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# Out of the Running?

How Germany, Spain, and China Are Seizing the Energy Opportunity and Why the United States Risks Getting Left Behind

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# Introduction and summary

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## A clean-energy call to arms

As the United States debates comprehensive clean-energy legislation, it is confronted with a simple choice: come to the table and feast on the enormous economic opportunity that comes with reducing global warming pollution or be an item on the menu as our economic competitors forge ahead to build prosperity.

By 2020, clean energy will be one of the world's biggest industries, totaling as much as \$2.3 trillion.<sup>1</sup> Over the past year, other countries made huge investments to seize the economic opportunity provided by the historic shift from fossil-based energy to renewable, low-waste electricity and fuel. These investments weren't made out of thin air, but were a result of intentional public policies, which in turn provided a strong stimulus for new public and private investment in new clean-energy markets, infrastructure, and human resources.

China, a country that in some ways is only now experiencing an industrial revolution, has made a serious commitment to building that revolution with low-carbon, low-waste technologies and infrastructure. Several European Union countries—notably Germany and Spain—have also turned from old energy policies to embrace the new. These three countries understand that the transformation to a low-carbon economy brings a range of strategic benefits, from climate stability to energy security to economic prosperity.

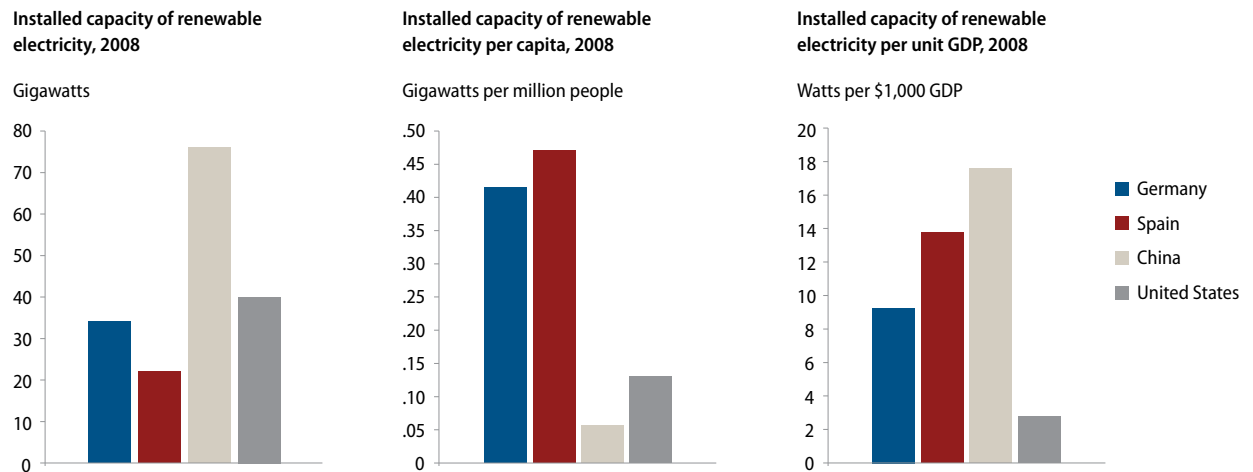
With that understanding, these countries are moving forward decisively. The United States came in second just behind Germany in absolute sales in a recent global country ranking of 2008 clean-energy technology product sales.<sup>2</sup> But when product sales were expressed as a proportion of respective gross domestic product, the United States was far down the list at 19th, compared to Germany at third, Spain at fourth, and China at sixth.<sup>3</sup> The United States also lags on installed renewable energy per capita as well as per unit of gross domestic product (see Figure 1).

These countries invested in clean energy for short-term benefits and laid a solid foundation for future sustainable economic growth by either setting a price on carbon or implementing strong national energy performance standards or both, thus spurring innovation in new technologies that lower carbon emissions. A 2009 study by the CERNA Research Program on Technology Transfer and Climate Change found clear evidence that

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**FIGURE 1**  
**Comparison of renewable electric power capacity in Germany, Spain, China, and the United States**

The United States trails these countries on capacity



Source: Center for American Progress, REN21, International Monetary Fund.

developed countries that ratified the Kyoto Protocol—each of which set a legally binding target to reduce its carbon emissions—saw a rise in green-tech innovation patents of more than 33 percent (see Figure 2).<sup>4</sup> Developed nations that didn’t initially ratify Kyoto—the United States and Australia—saw no noticeable change in their share of total green tech patents over the same time period.

China, as a developing country, was not obligated to adopt mandatory carbon emission reductions targets under the Kyoto Protocol, but the country did embrace the treaty’s clean development mechanism, or CDM. The CDM allows developed countries to offset their emissions at home by investing in clean-energy projects in developing countries, and China greatly benefitted from the resulting technology transfer, particularly in its wind industry.

Today’s clean-tech innovations represent tomorrow’s jobs and GDP growth. China, Germany, and Spain are well on their way to global competitiveness in the clean energy economy. Besides the clear advantage of having signed onto or directly benefitted from the Kyoto Protocol, these three countries have also benefitted from their early adoption of a truly comprehensive approach to energy and climate policy.

In a September 2009 report, “The Clean-Energy Investment Agenda,” the Center for American Progress identified the need for a long-term, comprehensive approach to clean-energy policy that includes three core policy pillars:<sup>5</sup>

- **Markets:** Expanding markets and driving demand for new clean and efficient energy products and services
- **Financing:** Investing across the full value chain of clean-energy solutions—research, development, commercialization, production, and deployment—needed to meet demand
- **Infrastructure:** Revitalizing and reinvesting in the physical and human capital infrastructure upon which the clean-energy transformation—like all major industrial transformations in the past—will ultimately be built

When we researched Germany, Spain, and China’s approach to the emerging clean energy economy, we found that all three countries have taken just such an approach. In this report, we will take a close look at the policies and programs that make up each country’s approach to building a clean energy economy. We will examine how these policies are creating jobs, boosting industries, and spurring innovation in these three countries.

In addition we will use CAP’s three-pillar framework to demonstrate the specific ways these countries are pursuing a broad range of smart policies to create new markets for clean-energy solutions, strategically channeling finances across the entire innovation and commercialization cycle, and building the necessary support infrastructure for new technologies and fuels.

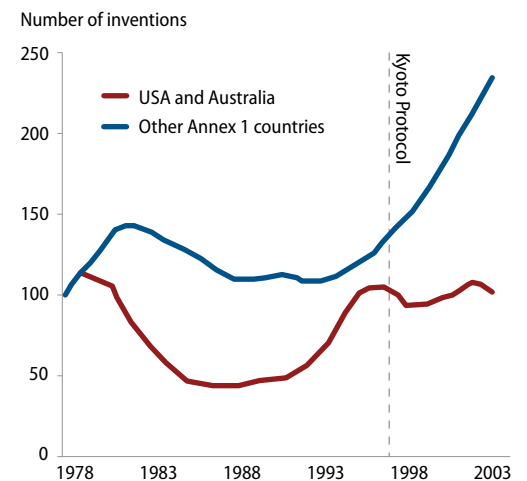
Our purpose here is not to provide an exhaustive survey of the clean-energy policies of each of these countries. Rather, it is to show how they have become top competitors in the emerging global marketplace of clean energy by adopting a strategic policy approach—and to demonstrate what is at stake for the United States if we fail to learn from their example.

China, Germany, and Spain are early winners in the next great technological and industrial revolution. Many other countries such as Denmark, Japan, and South Korea that we do not discuss in this report are also forging ahead with ambitious clean energy economic strategies. The United States, which has yet to fully embrace a truly sustainable growth strategy for the low-carbon future, is not.

The United States has a clear moral imperative to join the worldwide effort to reverse climate change. But it also has an urgent economic imperative to become a clean-energy leader. The clean-energy achievements of China, Germany, and Spain represent a significant step in the fight against global warming pollution, but their driving motivation has been their own economic self-interest, through creating vibrant new industries, sustainable jobs, and international markets for clean-energy technologies.

**FIGURE 2**  
Innovation trends, by number of inventions, among Annex I developed countries under the Kyoto Protocol

Kyoto signatories saw more inventions



Source: CERNA, Mines ParisTech.

We can do the same and we can do better, but not if we use the excuse—as opponents of passing comprehensive energy and climate legislation frequently do—of temporarily weak economic conditions to delay the transformation to a clean energy economy. It is through a failure to act that the United States will suffer economically.

American workers, business leaders, and policymakers struggling under the weight of a historic economic downturn may question the relevance of policies in European and Asian nations. But they should consider just one concrete result of the United States not having a similar policy focus: Less than two years after building a solar manufacturing plant in Devens, Massachusetts, Evergreen Solar—an early U.S. pioneer in solar photovoltaic technology—announced plans to move part of that operation to Wuhan, China.<sup>6</sup>

The race toward a clean-energy future is underway, and those nations that lead will reap enormous economic benefits. With the right investments and smart policies, the United States can be among them, a top player in the emerging global low-carbon economy.

## Energy policies in Germany, Spain, China, and the United States

Germany, Spain, and China are pursuing national policies for markets, financing, and infrastructure

		Germany	Spain	China	United States
<b>Markets</b>	<b>Carbon pollution reduction commitment</b>	40 percent below 1990 by 2020	20 percent below 1990 by 2020	40 to 45 percent decrease in carbon intensity by 2020	No binding national policy, although a political commitment to 17 percent below 2005 by 2020
	<b>National renewable electricity standard</b>	20 percent by 2020	30 percent by 2020, with carveouts for specific technologies	15 percent nonfossil energy by 2020, with additional policies for specific technologies that effectively strengthen the goal	No comparable national policy, although 29 states have mandatory RES policies and six more states have goals for renewable energy use
	<b>National energy efficiency plan</b>	E.U. goal of reducing energy use to 20 percent below business-as-usual projections by 2020. Building codes have increased demand for low-energy houses 900 percent from 1999 to 2007.	E.U. goal of reducing energy use to 20 percent below business-as-usual projections by 2020. National plan has already reduced energy intensity by 11 percent from 2004.	20 percent decrease in energy intensity from 2005 to 2010	No comparable national policy, although 21 states have energy efficiency resource standards. The United States will invest \$28 billion in efficiency programs as part of American Recovery and Reinvestment Act.
<b>Financing</b>	<b>Feed-in tariffs</b>	Tariff targets emerging technologies, with a total subsidy of \$4.6 billion	Tariff amount tied to market growth for specific technologies	Tariff is 7 to 9 cents per kwh for wind, with solar moving toward a similar structure	No comparable national policy, although there are a few state and local feed-in tariff experiments
	<b>Government-run "Green Bank"</b>	Government-run KfW provides loans and other financing supports for renewable energy and energy efficiency	Multiple programs, including loan programs for specific technologies and support for strategic projects from government-run IDAE	Government-run CECIC will have a portfolio of roughly \$15 billion in assets consisting of energy efficiency, renewable energy, and pollution control technologies by 2012	No comparable national policy, although DOE's loan guarantee program provides low-cost financing that leverages private capital and DOE-run ARPA-E supports earlier stage innovation
	<b>Tax benefits</b>	Tax incentives for bioenergy and fuel-efficient vehicles, in addition to a generally low corporate tax rate	Tax exemptions for biofuels	Value-added tax reduction for wind generators and value-added tax rebate for raw materials imports used in wind turbine manufacturing	Production Tax Credit for wind and Investment Tax Credit for solar
	<b>Other government funds</b>	Market Incentive Program provides \$308 million annually in grants to renewable projects	Funding for energy R&D via multiple government institutions (ENCYT, CIEMAT, and CENER)	Multiple technology R&D programs and large equity investments from the state wealth fund	No permanent national policy, although ARRA has \$6.3 billion for research, including advanced batteries, carbon capture and storage, and ARPA-E that develops new clean energy technologies
<b>Infrastructure</b>	<b>Workforce and manufacturing infrastructure</b>	Provides grants and interest-free loans with goal of reducing number of young adults without vocational training by half by 2015	National renewable energy job-training center has programs for all sectors and skill levels	Strong domestic content laws and incentives to use domestically produced inputs	No permanent national policy on green workforce development, but related programs include \$500 million for clean-energy jobs training and "Buy America" provisions in ARRA, the Workforce Investment Act, and the Green Jobs Act
	<b>Grid construction and improvements</b>	Coordinating with neighboring countries to build a "supergrid" for offshore wind power	Upgrading grid with new technologies specifically for renewable energy, including use of electric vehicles as a stability tool	Mandates that grid companies must build interconnections for renewable projects and has plans for smart grid by 2020	No permanent national policy, but ARRA includes \$17 billion for grants and loans for transmission and smart grid, which will leverage private capital

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The Center for American Progress is a nonpartisan research and educational institute dedicated to promoting a strong, just and free America that ensures opportunity for all. We believe that Americans are bound together by a common commitment to these values and we aspire to ensure that our national policies reflect these values. We work to find progressive and pragmatic solutions to significant domestic and international problems and develop policy proposals that foster a government that is “of the people, by the people, and for the people.”

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