



# Putting America Back to Work with Clean Energy

## Productivity, Economic Efficiency, and the Promise of Green Jobs

Richard W. Caperton and Adam Hersh | March 17, 2011

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### Introduction

With nearly 14 million Americans unable to find work right now, jobs are the most pressing immediate problem facing the U.S. economy. At the same time, we need to rapidly move toward clean energy sources that will protect the economy from volatile imported fossil-fuel prices and help prevent the most extreme results of climate change. Policymakers have the opportunity to kill two birds with one stone. Green jobs—jobs created or retained through investments in renewable and efficient energy technologies and processes—are a key way to solve these overlapping challenges.

Over the past two years, the Obama administration and congressional leaders have taken critical steps to create jobs by moving our country toward a more efficient, lower-carbon economy powered by the clean energy sources of the future. They have instituted financial incentives for clean energy investment, continued regulatory processes that will level the playing field for renewable and efficient energy sources, and have proposed an ambitious plan for the United States to source 80 percent of its power from clean sources by 2035.

We know from experience that the twin objectives of jobs growth and a clean energy future go hand in hand. Research from CAP and the University of Massachusetts shows how investments in clean energy could revitalize our economy and create millions of new jobs over the course of a decade. So far, results from the American Recovery and Reinvestment Act of 2009 are bearing out this hypothesis, proving that clean energy carries substantial job creation potential. Three specific clean energy programs—the Treasury cash grant in lieu of a tax credit (known as the 1603 program), the advanced energy manufacturing tax credit (known as the 48C program), and the Department of Energy loan guarantee program—have cost the government about \$7 billion—only 1 percent of Recovery Act funding—but have leveraged more than \$12 billion in private capital and account for more than 13 percent of the jobs created directly by Recovery Act funding.

Of course, the direct jobs represent only the tip of the iceberg: consumption from these wages and demand for manufacturing activity carry a stimulative effect that reaches far and wide through our economy. For instance, when a wind developer receives a Treasury grant, that developer will hire turbine installers to work directly on the project. These jobs are what the developer will have noted on the grant application under “jobs created.” But this project creates many more jobs than just the installers: truck drivers and train engineers deliver parts, engineers design the facility, and factory workers actually build the turbines. This indirect job creation from clean energy projects is almost always bigger than the direct job creation.

Numerous studies, including reports by [University of California-Berkeley](#), the [U.S. Conference of Mayors](#), and the [American Council for an Energy Efficient Economy](#), have rightly focused on the number of jobs that will be created by specific clean energy policies, such as putting a price on carbon, or making major annual investments into clean energy technology research and development. These efforts are critical contributions to the green jobs policy debate. Quite predictably, though, opponents of clean energy have responded to these studies by arguing about methodologies and assumptions.

Critics of jobs created from renewable and efficient energy investments—often airing their views in reports funded by the fossil-fuel industry—still deny that clean energy policies and investments create net new jobs now and make our economy more productive in the long run. These critics marshal plenty of economic jargon, but closer evaluation reveals fundamental flaws in their arguments. Importantly, these studies mistakenly think that the “price” of energy reflects its true “cost” to society, and they confuse short-term with long-term perspectives. In fact, digging below the surface of these arguments actually reveals the myriad jobs, competitiveness, and productivity benefits that clean energy investments yield for our economy.

This issue brief will examine the flaws in these criticisms of green jobs, and along the way detail actual job creation due to these clean energy investments—investments that do triple-duty to help reduce our dependence on foreign oil, clean up our environment, and help combat climate change. In short, we will demonstrate how effective and efficient investments in green jobs are for the competitiveness and broad-based economic growth of our nation.

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## Clean energy is cheaper than the real cost of fossil fuels

Critics, such as Heritage Foundation and the American Enterprise Institute, often claim that energy from fossil fuel sources simply costs less than energy from renewable sources. If consumers must pay a higher price for energy, they claim this will divert resources from other parts of the economy, resulting in job losses that are not offset by gains in the renewable or efficient energy sectors.

But this is only true if the market price of the energy consumers are buying does not include the full extent of the costs arising from fossil fuel-based electricity generation, such as air and water pollution. Economists call these additional costs not reflected in market prices “externalities.” There are a number of reasons why these costs are not factored into prices. No one owns the air we breathe, for example, which means that we rely on government—not the free market—to tell utilities that they can’t spew harmful emissions into the air.

Because the costs of all these harmful emissions are largely not borne by the utilities, they have little incentive to reduce emissions, so they pollute as much as they want. Instead, the general public pays for these “externalities”—in this case, air pollution—in other ways, among them higher incidences of asthma, cancer, and other health issues as well as lost work days due to these adverse health conditions and even premature death. Recent research published in the [Annals of the New York Academy of Sciences](#) estimates that externalities from coal-fired electricity cost the United States between \$175 billion and \$523 billion per year.

In the longer term, these estimates will also have to include the costs of climate change. Virtually every sector of the economy stands to lose in a warmer world with more extreme weather. Idahoans, for example, will have to spend \$124 million more each year fighting fires by 2040, and Georgia farmers will see annual losses of \$110 million because of heat and droughts. These are very real costs to the economy, and would be on top of previously estimated externalities from fossil fuels.

The bottom line: These costs are real and are still paid for elsewhere in the economy, even if they are not reflected on our electricity bills.

So there’s an important rationale for making the market price reflect these total costs from fossil fuel utilities: consumers of electricity could make better choices about how to use energy more efficiently if the price reflected the true costs. If these costs were fully included in electric rates, say by requiring utilities to reduce pollution, power generated by burning coal would cost a whopping 37 cents per kilowatt-hour rather than 10 cents per kilowatt-hour, the average electricity rate in the United. In other words, dirty electricity is only one-fourth as cost-efficient as the market price might suggest.

As we move toward a clean energy future, such comprehensive pricing is helping to make market pricing better reflect these total social costs. For instance, stricter pollution limits on mercury, arsenic, and other toxins from the Environmental Protection Agency will incorporate the costs of pollution into power prices. And, an inevitable price on carbon will shift the economy from paying large amounts to deal with the cost of climate change to incentivizing more efficient use of and cleaner energy.

In contrast to what electricity from coal should cost today—37 cents per kilowatt-hour if priced comprehensively—the *present cost* for a kilowatt-hour of electricity from solar generation is between 16 cents and 20 cents, and from wind is 5 cents to 11 cents. And they generate electricity without also generating costly pollution externalities.

In fact, recent utility filings in [Michigan](#) and [California](#) show that it is cheaper to build new clean energy than new dirty energy. These are areas with above average renewable resources (that is, it's sunny in California, and windy in Michigan) that also rely on transporting fossil fuels over long distances, making coal and natural gas power plants more expensive.

As wind and solar costs [continue to fall](#), renewable energy will become even more competitive with fossil fuels. Just like semiconductors in computers, the price of wind turbines and solar panels steadily declines as we make more of them. This is because designs improve, manufacturing processes get better, and installers get faster. The history of solar photovoltaic power shows that every time cumulative production of solar panels doubles, the costs come down by 20 percent. Wind turbines, which are a relatively low-technology product, have a slower, but just as steady, improvement rate.

The upshot: costs of clean energy will rapidly decline because renewable energy standards, public investments, and environmental incentives will all spur new production of clean energy. At the same time, the costs of fossil fuel energy are expected to increase. The crossover point—where clean energy becomes cheaper than dirty energy—will be different in each region of the country, but it is coming quickly across the United States as comprehensive pricing takes hold and as the cost of renewable energy falls.

This is why public investment in clean energy is so important. Because the externality costs from fossil fuel energy are so high, utilities enjoy an implicit production subsidy that slants the competitive landscape in their favor. This makes the alternative energy business a less attractive market for private investors to enter. Public investments can get the ball rolling, drive efficiencies and innovation in clean energy manufacturing that bring production costs down, and improve social welfare by putting people back to work while cutting down on pollution, reducing our energy trade deficit, and combatting climate change.

Looking at the complete picture, renewable energy is a lower cost electricity alternative than dirty fossil fuels. Over the long term, renewable energy will reduce costs for businesses and household consumers, freeing up economic resources that can be reallocated to other uses, creating jobs and even entire new industries in more productive parts of the economy. Getting to that point in the future, however, will require investments in renewable energy today to supplement (and eventually replace) existing fossil fuel-based electricity generation.

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## Clean energy creates new jobs and new efficiencies

This brings us to the second erroneous criticism of clean energy critics: that clean energy actually costs jobs by destroying productive capital and robbing jobs from other sectors of the economy. Their argument is that clean energy jobs are an example of the famous economic observation known as the “Broken Windows Fallacy.” In the classic telling of this economic lesson, a vandal breaks the window of a shop. The shopkeeper then has to replace the window, and calls the glassmaker, who then has more business. While the new business is good for the glassmaker, economists point out that this has not created a “net new job,” but has simply moved employment around in the economy. After all, if the shopkeeper didn’t have to spend money on the new window, he would have spent it on something else that he’s now foregoing.

But this criticism applies *only* if a broken window is replaced with another identical window. But in the transition to a cleaner energy economy, we are talking about replacing that first broken window with a much more efficient one—perhaps one with double-paned glass, or even glass with solar reflectors on it to store heat from the sun. Or maybe we’re talking about replacing a 40-year-old, coal-fired power plant with a geothermal plant, or a new wind or solar farm. The “broken window” analogy simply does not work when the window you start with is flawed. We’re replacing an outdated window with a new, more efficient one that costs less to operate.

Furthermore, this criticism of green jobs as taking jobs from one part of the economy and moving them to another part assumes the economy’s resources are already fully employed. But this notion is almost laughable in the aftermath of the Great Recession, when our factories are only running at 76 percent of capacity and unemployment has been so high for so long. There are clearly plenty of workers and factories just waiting to be employed—we won’t be robbing resources from other parts of economy.

Investing in clean energy today helps create new jobs now for two reasons: First, installing new clean energy systems creates demand for advanced technology manufacturing industries, which have strong positive spillovers that increase employment and productivity in the rest of the economy. As it turns out, more of the renewable energy “window” is produced domestically in the United States than the alternative fossil-fuel “window.” That means for a given amount of capital equipment, more jobs are created manufacturing renewable energy goods. At the same time, U.S. clean energy manufacturers face increasing global competition, particularly from China. Lack of a domestic market for their products is hurting the competitiveness of American advanced technology manufacturers. Public investment in clean energy can help keep this manufacturing at home.

Second, the installation of advanced technology solar panels, wind turbines, or geothermal systems is a relatively labor-intensive process, meaning this activity requires more jobs on average than many other kinds of activities, thus putting more people to

work across our country now. But this does not mean creating installation jobs reduces economic productivity. On the contrary, putting people to work when we have such a problem with unemployment *raises* overall productivity in the economy by employing people who would otherwise be unemployed.

Of course, the transition to a cleaner energy economy won't last forever, and so these installation jobs cannot be thought of as permanent, though the scale of the challenge will mean installation jobs will certainly last for years to come. But the combination of research, development, manufacturing, installation, and operations and maintenance jobs that make up the renewable and efficient energy sectors can, taken together, form the foundation for a strong and sustainable new economic driver for the United States.

The third criticism levied at clean energy investments is that renewable energy is less efficient than fossil fuels in terms of the jobs needed per unit of energy generated. This measure is usually counted in BTUs, which stands for British Thermal Units, a measure used to compare the energy output of different technologies. Simple physics says that the less work per energy generated, the better. But here the critics falsely compare apples to oranges. They measure the energy efficiency of coal using the number of jobs needed to operate a coal power plant, but then measure the efficiency of renewable energy by the number of jobs needed to install *and* to operate clean energy infrastructure. The comparison ignores the rather obvious point that, at some time in the past, labor was also need to install coal power plants. They're not comparing apples to apples.

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## Conclusion

Unfortunately, some opponents of clean energy have built a fear campaign about the impacts of these investments, arguing that the costs are too great and the jobs created are too small. As we've argued here, this is only true if you look at an incomplete picture of the full problem.

First, their argument rests on the mistaken assumption that dirty energy is "cheap." This is wrong because the apparent price we pay for dirty power may be low but the actual price we pay after spending hundreds of billions of dollars each year dealing with the negative externalities of these power sources is far, far higher, and these costs will only escalate in the future.

Second, even if we don't count these "externalities," then dirty energy activists want us to believe that clean energy is hopelessly expensive. This is wrong and getting even more wrong because as renewable energy gets developed at a larger scale costs will come down.

Third, the dirty energy opponents argue that green jobs are a myth, and aren't actually new jobs. This is wrong because building clean energy creates new installation, construc-

tion, and manufacturing jobs immediately, and then frees up resources to create jobs and growth in the rest of the economy.

So investing in green jobs will immediately address two of our country's most important challenges: lowering unemployment while improving our energy system. For these specific reasons alone, these investments would be worthwhile. But these investments will also significantly improve our economy in the long term, making it more productive and efficient. A more productive, efficient economy will be better for all Americans, and will allow for middle-class job creation across sectors and occupations.

Like the transformation from an agricultural to an industrial economy, or from a non-computerized to a high-tech economy, the transition from fossil fuels to a clean energy economy will be far more valuable than just the direct jobs it creates.

*Richard W. Caperton is a Senior Policy Analyst on the Energy Opportunity team at the Center for American Progress. Adam Hersh is an Economist on the Economic Policy team at the Center for American Progress.*

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