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on

“Green Jobs and Trade”

by

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Mr. Chairman and Members of the Committee, thank you for inviting me to testify before you today. The issue of green jobs and trade is critical in light of the triple crises America faces: an economic crisis that has left 14 million people unemployed; an energy security crisis that leaves us vulnerable to every international incident and natural or man-made disaster; and a climate crisis that threatens the very planet we live on. In true American entrepreneurial spirit, we at the Center for American Progress Action Fund believe that these crises bring enormous opportunity, but only if the United States decides to get off the bench and join the green jobs race already being run by most of the other developed countries in the world. I am glad to share my and the Center for American Progress Action Fund's perspective on green jobs and the global economy, and I look forward to your comments and questions.

In my testimony I will discuss the global clean energy marketplace, and specifically the work other countries are doing to become innovation leaders in the new green economy. As a contrast, I will point out where the U.S. has failed to pass policies and make investments in the "building blocks of innovation" that made us leaders in prior economic transformations, including our infrastructure, our workforce, our research and development capabilities, and our manufacturing sector. I will conclude by recommending several specific steps this Congress and administration can take to put America back on track to lead the clean tech revolution, just as we led the Industrial and high tech revolutions that came before. These recommendations include:

- Stabilizing the market for green technologies by passing a national Clean Energy Standard.
- Crafting finance policies to make more public and private capital available to innovators to invent, commercialize, and produce green technologies.
- Modernizing our basic infrastructure to allow businesses to more effectively collaborate and compete in domestic and international markets.
- Investing more in science and math education and in workforce training to ensure we have workers able to participate in the technology-driven economy of the present and future.
- Promoting international trade policies that ensure access to foreign markets, and the free flow of goods, services, knowledge, and capital across borders.
- Providing incentives, through competitions and other "race to the top" strategies, to lift up innovative energy solutions at the local, state, and regional level.

Green Jobs and the Green Economy

Amidst the Great Recession that swept the U.S. in 2007 and the high unemployment that we are still experiencing today, the set of industries and occupations often referred to as "green jobs" continues to hold the key to unlocking a better, stronger, clean energy economy for the country. And not only do these industries have the potential to employ many currently un- and underemployed workers across a range of skills and occupations; they can also help catapult the U.S. into a leadership position in one of the fastest growing sectors in today's economy.

I want to emphasize that the phrase "green jobs" stands for much more than the jobs themselves; it also stands for a whole new set of industries and investments that will make us more competitive and our economy more sustainable. We are currently in the process of switching our

entire energy infrastructure over from capital-intensive, risky, and often highly polluting energy sources to clean, labor intensive clean energy sources.

This is an economic transformation on the scale of the transition from horse-drawn carriages to engine-driven vehicles, or the Industrial Revolution, or the more recent high-tech revolution. In each of those eras, we talked about economic transformation, competitiveness, and overall job growth. We talked about the need to transition away from industries on the decline into the industries of the future. We did not sit around counting exactly how many jobs might be lost in agriculture if people moved to the cities to work in factories, or how many blacksmiths might be out of work with the advent of the automobile.

We saw these as transformative moments in American history, where we had the chance to move forward toward a more advanced age defined by stronger industries, better infrastructure, and a steadily growing middle class. And in fact, in each of these revolutions we saw workers applying current skills to new industries—blacksmiths using welding expertise to become auto mechanics, for example—along with new workers, especially women and immigrants, finding opportunities where before there had been none. Many of these workers ultimately enjoyed higher wages, longer-term job prospects, and a shot at the middle class as a result.

The move to a greener economy brings additional value in that it is focused on making the U.S. a more effective energy consumer, which ultimately will make us more productive and efficient. As we invent new renewable energy systems and energy efficiency improvements, we will apply these to our own businesses and industrial processes, making the U.S. economy run more smoothly with fewer dollars invested in energy consumption. Our energy bills will be lower and our productivity greater as a result. In this way, “greening the economy” will create benefits that go far beyond the individual sectors and occupations included in most definitions of “green jobs.”

The green jobs revolution has the potential to move us into yet another stage of American leadership, with the huge added benefit of combating the climate change that threatens not only this country, but the entire planet. But the potential will only become reality through political leadership and progressive action.

Competing with Other Nations for Global Leadership: Is the U.S. Falling Behind?

The global clean-tech market is expected to expand to at least \$2.3 trillion by 2020, and America must compete for a piece of this pie.¹ To compete in the global clean energy race, America must take a page from China’s playbook and begin to invest in the building blocks of innovation, like education and worker training, research and manufacturing, and infrastructure—the same building blocks that brought America to global leadership in past economic transformations.

The World Economic Forum, in its monumental *Global Competitiveness Report 2010-2011*, underscores the importance of innovation as the basis for long-term economic growth:

Although substantial gains can be obtained by improving institutions, building infrastructure, reducing macroeconomic instability, or improving human capital, all these factors eventually seem to run into diminishing returns. The same is true for the efficiency of the labor, financial, and goods markets. In the long run, standards of living

can be enhanced only by technological innovation. Innovation is particularly important for economies as they approach the frontiers of knowledge and the possibility of integrating and adapting exogenous, [or imported,] technologies tends to disappear.ⁱⁱ

We are bound by the reality that to be competitive in the 21st Century global economy, we have to innovate. Across the globe, developed and developing countries are realizing what economists have known for years—that technological innovation, more than any other factor, fuels long-term economic competitiveness and growth, and that innovation in turn requires a robust and well-integrated foundation of education, research, and infrastructure.ⁱⁱⁱ

Yet we are failing to take these lessons to heart.

In the United States, non-defense R&D spending as a percentage of all discretionary government spending has fallen from a high of 25 percent in the mid 1960's at the height of the Apollo space program, to between 12 and 13 percent since the early 1980s.^{iv}

And investment in clean energy R&D is even further behind. Venture Capitalist John Doerr, an early investor in Google Inc. and other companies, worries that we are failing badly behind in the clean energy race because investments in R&D are completely inadequate to drive innovation and growth:

America spends only about \$5 billion—about half a percent—per year on new energy R&D... Sadly, America spends more on potato chips than we do on our new energy R&D.^v

We have also fallen behind in providing investments for the stages of innovation beyond early-stage inventions. America still supports our national laboratories—though we will see whether the labs can emerge intact from the current budget battle—but we fall down on investing in turning these inventions into commercializable products that can in turn become part of an American export market. An essential element of innovation and competition is to nurture new technologies so that they can actually be built and commercialized. Many inventions require continued investment across the technology innovation cycle: from invention at the federal labs and publicly sponsored universities, to public-private partnerships aimed at commercializing and licensing new technologies, to technical assistance to make our manufacturers the most advanced and efficient in the world, and finally to deployment to bring these technologies to scale.

In particular, the link between innovation and manufacturing is an important one.

We all know that the U.S. manufacturing sector has experienced a long-term decline. The U.S. manufacturing capacity utilization rate hit a near all-time low of 65 percent last June. Overall, manufacturing now just makes up 12 percent of U.S. GDP, down from 28.3 percent at its high point in 1953.^{vi} As American firms close their doors and investments increasingly flow to other countries, we need to amp up our game to remain competitive.^{vii}

Some in Washington have intimated that the manufacturing sector is no longer necessary to American global leadership—that we can just as easily invent here and manufacture elsewhere without losing any competitive advantage. But research shows that the manufacturing sector, especially the advanced manufacturing industries that characterize clean tech manufacturing, is actually critical if America wants to stay innovative and globally competitive.

It turns out that it really does matter to our global leadership where our manufacturing jobs are located. According to Harvard economist Gary Pisano, when manufacturing moves overseas, America not only loses solid middle-class jobs and production prowess; we also lose the process innovation that comes from co-locating R&D, design, engineering and manufacturing. Pisano calls this combination of related skills and industries the “industrial commons”: “In addition to undermining the ability of the U.S. to manufacture high tech products, the erosion of the industrial commons has seriously damaged the country’s ability to invent new ones,” he writes.^{viii}

The upshot is that if we lose our ability to make things, we may well also lose our ability to invent them. Though it is difficult to measure the precise impact advanced manufacturing has on innovation, we know anecdotally that if we cede production on a process invented in the U.S., we may lose future iterations of innovation in that process.

Solar panels are one example: invented in the U.S. at Bell Labs in 1954, production of solar PV panels has moved largely overseas (China is currently the world’s largest producer), and most new innovations in panel production, such as process improvements that make the panels far more powerful by altering their electrical properties, are happening outside the U.S.^{ix} This is less true for non-panel innovations, such as the holographic solar applications pioneered by small start-ups in Arizona and New York, possibly because these new innovations are still cutting-edge and not yet in commercial production at any real scale. Once these technologies do scale up, however, they too may be produced and improved overseas.

One industry where the spatial relationship between manufacturing and innovation has actually been tracked and measured using empirical data is the optoelectronic industry (e.g. lasers, fiberoptic telecommunications). In a recent set of studies, Carnegie Mellon engineering professor Erica Fuchs used a combination of simulation modeling and empirical data to demonstrate the impact of offshoring production on technological innovation. What she found was that when optoelectronic firms offshored production of their original designs to, for instance, Asia, they tended to produce those initial designs cheaply and efficiently. However, when these firms then began work on new and improved designs, they tended to lose valuable time and knowledge if their operations were offshore. The firms she studied were faced with a choice: whether to offshore their production and save labor and materials costs—often the most efficient solution in the short-term—or to take a longer-term view, keep emerging design and production domestic, and push forward new technologies that might keep them more competitive in the long run.^x

As Fuchs and others have pointed out, the workforce skills associated with these jobs are also at risk of moving overseas when advanced manufacturing migrates.^{xi} That’s a problem for the U.S. for two reasons. First, it means we lose manufacturing jobs here, which are some of the best jobs for middle-skill American workers—those who have a high school education but lack a four-year college degree. These workers make up fully two-thirds of America’s workforce. They should not be left behind.

But it also means we lose actual skills, so that we are at risk of having to import workers into trades facing labor shortages due to the lack of trained, skilled workers in some critical industries. These range from engineering and science-based occupations, to trades such as machining, welding, and pipefitting. Maintaining this skill base in the U.S. is critical for our

future competitiveness, but it is also essential if we are to keep our lights on and electricity flowing through the transmission grid. Fully half of America's utility workforce is expected to retire in the next decade.^{xii}

Other Nations Are Not Waiting Around for America to Act

America may be hesitant to throw itself into green jobs growth—the great economic engine of this century—but other countries are not. Countries such as China and Germany are now investing in many of the building blocks of innovation-driven economic growth that the United States has all but abandoned over the past several decades, and are focusing on clean tech industries as a critical part of their economic growth strategies. In a recent Center for American Progress report *Rising to the Challenge*, I and my co-authors argue that China in particular is actively and methodically building up the basic foundations for future economic growth while also ensuring a market for its current and future products and services at home and abroad.^{xiii} Commerce Secretary Gary Locke reports that China invests almost \$12 billion *monthly* into its renewable-energy sector: “They’re doing this because they really want to be the world’s supplier of clean energy and they recognize this will support millions of jobs.”^{xiv}

In 2008, China’s gross national expenditure on research and development stood at roughly \$66 billion, or about 1.5 percent of China’s gross domestic product.^{xv} This is the highest investment level among developing economies as a percent of their domestic economy and ranks China fourth in the world in overall R&D spending behind the United States, Japan and Germany.

Compounding this imbalance is that some of America’s political leaders seem intent on crippling us before we have even fully entered the global green jobs race. Just this week, the House Republican caucus put out a proposed spending bill for the remainder of Fiscal Year 2011 that waves the yellow caution flag that these legislators want to slow down—if not outright halt—the promise of America’s green jobs revolution and all the ensuing companies and jobs that would create. The proposed budget would slash clean-tech and energy investments by nearly 30 percent, devastating this growing but immature industry that struggled during the Great Recession.^{xvi} It would also dramatically disinvest in the solar, wind, wave, geothermal and other renewable technologies that enabled the United States to get back in the clean energy race, and would cut funds to technical assistance to manufacturers and to job training programs working to prepare unemployed job seekers for the clean tech industries of the future.

The decision not to invest in the green economy comes at a cost. Already we have seen cutting-edge solar power manufacturing companies begin to close their doors, either permanently or to move to other countries with strong and dedicated clean energy markets. Evergreen Solar Inc., for example, recently announced plans to close its Massachusetts plant to put more funds into solar panel manufacturing in China. The company followed on the heels of SpectraWatt Inc. in New York and Solyndra Inc. in California closing some of their facilities. As General Electric Co.’s chairman and chief executive, Jeff Immelt, said at last year’s ARPA-E summit, those countries with strong demand for renewable energy products will naturally pull these companies into their borders because “innovation and supply chain strength gets developed where the demand is the greatest.”^{xvii}

Similarly, wind manufacturers in Iowa, once a state leader in this industry, have begun to lay off workers as new orders fail to materialize. Leading global financier Deutsche Bank decided to

move billions of investment dollars out of the U.S. clean energy market, and into China and Europe as soon as it was clear there would be no comprehensive climate and energy legislation coming out of the 111th Congress. China and our other economic competitors in Asia, Europe, and emerging markets are not waiting for America to regroup.

All this points to one key question: Do we really want to be in the business of inventing the green technologies of the future, only to end up buying those technologies back from countries that have successfully commercialized, manufactured, and exported those technologies—and come up with successive waves of innovation that they can then also sell back to the U.S.? Do we want to be the world’s great clean technology consumer, while the rest of the world prospers? Is this the way to strengthen the American economy?

A Lack of National Leadership, but Some Hope from America’s Cities and States

Contrary to critics intent on maintaining the carbon-intensive, fossil-fuel dependent status quo, we know that investing in the green economy does produce results, and that these investments are critical if America is to get back on the path to global leadership.

The evidence is ample. The American Recovery and Reinvestment Act of 2009, the largest single domestic investment in clean energy in U.S. history, jumpstarted our economy, saving and creating millions of jobs and providing successful clean energy incentives to spur business investment and help consumers lower their electricity bills. The Council of Economic Advisors’ recent quarterly report found that “the clean energy provisions of ARRA alone have already saved or created 63,000 jobs and are expected to create more than 700,000 by 2012.”^{xviii}

But ARRA funding is coming to an end, and businesses are beginning to worry that the U.S. will not make any further real commitment to moving America toward the green economic transformation already happening throughout the rest of the developed world.

Luckily our states and cities have surged ahead, and there is evidence at these sub-national levels of the great strides that our country can make when we harness our innovative and entrepreneurial spirit, along with our skilled workforce, to tackle the green jobs challenge. Because of these state and local efforts, such as Renewable Electricity Standards in place in 30 states, multiple building codes and energy efficiency investments, and creative “cluster-based” approaches combining research and development with regionally specific natural resources and competitive industries, the last decade has seen significant green jobs growth relative to the economy as a whole. A PEW Charitable Trusts study found that the number of green jobs in America grew about 2.5 times faster than job growth as a whole, growing 9.1 percent from 1998-2007.^{xix}

California’s green economy in particular has shown high returns on investment. In the recent report *Many Shades of Green*, by the California-based non-profit Next 10, researchers found using state employment data that from 2008 to 2009, California’s ‘core green economy’ grew over three times faster than its traditional ‘brown economy.’ The report found that “between 1995-2008, green businesses increased 45 percent, and green jobs grew 36 percent while total jobs in the state grew only 13 percent.”^{xx} Green manufacturing jobs alone grew by 10 percent in 2009 in California. Partly as a result of this expansion, 24 percent of green jobs were in manufacturing in California as opposed to 11 percent for the economy as a whole. And in

November 2010, California voters overwhelmingly voted to continue growing this green economy, defeating the Big-Oil funded Proposition 23 which would have indefinitely stalled implementation of California's landmark Global Warming Solutions Act, A.B. 32.^{xxi}

Michigan, too, is a striking example of how the clean energy economy can bring opportunity to one of the hardest hit regions of the U.S. In Michigan, total private employment dropped 5.4 percent from 2005-2008, while during the same period employment increased by 7.7 percent among 358 green-related firms counted in the study.^{xxii} As Michigan continues to struggle with devastatingly high unemployment rates, the green jobs sector remains both a growing source of jobs and a bright spot on the horizon.

In Subcommittee member Senator Voinavich's state of Ohio, new Governor Kasich recently reversed his campaign promise to roll back the state's Renewable Energy Standard after multiple business leaders contacted him to tell him how important green industries have been in the Toledo area in particular. The city, which ranked in the bottom 10 by per capita income in 2000, has seen a renaissance as a hub for solar innovation and production. Over 6000 individuals are employed in these industries in Toledo today, and the city is home to several major solar panel exporters including First Solar and Xunlight. Building on its existing manufacturing infrastructure and workforce skills in glass and auto parts, both industries that were on the decline, as well as its world-class universities and strong economic development agencies, Toledo managed to turn itself into a serious player in the global solar marketplace.^{xxiii} The city stands as a testament both to the promise of new clean tech industries to revitalize aging industrial cities, and to the innovative spirit of America's existing businesses and communities.

Preliminary research by the Apollo Alliance also highlights a promising advantage in inner-city areas in particular, where green jobs growth is rapidly outpacing overall job growth:

“While the number of inner-city jobs in the largest U.S. cities has grown by a scant 1 percent overall during the past decade, new research from Apollo, the Initiative for a Competitive City (ICIC), and Green For All, suggests that *inner-city green jobs have grown by 11 percent*, more than 10 times the rate of job growth overall.”¹

Green jobs have seen faster rates of growth throughout the country than the rest of the job market, and we need them to move the country forward as the transformation to a clean energy economy takes shape.

And lest we forget, the policies and investments put in place by ARRA and multiple states and cities have not just created jobs today, they have created new low-carbon infrastructure that will help our nation become more energy independent, cleaner, and healthier well into the future. Every million dollars invested in building a wind farm creates 5.7 permanent, direct jobs, to be sure—but it also creates a wind farm that will be in place for at least thirty years.

Green Jobs Protect Americans' Health While Helping American Business

The case for green jobs is integrally related to the case for solid, predictable environmental regulation—something that is on the minds of many here in Washington as the Environmental Protection Agency goes to the mat to defend its current plans to curb pollution in a number of sectors. As you know, the EPA has recently come under attack from politicians and dirty energy

lobbyists, despite the trillions of dollars of health benefits it has generated since its creation.^{xxiv} But the case for EPA authority goes far beyond the protection of public health and the environment, which Americans in great majority already support. New data shows that the EPA's soon-to-be-finalized regulations create green jobs while also creating the business certainty and environment that American businesses need to invest in America.

A new report by Ceres and the PERI Institute at the University of Massachusetts, Amherst, finds vast economic benefits from two Clean Air Act rules expected to be finalized in 2011: the Clean Air Transport Rule and the Utility Maximum Achievable Control Technology, otherwise known as Utility MACT. The report outlines the jobs impact of "investments in pollution controls, new plant construction, and the retirement of older, less efficient coal plants as the country transitions to a cleaner, modernized generation fleet under new EPA clean air standards." Key findings include:

- Total employment created by capital improvements over the next five years is estimated at 1.46 million jobs, or about 290,000 jobs on average in each of the next five years.
- Installing modern pollution controls and building new power plants creates a wide array of skilled, high-paying installation, construction, and professional jobs.^{xxv}

The American auto industry provides a prime example of how well-crafted rules can translate directly into new green jobs and industries. A new fleet of fuel-efficient vehicles would put auto workers and many others back to work while reducing dangerous carbon pollution, enhancing America's energy security, and allowing the American auto sector to sell its new technologies on the global market.

The recent analysis *Driving Growth: How Clean Cars and Climate Policy Can Create Jobs*, conducted by the Center for American Progress, the United Auto Workers, and the Natural Resources Defense Council, found that strengthening automotive fuel efficiency standards through streamlined federal standards can spark the investment and innovation needed to reach new levels of efficiency while creating jobs. The analysis found that supplying the U.S. automobile market with more efficient cars could create up to 150,000 new jobs for U.S. workers by 2020 from improvements to fuel economy alone, all things being equal.^{xxvi}

We need to let the EPA continue to do its job: creating green jobs, spurring innovation and investment, and strengthening the economy while protecting our health and the environment.

Harnessing the Green Economy to Enhance American Innovation and Competitiveness

Innovation and investment are the essential building blocks of a strong U.S. economy, but we are no longer doing what we should to continue generating the ideas, goods, and services for which America is so well known. Instead, we are spending our time squabbling while Rome burns, by ignoring our crumbling infrastructure, by disinvesting in our workers and students, by chopping away at research and development funds, and by failing to take the necessary steps to put America into the global race to lead the green economy.

These are some of the progressive proposals that Congress dearly needs to take to heart to strengthen our economy:

- Stabilize the market for green technologies by passing a national Clean Energy Standard, one that would set a target of 35 percent renewable and efficient energy by 2035, and a second target of up to 80 percent including a broader range of clean energy technologies.
- Craft finance policies to make more public and private capital available to innovators to invent, commercialize, and produce green technologies. These include policies such as the Clean Energy Deployment Administration, the 1603 cash grant program for renewable energy developers, and the 48C program for advanced manufacturing. Each of these received bipartisan support in the last Congress.
- Modernize our basic infrastructure to allow businesses to more effectively collaborate and compete in domestic and international markets
- Invest more in science and math education and workforce development to ensure we have workers able to participate in the technology- and advanced-manufacturing-driven economy of the present and future.
- Promote international trade policies that ensure access to foreign markets, and the free flow of goods, services, knowledge, and capital across borders
- Provide incentives, through competitions and other “race to the top” strategies, to help our most innovative cities, states, and regions develop private-public partnerships to harness their best institutions, workers, and minds and find solutions to tomorrow’s energy challenges

The Center for American Progress has fleshed out many of these recommendations in a number of white papers and reports that are available on the CAP website at www.americanprogress.org. These include: *Helping America Win the Clean Energy Race*, *Rising to the Challenge*, *Cutting the Cost of Clean Energy*, *The Green Bank*, and *Rebuilding America*.

These steps would make great strides in boosting our national competitiveness and jobs growth in the short run and ensure our once-dominant position in science and technology, innovation and entrepreneurship, and job creation is not eclipsed by China in the 21st century. Government cannot do everything, but it can spur the private sector by ensuring a market for emerging technologies, and by creating incentives and evening the playing field for rising industries with great job potential. This will revitalize our entire economic engine and change how we are innovating new ideas, products, goods, and services.

Conclusion

We believe it is time that America fully join in the global green economic transformation. In fact, we want America to lead this transformation and to turn it into the great economic engine of future growth—much as we did during the Industrial and high tech revolutions. If we do not embrace a more sustainable growth strategy, we risk seeing jobs move overseas and our middle class decimated, even as we become more and more vulnerable to volatile energy and financial markets. If we do not lead in this green revolution, we risk becoming the great consumers of the 21st century, rather than its great innovators.

Investments in clean energy will do more than help some specific sectors add and maintain green jobs, though it has and certainly will continue to do so. Rather, by realigning America’s thinking

toward a strong clean energy economy, we can strengthen the entire economy and ensure U.S. global competitiveness in decades to come.

President Obama reminded Congress during his State of the Union that the United States faces a real innovation challenge from China, Germany and other nations, much as it did in 1957 as the Soviet Union rocketed ahead of us in space exploration.

When the Soviets beat us into space with the launch of a satellite called Sputnik, we had no idea how we would beat them to the moon. The science wasn't even there yet. NASA didn't exist. But after investing in better research and education, we didn't just surpass the Soviets; we unleashed a wave of innovation that created new industries and millions of new jobs.

***This is our generation's Sputnik moment.** Two years ago, I said that we needed to reach a level of research and development we haven't seen since the height of the Space Race. And in a few weeks, I will be sending a budget to Congress that helps us meet that goal. We'll invest in biomedical research, information technology, and especially clean energy technology—an investment that will strengthen our security, protect our planet, and create countless new jobs for our people.*^{xxvii}

Our country needs a truly comprehensive clean energy investment agenda centered on groundbreaking policies and programs that reduce carbon emissions, increase public and private investments in clean and efficient energy technologies, and ensure broadly shared prosperity and sustainable economic growth. As President Obama said, this our Sputnik moment, and we must seize the opportunity it presents.

Thank you very much.

ⁱ Kate Gordon, Julian Wong, and JT McClain, “Out of the Running?” (Washington: Center for American Progress, 2010)

ⁱⁱ World Economic Forum, “The Global Competitiveness Report 2010-2011” (2010).

ⁱⁱⁱ Nathan Rosenberg, “Innovation and Economic Growth” (OECD, 2004), available at <http://www.oecd.org/dataoecd/55/49/34267902.pdf>

^{iv} “Federal Support for R&D,” *Science Progress*, available at http://www.scienceprogress.org/wp-content/uploads/2008/06/print_edition/federal_support_data.pdf

^v John Doerr, “Energy: The Next Big Thing,” America’s Energy Innovation Council, available at <http://www.americanenergyinnovation.org/john-doerr-bio/>

^{vi} Kate Gordon, Susan Lyon, Ed Paisley, and Sean Pool, “Rising to the Challenge” (Washington: Center for American Progress, 2011)

^{vii} Ibid.

^{viii} Gary Pisano, “The U.S. is Outsourcing Away its Competitive Edge” (Harvard Business Review online, Oct. 1, 2009), available at <http://blogs.hbr.org/hbr/restoring-american-competitiveness/2009/10/the-us-is-outsourcing-away-its.html>.

^{ix} Kevin Bullis, “Solar’s Great Leap Forward” (MIT Technology Review, July/August 2010).

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- ^x Erica Fuchs and R. Kirchain, “[Design for Location?: The Impact of Manufacturing Off-Shore on Technology Competitiveness in the Optoelectronics Industry](#)” (Management Science, December 2010), available at <http://mansci.journal.informs.org/cgi/content/abstract/56/12/2323>.
- ^{xi} Robert H. Hayes, “Outsourcing is High Tech’s Subprime Mortgage Fiasco” (Harvard Business Review online, Oct. 7, 2009), available at <http://blogs.hbr.org/hbr/restoring-american-competitiveness/2009/10/outsourcing-is-high-techs-subprime.html>.
- ^{xii} Stephen Singer, “Utilities Offer Jobs, Training as Workers Near Retirement,” Huffington Post, October 2010, available at http://www.huffingtonpost.com/2010/10/03/utility-workers-jobs-training-aging-workforce_n_748339.html
- ^{xiii} Kate Gordon, Susan Lyon, Ed Paisley, and Sean Pool, “Rising to the Challenge” (Washington: Center for American Progress, 2011)
- ^{xiv} Michael Richardson, “China’s Green Ambition: U.S. Sees Red,” YaleGlobal, January 2011
- ^{xv} “R&D Giant Ascendant,” *R&D Magazine*, December, 2009, p.48-49.
- ^{xvi} “CR Spending Cuts to go Deep,” U.S. House Committee on Appropriations, February 2011, available at http://appropriations.house.gov/index.cfm?FuseAction=PressReleases.Detail&PressRelease_id=259&Month=2&Year=2011
- ^{xvii} Martin LaMonica, “GE’s Immelt: U.S. Lagging in clean energy,” CNET’s Green Tech, March 2, 2010, available at http://news.cnet.com/8301-11128_3-10462182-54.html
- ^{xviii} Heather Zichal, “Progress on Green Jobs from the Recovery Act,” The White House, January 2010, available at <http://www.whitehouse.gov/blog/2010/01/14/progress-green-jobs-recovery-act>
- ^{xix} “The Clean Energy Economy,” PEW Charitable Trusts, June 2009, available at http://www.pewcenteronthestates.org/uploadedFiles/Clean_Economy_Report_Web.pdf
- ^{xx} “Many Shades of Green: Regional Distribution and Trends in California’s Green Economy,” Next 10, 2011, available at http://www.next10.org/next10/publications/pdf/2011_Many_Shades_of_Green_FINAL.pdf
- ^{xxi} Araceli Ruano and Sean Pool, “A California Campaign With Global Consequences” (Washington: Center for American Progress, 2010)
- ^{xxii} “Michigan Green Jobs Report,” Michigan Department of Energy, Labor, & Economic Growth, May 2009, available at http://michigan.gov/documents/nwlb/GJC_GreenReport_Print_277833_7.pdf
- ^{xxiii} Judy Keen, “Toledo reinvents itself as a solar-power innovator,” USA Today, June 15, 2010, available at http://www.usatoday.com/money/industries/energy/2010-06-15-toledo15_CV_N.htm.
- ^{xxiv} Kate Gordon and Susan Lyon, “The Business Case for EPA Rulemaking” (Washington: Center for American Progress, 2011)
- ^{xxv} “New Jobs – Cleaner Air: Employment Effects Under Planned Changes to the EPA’s Air Pollution Rules” (Washington: Ceres/PERI, 2011)
- ^{xxvi} Alan Baum and Daniel Luria, “Driving Growth” (Washington: Center for American Progress, 2010)
- ^{xxvii} President Barack Obama, State of Union Address, January 25 2011, available at <http://www.whitehouse.gov/the-press-office/2011/01/25/remarks-president-state-union-address>