Germany's Clean-Energy Push Fuels Interdisciplinary Focus

By PAUL HOCKENOS

BERLIN

GERMANY HAS SET an ambitious goal: to run its economy entirely on renewable energy by 2050.

The *Energiewende*, or clean-energy transition, is often compared in scope to the country's postwar reconstruction. It will require wide-ranging changes in German society beyond energy supply alone—like in architecture and agriculture, urban planning and economic markets, and more. Treading onto this unknown territory, Germany has called on its universities to help make the transformation work.

While Germany is supporting university research into solar power and other clean energy, perhaps the biggest innovation in higher education is how the *Energiewende* has triggered the creation of new interdisciplinary approaches, pushing institutions to develop new courses, degrees, and departments.

INTERNATIONAL

Green technology is not necessarily where the breakthroughs need to happen, said Karl-Friedrich Ziegahn, head of the renewable-energy department at the Karlsruhe Institute of Technology's School of Energy. In terms of the transformation, Germany's biggest challenges today, he said, "are socioeconomic in nature: public awareness, cost, and community involvement."

This is the thinking, for example, behind the University of Freiburg's master's in renewable-energy management, one of several hundred sustainability-related degree programs offered in Germany. Almost all of them have been added over the last six years.

The degree, which is offered through the university's Center for Renewable Energy, is designed to close the gap between the technical aspects of renewable energy and a broader vision of the future of sustainable development.

"This combination of skills is urgently needed right now," said Stefan Adler, the center's managing director. Since it was first offered, in 2008, the degree has grown in popularity. The initial year, the center received 70 applications for 30 spots. In 2013-14. more than 500 applicants worldwide applied for the same number of places, and the center will offer more spots next year.

Germany has already made enormous strides in clean-energy generation. In roughly a decade, the country has expanded its green-power supply to account for a quarter of its electricity—which is twice the United States' share of renewables. On especially sunny and windy days, when its wind farms and solar parks churn out power at peak volume, more than two-thirds of the country's electricity needs are covered by renewables alone.

LEUPHANA U.

At Leuphana U., which has run on renewable energy since 2012, the new central-administration building, designed by the American architect Daniel Libeskind, will be a net-zero-emissions facility.

There are 180 universities and polytechnic colleges in Germany involved in the energy transition, with the federal research ministry providing some $2.65-billion in competitive grants during 2011-13.

"The ethos of sustainability is now integral to all of Germany's universities these days," said Thomas Schomerus, a professor of environmental and energy law at Leuphana University, in Lüneburg, and director of its Institute of Sustainability Governance. "It's not an extra anymore in the curriculum or something exceptional for research."

Leuphana University, for example, has an entire school dedicated to sustainability science. Its 25-member faculty hails from both the humanities and natural sciences.

"Sustainability means that everything is connected, so much so that dividing it up into traditional disciplines means losing the big picture. Sustainability is the big picture, and we need to go deeper into it," said Mr. Schomerus. "It's a new level of doing research."

And Leuphana University practices what it preaches: The university has run on renewable energy since 2012, and its new central-administration facility will be a net-zero-emission building. It is being designed by Daniel Libeskind, an American architect who designed the master plan for the rebuilding of the World Trade Center, in New York City.

Germany's research ministry has also supported collaborations between universities and the private sector. In Berlin, for example, the Technical University is teaming up with Schneider Electric, an electrical-engineering firm, along with other companies, to test innovations in electric mobility and urban smart grids on a new campus.

The campus is a "living lab," said Kai Strunz, a professor of electrical engineering involved in the project. It will eventually employ electrical engineers, computer scientists, mechanical engineers, sociologists, behavioral psychologists, and others.

TURF WARS

To be sure, the steps universities have taken to support the *Energiewende* haven't always been easy.

"Many universities had to catch up with the fast tempo of the changes happening," said Miranda Schreurs, a professor of comparative politics at the Free University Berlin and director of its Environmental Policy Research Center, which advises the government on policy issues.

She said German universities have had to overcome rigid departmentalization and turf wars. "They had to reach out, which was a challenge at first, to collaborate between departments and with non-university actors. Engineers had to talk to sociologists, and sociologists had to understand something about applied science," she said.

And while federal funds have paid for research, they don't necessarily cover the costs to offer new courses or degrees. The budgets for instruction at the University of Freiburg, for example, have remained largely constant, despite the new work in sustainability studies and ever more students. "Our academic staff has taken on a lot of pro-bono work because they believe in what we're doing," said the university's Mr. Adler. "But they're heavily taxed by this overload."

Despite the problems, several German academics involved in *Energiewende*-related work say they have encouraged their counterparts in the United States to follow suit.

Mr. Schomerus of Leuphana, for example, has been a guest lecturer at the University of Texas-Pan American for 20 years. His American colleagues and the university's administration, he said, are "extremely interested" in Germany's energy experiment and have begun "greening" their campus.

"But there's still a big difference," said Mr. Schomerus. "While in Germany sustainability is central to universities today, in the U.S. it's still something exotic. It hasn't been integrated into the curriculum and research priorities."

Mr. Adler of the University of Freiburg said that the political backgrounds in Germany and the United States are very different. In Germany, for example, there is a broad consensus that hydraulic fracking and nuclear power are not options for the future. The country's research agenda reflects a commitment to renewable energy and a concern about climate change shared broadly by political parties, academe, and the public.

"The priorities are simply different," said Mr. Adler, who notes, however, that collaboration can take place. His university is working with the Massachusetts Institute of Technology and the Fraunhofer Center for Sustainable Energy Systems, in Boston, to expand its online master's program in photovoltaics.

"This is just beginning now" in the United States, said Mr. Schomerus, who thinks that American universities could be a catalyst in promoting the principles of sustainability. But German academics can't tell their Americans counterparts "just to do what we do," he said. "This wouldn't work. They have to figure out their own way." ■