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In the Clean Energy Race, Is the United States a Leader or a Luddite?

By Kate Gordon, Robert Borosage, and Derek Pugh December 2013

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Introduction

A new green industrial revolution—driven by a variety of concerns and opportunities—is gathering steam across the globe. In some regions, it is spurred by land and water scarcity. In others, it is driven by rising concerns about catastrophic climate change. And in even more regions, new energy technology and financial innovations have opened up exciting industrial and economic possibilities. Whatever the cause of this transformation, at its center is a new approach to energy characterized by an increasing commitment to renewable energy, energy conservation and efficiency, and a 21st-century approach of generating and moving fuels and electricity that recognizes—not denies—our climate and natural resource challenges.

This growing commitment is already informing governmental, corporate, and private decisions. It is beginning to affect how regions produce, distribute, and consume energy. Over the next few decades, it will alter everything: where we live, how we travel, and how we think about economic growth and prosperity. The commitment is only at its beginning stages; it will become the source of expanding global markets and of millions of new jobs in a hugely diverse set of industries and occupations, from cutting-edge research to installation of technologies such as rooftop solar panels and utility-scale wind farms.

The countries that lead this transformation will benefit enormously, not just from breathing healthier air and drinking untainted water, but also from economic expansion in the forms of new markets, profits, and jobs. The countries that lead this green revolution will lead the 21st century. Those that ignore it will become this century's Luddites.

The question facing the United States is clear: Which one will we choose to be, leader or Luddite?

Today, the United States is a leader in advanced energy innovation, holding most of the world's patents in this area. We are also at the front of the pack when it comes to installing new renewable energy systems, building highly efficient structures, and pushing for more fuel-efficient and electric cars. But we have many rivals. China and Germany, in particular, have made the clean energy transition central to their overall economic development strategies. Despite some major setbacks and obstacles, these countries continue to have a strong political and policy consensus behind transforming to a more advanced energy economy, while in the United States—notwithstanding the president's recent rousing climate speech in June 2013—the past few years have seen an increasingly partisan divide on energy and climate issues at the national level.

The 2012 election highlighted these divisions. Candidates from states with strong fossil fuel mining and extraction operations increasingly identified with a "drill, baby, drill" agenda, dismissing climate change alarms and championing domestic energy production. The ferocity of the political season's anti-climate change rhetoric ultimately moved New York City Mayor Michael Bloomberg—who witnessed the destruction of parts of his great city after Hurricane Sandy—to issue a strong endorsement for President Barack Obama a few days before the election, stating that "This issue is too important. We need determined leadership at the national level to move the nation and the world forward."[1]

We now face a situation where political pressures are threatening to roll back valuable energy programs, such as state renewable energy standards and federal tax credits for wind and solar power. Instead, at the front and center of our new national energy policy is a domestic oil and gas production agenda that would ultimately speed the rate of climate change. At the same time, the surge in funding for clean energy that came from the American Recovery and Reinvestment Act is winding down, meaning that many of the most exciting efforts to move America toward a new energy paradigm are at risk of dying on the vine.

America is at a crossroads. Will the United States choose to continue its progress toward leadership in renewable energy and energy efficiency in the green industrial transformations that have already begun? Or will it cede leadership to other countries committed to dominating the new markets?

This report—a joint effort of the BlueGreen Alliance, the Institute for America's Future, and the Center for American Progress—summarizes the stakes involved in this choice. We propose a bold strategy for the United States, one that relies on this country's great natural and economic strengths, to capture a leading role in this 21st-century green industrial transformation.

Specifically, we propose that the United States take advantage of its true national strengths: the ability to innovate from the state and local levels up, and to combine policies that work for different regions of the country into a coherent whole. Ultimately, we believe that our national energy strategy must be, at its heart, an integrated set of regional energy strategies. This is our competitive edge. Unlike China and Germany, which drive policy from the top down, we are a country of bottom-up innovation and initiative. Collecting these efforts into a national strategy will take action, and we recommend that not only Congress but also the Department of Commerce—which already has regional economic development functions—play a major role in this initiative.

The global race for clean energy leadership

America is emerging from a historically strong period of clean energy investment. The American Recovery and Reinvestment Act, or ARRA, often called the "stimulus bill," presaged a golden age of clean energy policies and financing, which led to rapid growth in the renewable energy and efficiency sectors. The tax credits, block grants, and infrastructure funds generated by this program, building on a foundation of strong state incentives for renewable energy and efficiency that had been developed in the years leading up to the national stimulus bill, vaulted the United States to the number one position on the Pew Charitable Trust's ranking of global clean energy investors in 2011.[2] With $48.1 billion in clean energy investments that year, the United States finally pulled in front of China for the first time since Pew began this series of reports.

In 2011, the United States "led all nations in financing for solar, energy efficiency, and biofuel technologies"[3] and continued its leadership in venture capital investment. We also excelled in research and development, or R&D: U.S. public and private R&D accounted for 30 percent of the world total in 2011.[4] And we were not just inventing and financing these systems: The U.S. doubled its own domestic renewable energy capacity from 2009 to 2012.

But while we led in innovation and installation, we fell behind on other critical pieces of the energy value chain, particularly in advanced manufacturing. Throughout our history, our most effective economic development initiatives have focused not only on creation of new technologies, but also on providing the infrastructure for those technologies to be developed, produced, and moved across the United States. Our education, workforce training, transportation, and energy systems have undergirded our economic successes for decades. Without public investments in higher education and defense-related computer technology, for instance, there would likely be no Internet today.[5]

In addition, many of these innovations happened not at the national level, but rather at the regional level. As the Brookings Institution's Mark Muro and Bruce Katz pointed out, it is at the local and regional level where the United States experiences the "grounded, day-to-day interactions by which real companies in real places complete transactions, share technologies, develop innovations, start new businesses—and yes, create jobs and locate workers."[6]

But in our approach to energy policy and—within it—advanced manufacturing policy, we seem to have forgotten these lessons. Although the ARRA took a regionally focused and integrated approach to policy development,[7] it stands as an exception: In general the U.S. approach to policy in this arena has been disaggregated and inconsistent.[8]

China's approach to clean energy policy stands in contrast. China has prioritized manufacturing and installation, focusing specifically on increasing its exports in clean energy technologies to other countries. This was in the context of a high-level policy strategy, the 12th Five-Year Plan, which set aggressive growth goals for "strategic emerging industries"–including three new energy industries: clean energy technology, alternative energy, and clean energy vehicles.[9] China's clean energy strategy is not perfect by any means. The government's focus on manufacturing and installation at the expense of building out China's research and development engines, for example, led to major overproduction of conventional solar panels last year and ended up bankrupting some of the country's model businesses. But there is no doubt that the strategy drove China's clean energy sector forward. The country is now the world leader in total installed capacity for renewable energy, while also producing half of the world's wind turbine and solar modules.[10] Indeed, in 2012, China reclaimed the first spot in the Pew rankings.

For those uncomfortable with looking to a non-democratic country for inspiration, we can turn westward to Germany. In many ways, Germany's remarkable commitment to "Energiewende," or energy transformation, is even more breathtaking than China's recent moves in this direction. Germany has pursued its clean energy vision over the past two decades, recognizing the need for a comprehensive policy approach across sectors. This has driven a dramatic investment in clean energy as well as a modernized grid, energy efficiency, and technological invention.[11] Now committed to closing down nuclear plants that supply 20 percent of the nation's energy, the German plan projects that in 40 years, 80 percent of electricity will come from renewable sources, as opposed to 80 percent currently derived from fossil fuels and nuclear. Recently, Chancellor Angela Merkel announced plans to build offshore

wind farms that will cover an area six times the size of New York City at the cost of $263 billion, or about 8 percent of the 2011 German gross domestic product, or GDP.[12] Bolstered by strong incentives, Germany is the largest global solar market in the world.[13] Again, this strategy is not perfect. In Germany, the national feed-in tariff policy, which requires utilities to buy small-scale renewable power at a fixed price, has resulted in massive deployment of solar panels but also in inflated electricity costs. Germany's government continues to adjust the tariff rate, but many businesses are agitating to end the policy altogether.[14] Still, the German model—like the Chinese example—is a reminder that a true commitment to energy transformation must start with making that transformation a priority across sectors and industries, and an integral part of a nation's overall economic strategy.

The United States has not made energy transformation a priority. Here, funding for energy research and development is squeezed during every federal budget cycle, and a range of core clean energy initiatives are expiring. As Pew's "Who's Winning the Clean Energy Race? 2012 Edition" report noted, "Even as several pioneering countries have stumbled, new markets have opened, and the center for clean energy investment has shifted from West to East."[15]

The stakes: A new industrial revolution

The industrial revolution set up the economic pecking order for the 20th century. Leadership in the green economy will pay similar rewards in the 21st century, as this growing market experiences vast expansion over the coming decades. The U.N. Environment Programme reports that there are more than 5 million green jobs worldwide, which has doubled since 2006.[16] Domestically, job growth in the renewable energy sector has been increasing at a rate of 3.4 percent per year, and growing four times faster than other sectors.[17]

Private capital investment in renewable energy alone is up by more than 600 percent since 2004. An estimated $2.3 trillion investment in the broader low-carbon energy market is projected for the next decade.[18] Even in the face of new fossil fuel discoveries, unstable energy prices continue to drive investment in energy efficiency and conservation. Ernst & Young found in 2011 that three-fourths of the major global corporations planned to increase their clean technology budgets from 2012 to 2014, with much of it going to research and development.[19] In fact, global investments in renewable energy power plants were actually higher than in fossil fuel power plants in 2012.[20]

By the end of 2012, the 648 gigawatts, or GW, in clean energy generation capacity in place globally were 56 percent greater than installed nuclear generation.[21] While hydropower still provides the great bulk of electricity from renewable energy sources, solar photovoltaic, or PV, was the fastest-growing renewable energy technology worldwide, generating four times more than it did in 2009.[22] Both wind and solar prices have dropped dramatically, in no small part because of ill-considered Chinese and German policies that led to overproduction of solar panels, which flooded the global market, making them closer to price-competitive with traditional sources. Investment in this sector is projected to total $1.9 trillion over the next seven years.[23]

In the United States, public and private investments in advanced energy projects have created both new clean megawatts and new clean energy jobs. In general, advanced energy industries grew faster than the overall economy during the past decade and fared better during the recession.[24] The Bureau of Labor Statistics, or BLS, estimates that there were 3.4 million green jobs in the U.S. economy in 2011, nearly three-fourths of which were in the private sector.[25] The BLS definition is narrow, omitting areas such as vehicle efficiency, but it does include jobs across multiple sectors of the economy: clean energy production, conservation, recycling, energy efficiency, retrofitting, sales and services, and more.

Although the United States has not focused as intently on its energy manufacturing strategy as China and Germany, manufacturing still dominates the clean economy sector, with jobs in renewable energy and efficiency systems, biofuels, green chemicals, and electric vehicles. The highest number of green jobs in the BLS survey—nearly 15 percent of all jobs counted—were in manufacturing.[26] This is down from 26 percent in 2010, mostly because of gains in the construction sector, but it is still significant. While China competes largely on price with low-wage labor, the United States tends to hold a competitive advantage in higher-skilled, more advanced manufacturing jobs and with jobs in firms making products that are not produced elsewhere.[27] These jobs "punch above their weight," as National Economic Council Director Gene Sperling has noted, in that they generate multiple offshoot jobs in other industries, offer good job opportunities to non-college-educated workers, and offer a median wage that is higher than that of the economy as whole.[28]

The coming years will bring huge new climate challenges, and with them new opportunities to continue these strong industry- and job-growth patterns. We will also see growth in new areas, such as infrastructure development, which will bring job opportunities to skilled workers in manufacturing and construction in particular. Extreme weather events such as Superstorm Sandy not only underscore the need to do something about our warming planet, but they also highlight the inherent vulnerability of our existing energy infrastructure—and the imperative to strengthen and modernize it. While power lines went down, nuclear power plants went offline, and millions of people went without electricity during the hurricane, smaller and more localized power generators such as Bloom Energy's fuel cells in Delaware continued to operate. As storms like Sandy become more common, it is imperative that wealthy countries such as the United States begin to seriously think about hardening and modernizing their infrastructure in order to protect themselves against climate change events, and to do so in a way that emits as little carbon as possible.

The challenge: China rising

The United States is just waking up to these realities, but China—one of our major global economic competitors—is already acting on them. In its 12th Five-Year Plan covering the years from 2011 to 2015, Chinese leaders identified seven "strategic emerging industries" as critical to moving China up the value-added chain in manufacturing and crucial to its overall sustainable development.[29] Three of them—clean energy technology, alternative energy, and clean energy vehicles—are core to the green economy. China's goal is to grow these sectors from 5 percent of its GDP in 2010 to 15 percent of its GDP by 2020. Goldman Sachs reports that China plans to invest $1.7 trillion in the seven industries over the next five years—the equivalent of a stunning 20 percent of China's GDP in 2011.[30] In 2012, China's growth and energy use slowed, but it remains on target for its major goals. Renewable and nuclear energy constituted an estimated 94 percent of all electricity generation growth in 2012.[31]

China is now the largest energy consumer in the world, having surpassed the United States in 2010. Not coincidentally, it is also the largest carbon emitter. Seventy percent of China's energy comes from coal, and China is now the world's largest producer and consumer of coal.[32] This dominance has come at a huge cost to China's air and water quality. In its push for more sustainable development to deal with pollution issues and to turn itself into an advanced energy manufactur-

ing powerhouse, China is emphasizing clean coal technologies along with other more renewable technologies. To advance and clean up its coal industry, China has set required targets for a 17 percent reduction in carbon emissions per unit of GDP, 16 percent reduction in energy intensity per unit of GDP, and a 30 percent reduction of water usage per unit of industrial value added.[33] Since 2011, China's leaders have pushed new coal emission regulations and air-quality standards in response to what is seen as a growing crisis.

Meanwhile, China already has the largest renewable energy capacity in the world, totaling 152 GW in 2012, or 25 percent of the global total.[34] It is the world's largest producer of hydroelectric power, which constitutes 80 percent of its renewable energy capacity.

In addition, the current Five-Year Plan sets a renewable energy target that calls for non-fossil fuels to grow to 15 percent of the country's electricity use by 2020, up from 8.6 percent in 2010. Reputable estimates suggest that they exceeded 9 percent by the end of 2012.[35] The full target will require an estimated 320 GW to 480 GW in growth of capacity over the next decade, or what Goldman Sachs estimates as one-third to one-half of the entire global non-fossil fuel capacity.[36] This would require huge growth in China's renewable and low-carbon energy sectors: For wind, the current goal is 100 GW of capacity by 2015, up from 45 GW in 2001; for solar PV, the goal is a dramatic increase from 21 GW to 35 GW by 2015. Nuclear energy capacity is also projected to expand significantly.

This commitment to low-carbon energy is integrated into a broader set of clean energy and economic plans. The Five-Year Plan is complemented by China's Top 1,000 Energy-Consuming Enterprises Program, which sets targets for energy efficiency from the country's leading corporations that consume one-third of the country's energy.[37] It has ambitious goals for upgrading and expanding a smarter, more modern grid system, with a major commitment to building high-voltage transmission lines to try to solve problems of connectivity and transmission, and a mass market in smart meters to increase efficiency as consumer prices rise. It has launched pilot projects on price reforms, seeking to reduce subsidies for energy and allow rising prices to help fuel conservation and efficiency.[38] China has also implemented impressive education and workforce-training efforts to back up its commitment to clean energy leadership, making it an ideal place for emerging innovative energy companies to locate with the secure knowledge that they will find a willing and well-trained set of engineers, manufacturing experts, and programmers at the ready.[39] These strategies have not all succeeded—despite its

goal of becoming a clean energy innovator, China is still mostly competing in this sector as a low-cost manufacturer—but the country is continuing to push forward with a strong national clean energy strategy that is fully integrated into a larger economic development plan.

China's leadership in clean energy comes at a cost. Because of the country's strong focus on developing an export base for clean energy products, it has sometimes failed to push for the kind of domestic energy transformation that it desperately needs. It is beyond ironic that the leader in manufacturing clean energy technologies such as solar panels and windmills suffers from the world's worst air and water pollution. Twenty of the 30 most polluted cities in the world are in China, and one-third of the country is affected by acid rain.[40] Cancer is now a leading cause of death in China due to toxic chemicals.[41] Demonstrations and protests have spread, as people increasingly object to these policies, and these protests are starting to drive China toward a more aggressive approach to domestic pollution regulation.[42]

Chinese exports are also bolstered by harsh policies that suppress consumption, poison the environment, and expose workers to poor wages as well as unsafe working and living conditions. China's overall economic growth strategy drives a race to the bottom globally, as countries with better worker and environmental protections struggle to compete.[43]

China clearly sees leadership in renewable energy as essential to its own internal development, as well as a key part of its export strategy. Premier Li Keqiang, who came into power in March, is so focused on moving China toward a more sustainable—and at the same time, profitable—business model that some are calling the country's shift toward these practices "Liconomics."[44] It is moving aggressively to climb the ladder of technological innovation, capturing existing technology, seeking to dominate the markets in wind and solar. It has sustained and expanded this effort in its 13th Five-Year Plan, with clear goals, the commitment of substantial capital, and pricing policies that help create markets for more costly renewable energy such as solar and wind. It has become a world leader in renewable energy and plans to sustain and expand on that position. Although this strategy is showing cracks, most recently in China's largest solar manufacturer, Suntech, defaulting on its state loans after being propped up by government funds for years,[45] China's commitment to renewable energy will continue to make it a manufacturing leader in the green industrial revolution.

The United States: Pushing forward or falling behind?

Unlike China, the United States is not a top-down, command-and-control economy. Private-sector investment decisions drive innovation and development, and are the primary source of economic growth. These decisions often happen along regional lines—for instance, in the Silicon Valley and Research Triangle corridors. But historically, the private sector relies on the government, whether state or federal, for help: to structure markets, seed research and development, and provide subsidies and support for strategic industries that are deemed important to our national security or economic position.

In clean energy and the green economy, the United States has suffered from short-term and changeable policies at the national level. We started out strong in the 1970s. In response to the Arab oil embargo, the National Energy Act of 1978 focused on conserving fossil fuels; at the same time, public utility regulatory policy required utilities to purchase power from consumers, encouraging development of a small distributed solar and wind energy sector.[46] The oil crisis and concerns about "peak oil" also spurred federal support of the biofuels industry and development of ethanol as an energy source. But this period of growth was succeeded by neglect—if not disdain—for clean energy technologies in the 1980s, and then a resurgence of interest that peaked with the American Recovery and Reinvestment Act in 2009. Overall, from 1979 to 1999, $91.5 billion in 2000 dollars went into energy R&D at the Department of Energy—and of this, 62 percent went to a combination of fossil fuel and nuclear research, and only 32 percent to renewables and energy efficiency.[47] And DBL Investors found that by 2009, the American oil and gas industry had received a whopping $447 billion in 2010 dollars in cumulative historical subsidies. Compare that to the paltry $6 billion that wind, solar, and geothermal energy received in cumulative subsidies by that same year.[48]

Even during times of growth, most U.S. clean energy policies have been time limited, underfunded, and politically charged, while oil and gas companies have quietly enjoyed sustained government subsidies for a century.[49] Perhaps the signature example of this on-again, off-again approach to alternative energy funding is the Production Tax Credit, or PTC, for renewable energy, which originally passed in the Energy Policy Act of 1992, and has limped along in short extender bills ever since. Most recently, the PTC was set to expire in December 2012 and extended for just one additional year; it is currently under consideration once again by a deeply skeptical Congress.[50]

President Obama's first term seemed to be a turning point for clean energy. The single-largest domestic investment in alternative energy, transportation, and fuel in U.S. history was the ARRA, which provided a dramatic surge of public investment and initiative in advanced energy projects. The ARRA provided about $90 billion in federal investment and stimulated another $100 billion in private investment in energy efficiency, renewable energy, and low-carbon fuels and vehicles. The total included grants, loan guarantees, tax credits, investment in R&D, competitive prize competitions, and development projects across a wide range of sectors and technologies. For instance, on the early stage technology side, the legislation created a new agency called the Advanced Research Projects Agency-Energy, or ARPA-E, modeled after the Department of Defense's Defense Advanced Research Projects Agency, or DARPA, program, to drive advanced research projects in energy. But it also prioritized deployment of existing technologies, such as smart grid and smart meter programs, high-speed rail, and efficiency upgrades to federal buildings and the federal fleet. One of the biggest single investments was in low-income weatherization, which received $6 billion under this measure.[51]

One important aspect of ARRA was that it combined efficiency regulations and procurement goals, which help create a market for new technologies, with financing tools to help the deployment of these technologies. For example, the administration raised fuel-efficiency standards to increase automotive efficiency and drive technology innovation, while also providing new financing tools for advanced battery research. At the same time, it recognized America's history of strong regionally-focused energy strategies by setting up a local Energy Efficiency Block Grant program and providing the initial funding for the Energy Regional Innovation Cluster, or E-RIC, which challenged regions to come up with innovative technology and economic development solutions to solve clean energy problems.[52]

Under these policies, combined with some very strong existing initiatives at the local and state level, renewable energy capacity in the United States doubled between 2009 and 2012.[53] The wind sector grew particularly fast during this period: U.S. wind energy capacity went from 9,922 megawatts, or MW, installed in 2009[54] to 59 GW installed and connected in 2012.[55] The Department of Energy projected that wind would reach 61 GW by 2030[56] but recent trends suggest that this figure will be far surpassed. The wind sector also saw strong domestic manufacturing growth as more megawatts were installed: Domestic content of wind turbine parts went from just 20 percent to 60 percent as the U.S. capacity built up.[57] One of the ARRA's most successful programs, the Advanced Manufacturing Tax

Credit program, helped companies build or retool hundreds of new factories for solar power generation, advanced batteries, wind turbine components, and more.

ARRA was a critically important bill. But it was also a time-limited one. The last ARRA dollars have wended their way through the clean energy markets, and now we face the potential expiration of several other important financing tools that have been part of the U.S. energy transformation toolbox. The Production Tax Credit just expired last year and was extended for only one more year through this December. The Investment Tax Credit is slated to expire in 2016. The last of the Advanced Manufacturing Tax Credits will be distributed in early 2014.

Unfortunately, there is little prospect of new federal congressional programs to provide strong incentives for the innovation, manufacture, and deployment of advanced energy technologies. Indeed, the current Congress seems especially hostile to any transformation of our energy system toward lower-carbon alternatives. For instance, the House appropriations bills for fiscal year 2014 seek to slash all nondefense research and development by 11.6 percent.[58] And under the sequestration cuts that went into effect on March 1, 2013, renewable energy grants were cut 8.7 percent for the remainder of the year, with more cuts likely in future budgets.[59] Even early stage research and development, usually a bipartisan program, has been slashed. The Department of Education's science budget, the Office of Energy Efficiency and Renewable Energy, or EERE, and ARPA-E suffered cuts of 5 percent and more under sequestration.[60] Perhaps most telling is that the BLS, which only just started tracking the clean energy economy a few years ago, had to cut its program off completely due to sequestration cuts. As the agency's March 19, 2013 press release on "Employment in Green Goods and Services—2011" stated, "In order to achieve these savings and protect core programs, the BLS will eliminate two programs and all 'measuring green jobs' products."[61]

President Obama remains committed to using regulation and his executive powers to drive the energy transformation as part of a larger national response to climate change, as is evident from the president's Climate Action Plan, which was released in June 2013.[62] But there are distinct limits on what any president can do without congressional action.

Just as all these renewable energy, efficiency, and technology programs have gone into decline, the United States has seen a huge energy boom in a much more carbon-intensive sector: unconventional oil and gas. Oil production rose to its highest level in decades, while natural gas—with the massive expansion of

controversial recovery technologies such as hydraulic fracturing, or fracking—reached an all-time high. These advances, especially in natural gas, have helped cut coal use dramatically in the United States but have also threatened to crowd out renewable energy innovation and deployment, as well as energy efficiency initiatives.[63] Without strong and consistent policy support for low-carbon energy alternatives, which help create market certainty for investors and inventors, these sectors threaten to wither on the vine. As Goldman Sachs noted in 2012, "The lack of long-term policy certainty in the United States makes it unlikely that the robust levels of [private] investment can be sustained."[64]

With the Recovery Act, the United States put a marker down that it is serious about transforming its energy sector. But most ARRA programs expired at the end of 2011, and though some programs were extended for a year or two,[65] the clean energy marker is decidedly wavering. The United States now must decide whether to compete for leadership in this area or cede the leadership to others.

Choosing to lead

There is no question that if we choose to lead, we can surge ahead in the global clean energy marketplace. Over the past four years, as ARRA programs and complementary state programs have trickled into its economy, the United States has demonstrated the ability to compete in the new global economy. Our capacity for innovation is unmatched. Our venture capital markets are unrivaled. Our scientists and technologically sophisticated workforce are a global asset. And our ability to translate local and state successes into national programs has borne out time and time again. But faced with China, Germany, and other countries making a full effort to capture and dominate the emerging clean energy and broader green economy, the United States will compete and win only if it leverages these economic and cultural strengths and uses them as the foundation for a long-term and integrated national policy to drive the process.

Many reports have been written about the policy elements necessary to put the United States into this leadership position.[66] It is clear that we must take the kind of integrated approach that China and Germany have taken when building their own clean energy economies. We need to provide clear and consistent signals to investors and businesses by setting national goals for clean energy production and carbon emission reduction. We need to help drive innovation by investing in research and development, and providing manufacturing incentives in these new

growth industries. We need to continue investing in the basic building blocks that underpin all economic growth: our education and workforce systems.

These national policies provide a framework for action. If the United States is to take leadership in this area, these policies should be augmented by a major strategic initiative that takes advantage of the country's natural strengths, in particular our ability to innovate at the local and regional level, and to learn from these successes in designing our national policy. In the remainder of this paper, we argue that a bottom-up regional strategy is key to the U.S. clean energy future, and that the Department of Commerce—usually an overlooked agency in the clean energy space—is key to accomplishing this regional strategy.

A regional strategy

The United States would greatly benefit from fostering a regional approach to clean energy. We are not a centralized economy like China. We are a collection of states and regions, each with diverse natural and human capital resources, energy consumption patterns, and economic growth strategies. We should exploit this diversity and develop a national energy strategy that truly draws from these regional differences. In a recent report, the Center for American Progress, or CAP, and the California think tank Next Generation—formerly called The Center for the Next Generation, or TCNG—joined in detailing elements of that strategy.

The report, "Regional Energy, National Solutions: A Real Energy Vision for America,"[67] provides a clear alternative to the simplistic—and irresponsible—"drill, baby, drill" vision put forth by the American Petroleum Institute and its followers. Instead, the report provides an alternative, sustainable vision for each of the six major multistate regions of the country, each based on that region's unique strengths: offshore wind off the Atlantic, solar in the Pacific, advanced vehicles in the Midwest, smart grid in the Southeast, large-scale renewables in the Mountain West, and coastal restoration in the Gulf states.

The report contends that energy issues are inherently regional, and the authors approach their policy recommendations in that light. They also recognize these other important truths about the future of the U.S. energy system:

- Our earth is warming, and our resources are finite, which means we must swiftly enact measures to make us global leaders in the face of that reality.

- We must drive investment in multiple forms of energy and fuel so we are never dependent on one finite resource for electricity and transportation needs.

- We must understand and respect the unique assets of each region of our country, whether they are natural resources or infrastructure and workforce investments.

- Energy transformation will require ambitious, large-scale projects that create new jobs and anchor strong economic development strategies to ensure American economic competitiveness and true energy independence well into the future.

Taking each of these priorities into account, the report identifies specific job-creating strategies for each major region of the country, taking special care to highlight the unique natural and human capital strengths of these regions and their potential to contribute to a low-carbon economic development strategy. For example, the chapter on the industrial Midwest—written by Zoe Lipman, formerly of the National Wildlife Federation, now of the Blue Green Alliance—highlights the combination of skilled workers and manufacturing infrastructure, including strong supply chains, that led to this region's dominance in the field of alternative vehicle manufacturing. Lipman points out that the region's growth in this sector would not have been possible without strong federal fuel economy standards, which drove automakers to find new and innovative strategies to make their cars more efficient. But it also would not have happened just anywhere: it was in this region that the economic infrastructure was already built out to anchor this innovation.

In a very different example, the report looks at the Gulf Coast, an area with integral ties to the oil and gas sector that is also on the front lines of climate change. Here, author Jeffrey Buchanan from Oxfam points to a different kind of economic development approach, one that focuses on coastal restoration and innovation in new restoration technologies. The region is particularly suited to these strategies because restoration is a specifically localized activity, but also because of its universities, research centers, and technical experience with coastal and water issues.

Another important approach the report takes is to call out "isolated energy regions"—regions of the United States that are particularly hard to reach with existing electricity infrastructure and therefore have very high energy costs. The report identifies Hawaii, Alaska, and northern New England—where many residents still use home heating oil, and where natural gas is imported from Yemen because of a lack of infrastructure to move it up from the lower Eastern states—as three such regions. These areas are particularly suited to take on alternative energy technologies, because they are cost-competitive in comparison with expensive imported fuel. They also underscore the importance of taking specific regional approaches to energy and climate policy in the United States, and the innovation that can be spurred at the regional level and then can bubble up into national policy.

These kinds of energy transformation and adaptation approaches can anchor an economic renaissance in these regions—in fact, in some cases that is already happening, such as in the industrial Midwest with its new focus on advanced vehicle manufacturing—while also helping to move the United States as a whole into a leadership role on clean energy. But energy leadership cannot come from the regions alone. The report argues strongly for a set of national policies that provide a framework for this regional action: a price on carbon, a true national clean energy standard, certainly and stability in the alternative energy tax credit market, and strong support for advanced energy manufacturing, to name the most critical.

The Department of Commerce: Core federal support for a regional energy strategy

What the CAP and TCNG report describes, and what we built on earlier in this report, is neither an energy strategy nor an environmental strategy. It is an economic development strategy that focuses on energy sectors and is responsive to environmental realities. That is why the Department of Commerce is well suited to assume an important role in managing this emerging industrial transformation.

The Department of Commerce, one of the smallest federal agencies, is often underappreciated in Washington. But consider this: Commerce already has a built-in infrastructure that provides federal support for regionally specific policies and programs. Its Economic Development Administration's, or EDA's, stated mission is to drive the federal economic development agenda by "promoting innovation and competitiveness, preparing American regions for growth and success in the worldwide economy."[68] Its focus is on innovation and regional collaboration, with six regional offices that work directly with state and local officials. The EDA and the Department of Commerce's National Institute of Standards and Technology, or NIST, have cooperated in building the Hollings Manufacturing Extension Partnership, a nationwide network of centers with more than 1,400 technical experts trained to assist small- and medium-sized manufacturers in creating and retaining jobs.[69] Part of its focus has been on green manufacturing and exporting. In California, for example, the "regional clusters of opportunity" program has placed specific focus on creating partnerships in clean transportation manufacturing and fuels.[70] NIST recently released a software-development kit to help utilities build "green button applications" that allow customers to see their energy usage, enabling them to make informed decisions about how to save on power usage.[71]

Commerce was also a core partner in the multiagency Energy Regional Innovation Cluster program, which challenged regional collaborations anchored by federal labs and universities to find new and place-based solutions to core energy challenges such as developing technologies to improve the efficiency

in buildings. The Greater Philadelphia region ultimately ended up winning the E-RIC competition for energy efficient building design, receiving $129 million to create a Navy Yard Smart Energy Campus.[72] Although Commerce played a small funding role in the E-RIC program—eclipsed by the many dollars spent by the much larger Department of Energy—its staff played a key role in shaping the program design and building off its many years of expertise in the idea that "clusters" of businesses, regional government entities, workforce and educational institutions, and innovators can anchor the economic growth of individual regions.[73]

Commerce is not just an important player in shaping regional economic development strategies. It is also centrally involved in tracking and monitoring global climate change impacts and their potential effect on these regions. The Department of Commerce's National Oceanic and Atmospheric Administration, or NOAA, provides not only weather forecasts through the National Weather Service, but also sophisticated information on the climate and ecosystems. Its four areas of focus include ecosystems, climate, weather and water, and commerce and transportation.[74]

Commerce is uniquely situated to provide the high-level environmental data that help regions understand how the climate will affect their infrastructure and economies, and it also has the economic development infrastructure to help those regions grasp the economic possibilities opened by the emerging challenges they face. The Department of Commerce operates at both the 450-mile-high level—literally—and on the ground.

We believe that, as climate change and its impacts become an increasingly critical part of our nation's economic growth strategy, Commerce should take on a far more ambitious role. With solid leadership and increased capacity, Commerce could be the central department ensuring that energy programs out of the Department of Energy, environmental programs out of the Environmental Protection Agency, and workforce training and standards programs out of the Department of Labor, all work together to support regionally specific economic development plans that will help America consolidate global leadership in the green industrial revolution.

These policies are critical to ensuring that the United States has what other countries like China have already established: a strong and stable market for new renewable and efficient energy technologies; some financing options to ensure that these new technologies can scale up quickly and efficiently; and the infrastructure of physical and human capital to get this low-carbon electricity and fuel to consumers. Providing that basic national framework will allow our regions, states, cities, and communities to do what they do best: innovate and incubate the best solutions for their own particular needs and conditions.

Conclusion: A matter of choice

From its beginning, the United States has prospered from augmenting the entrepreneurial energy of its private sector with public commitments and partnerships that help drive innovation and scale up invention. Our founders made an early commitment to building a canal system to help increase trade and travel in the early days of the Republic. In the midst of the Civil War, President Abraham Lincoln pushed development of the transcontinental railroad to bind the nation together. U.S. wartime spending gave U.S. industries leadership in postwar industries from commercial airlines to telecommunications to nuclear power. American public policy subsidized the education of a generation of soldiers through the G.I. Bill. The suburbs grew as public policy and guarantees made homeownership affordable. Public R&D provided the basis for what grew to be the dotcom revolution.[75]

Now we must decide how to react to the new green industrial revolution that is already creating new markets around the world. There is no question that the demand for clean energy; energy efficient products, buildings, homes, modes of transport; and environmentally sustainable production processes will burgeon over the coming decades. China, Germany, and other countries are already committing themselves to lead this revolution and capture these markets. The United States has many advantages in this competition, but it must make a clear choice to compete. That requires the clarity of public policy—the range of subsidy and strategy that has enabled us to lead in past industrial transformations.

Dow Chemical Company President, Chairman, and CEO Andrew Liveris has written that "A renaissance is within reach. If Americans are the ones who design and build the new [clean economy technologies] it will re-energize commerce in the United States, creating, without a doubt, millions of high paying jobs."[76] The question is: Will we reach for it or let it pass us by?

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