff of the Agency for Renewable Energies, a Berlin-based renewables advocacy organization.

Indeed, Mühlenhoff says that if a carbon price hits 30 euros, that would effectively spell the end of coal. He adds that renewables could cover most of the gap left by coal if the German government introduces new policy initiatives to spur investments in green energy.

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Wind turbines near Brueck, Germany in June 2016. Germany's nearly 30,000 wind turbines combined equal the power generation of about 10 nuclear reactors. SEAN GALLUP/GETTY IMAGES

Until quite recently, most of Germany's industrial sectors, particularly the more energy intensive among them, had treated *Energiewende* with acute skepticism, worried that high energy costs and supply bottlenecks would hurt their competitive edge in international export markets. Yet German industry is becoming more deeply involved in the *Energiewende*, given the demand for the likes of renewable energy infrastructure (think wind turbines, manufactured by Siemens), electric vehicles, and other green energy technologies. Industry now believes it's better to jump on the bandwagon and engage in policy discussions rather than carp from the sidelines.

Earlier this year, for example, a call for government action signed by 50 prominent businesses – including Siemens and the electronics and construction industries – insisted that “Germany needs a robust strategy for implementing its comparatively stringent emission reduction targets if it does not want to fall behind in the global race to develop carbon-neutral economies.”

This turnaround is nowhere more evident than in the pilot study of the Federation of German Industries (BDI), Germany's largest and most powerful industrial lobby organization. In close collaboration with German businesses, BDI has modeled several *Energiewende* scenarios that are unapologetically pro-business and pro-industry, yet support the broader goals of the energy transition.

“The remarkable thing about the BDI study is that German industry is saying that

the *Energiewende* is technically and economically feasible by 2050,” says Cyril Stephanos of Germany’s National Academy of Science and Engineering, which runs an Energy Systems of the Future program. “It shows that there’s money to be made and not just for industry but for the entire economy.”

The BDI study, however, underscores that unless there’s a multilateral international consensus about targets, burden sharing, and tools like a global CO₂ price, Germany should shoot for reducing emissions by only 80 percent below 1990 levels by 2050. The study claims that, when factoring in savings accrued by dropping fossil fuels from the supply, Germany could reach that target at an additional cost of 240 billion euros, while reducing emissions by a full 95 percent would cost the country 500 billion euros.

An industry scenario relies strongly on energy savings in the housing and building sector.

This BDI scenario relies strongly on energy efficiency, especially in the housing and building sectors, where the chemical industry has much to gain from retrofitting older buildings and providing new buildings with state-of-the-art insulation. It calls for doubling the rate of retrofitting housing and urges requirements that all new homes essentially be highly energy-efficient “passive houses.”

A third approach to fixing the *Energiewende* combines a rigorous reduction of emissions (95 percent by 2050) with solutions that appeal to German business. The research institute DENA favors a rollout of sun- and wind-based renewables, but also advocates for a broader mix of technologies that includes a high volume of synthetic fuels.

Both the DENA and BDI scenarios also depend on carbon capture and storage (CCS) in the transition’s final phase, when energy intensive industries will have to be decarbonized. “We ran our modeling through several times,” explains Christoph Jugel, head of DENA’s energy systems analysis unit. “And even using other technologies we couldn’t manage to eliminate the last 16 million tons of CO₂ left without CCS.” But Jugel notes that the different scenarios don’t factor in technological breakthroughs that can, and most probably will, happen in the decades ahead.

Stephanos says the studies show that Germany will need anywhere from four to seven times as much wind and solar power as it has now. “All of the studies mention

about 5 to 10 million electric cars by 2030,” notes Stephanos. “We’re ramping up, which is good, but we’re not yet close to even a million. There’s still a lot left to figure out. We don’t even know if electricity, hydrogen fuel cells, or biofuels are the best way to decarbonize transportation. It’s astonishing how much more Germany has to do.”

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Paul Hockenos is a Berlin-based writer whose work has appeared in the *The Nation*, *Foreign Policy*, *New York Times*, *Chronicle of Higher Education*, *The Atlantic* and elsewhere. He has authored several books on European affairs, most recently *Berlin Calling: A Story of Anarchy, Music, the Wall and the Birth of the New Berlin*. He was a fellow at the American Academy in Berlin. **MORE** →