



The elusive and expensive green job[☆]

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ABSTRACT

The United States, Europe, and non-governmental international organizations are seeking to encourage the creation of green jobs and the use of non-hydropower renewable energy. This paper discusses the challenge in defining green jobs and reviews definitions across different countries, states, and NGOs. The paper describes some of the costs the United States has faced in creating jobs through programs funded by the Departments of Labor and Energy. The paper concludes by comparing the experiences of China and the United States in the use of renewable energy.

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1. Introduction

Many people take two ideas as a matter of belief:

- (1) Government “investment” in green jobs helps Americans and America's economy; and
- (2) Such “investment” will enable America to keep pace with economic rivals such as China.

Neither concept is necessarily true. Rather, government spending to promote green jobs may harm the economy by raising energy prices. Such higher prices may act in the same way as a tax, reducing production and employment. Some green jobs may be created, but many manufacturing and energy-intensive jobs may be eliminated or driven offshore.

For example, the incandescent light bulb ban has meant that U.S. factories manufacturing such bulbs have closed ([GE Press Release, 2010](#)). Similarly, the U.S. government has incentivized the production and consumption of alternative energy sources like solar panels, which are made most efficiently in China. While American coal mines have been closing, China has been using coal as energy in its

production of solar panels. This makes Americans worse off, rather than better off, and puts America at a disadvantage compared to China and other countries that eschew uneconomic policies. Despite the seemingly significant investments the Chinese government has made in renewable energy, the actual reliance on renewables for electricity generation is negligible. According to the Energy Information Administration, less than 2% of Chinese electricity generation comes from renewables such as wind, solar, and biofuels ([U.S. Energy Information Administration](#)). Coal fuels 70% of the country's total energy supply ([Energy Information Administration, 2011](#)).

Green jobs are the most recent reappearance of a perennial idea—using industrial policy to promote certain industries. While there have been arguments for industrial policies in which firms and government engage in strategic coordination to promote economic efficiency ([Rodrik, 2004](#)), history is littered with unsuccessful examples of more traditional industrial policies such as tax subsidies and targeted government investment in firms. For example, Japanese subsidies to R & D in agriculture, forestry, and fisheries in the period from 1955 to 1980 showed little increase in the rates of technological development in those areas ([Pack and Saggi, 2006](#)). In the United States, the federal government granted solar panel manufacturer Solyndra \$528 million in federal loans only to have it declare bankruptcy in 2011. Abound Solar received \$400 million in loan guarantees and declared bankruptcy in 2012. U.S. green jobs initiatives result in a higher cost of energy to businesses, driving them to locate in other countries, and to households, who can afford fewer goods.

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Many scientists believe that released CO₂ gas either makes the atmosphere more like a greenhouse or gets absorbed by the oceans, resulting in acidification (American Institute of Physics, 2011). Is Planet Earth getting warmer through man-made emissions of greenhouse gases, or due to natural causes beyond human control? If so, is warming harmful rather than beneficial? It is up to the scientific community to battle out the pros and cons of the climate change debate. But, if global warming needs to be mitigated, there are less expensive ways of reducing these emissions, such as geoengineering solutions.

2. International measures of green jobs

The green jobs movement can be found in practically every country around the world. Most countries have their own government definitions.

In Australia and New Zealand, green jobs are defined as “managers, professionals and technicians who work in green organisations or who have green skills and responsibilities within other organisations that may not be considered as green” or “service, clerical, sales and semi-skilled workers who work in green organisations (“Who Are the Green Collar Workers?” Connection Research, commissioned by the Environment Institute of Australia & New Zealand, 2009).”

In Britain, a parliamentary report states that “The transition to a low carbon economy will require a ‘greening’ of the whole of the economy. As such, all jobs will need to be ‘greened’ to some extent.”

A 2010 Report of the British House of Commons, entitled “Green Jobs and Skills: Government Response to the Committee’s Second Report”. First Special Report of Session 2009–2010 notes:

DWP’s [the Department for Work and Pensions] Future Jobs Fund aims to create up to 10,000 ‘green jobs’. For the purposes of this fund a ‘green job’ can be defined as one that provides a good or service that helps move in the economy to lower carbon emissions and greater resource efficiency. This includes jobs in environmental sectors (including recycling, waste management, environmental consultancy and monitoring), renewable energy technologies (including wind, wave, geothermal and biomass) and emerging low-carbon sectors (such as alternative fuels, CCS, carbon finance and building technologies) (Green Jobs and Skills: Government Response to the Committee’s Second Report, 2010).

However, in a flash of wisdom unseen in America, the original report, “Green Jobs and Skills.” Second Report of Session 2008–2009 cautioned the government about the possibility of displacing other workers through green employment initiatives, saying “jobs will have to move from carbon-dependent sectors to low carbon sectors as economic growth shifts (Green Jobs and Skills, 2009).”

In Spain, economics professor Gabriel Calzada Alvarez of the Universidad Rey Juan Carlos calculated that his country has spent \$860,000 per green job. Alvarez calculated that over the 15-year period when Spain invested in green technology, 2.2 jobs were lost for every job created. Two-thirds of the 110,500 green jobs created were in construction and installation, 25% were in administration, and 10% were in maintenance and operation.

Between 2000 and 2008, Spain spent €571,138 on every green job, with subsidies totaling €1 million per wind industry job (about \$720,000 and \$1,260,000). Total subsidies reached €28,671 million and the extra electricity cost paid by consumers was €7919 million, slowing the economy (about \$36 billion and \$10 billion).¹ In 2008, the renewable energy sector employed 0.2% of Spain’s workforce, and wind accounted for just 10.2% of total energy generated (Alvarez et al., 2009). Since then, the electricity share generated from wind power increased to 15% in 2011, but a moratorium issued on many renewable

energy subsidies is expected to slow down the industry (Red Eléctrica de España, S.A.U., 2011; Sills, 2012).

In Japan, the Prime Minister ordered the Environmental Minister to draft a Green New Deal in 2009 including funds for green jobs creation. Also, Japan’s National Parks Program has a green worker program which has created green jobs (“Green Worker Program” National Parks of Japan). It gives the following examples of operations undertaken:

- Elimination of alien species;
- Repairs of mountain trails eroded by rainwater and overuse; and
- Burning off fields for the maintenance of grassland landscapes.

As well as national standards, international organizations have their own sets of definitions. In a joint study, the International Labour Organization (ILO) and the United Nations Environment Programme (UNEP) define green jobs

as work in agricultural, manufacturing, research and development (R&D), administrative, and service activities that contribute substantially to preserving or restoring environmental quality. Specifically, but not exclusively, this includes jobs that help to protect ecosystems and biodiversity; reduce energy, materials, and water consumption through high efficiency strategies; decarbonize the economy; and minimize or altogether avoid generation of all forms of waste and pollution.

The study argues that though some jobs will be eliminated or substituted in the “transition to a green economy,” overall there will be more employment gains than losses and government policies should be used to hasten the transition (Green Jobs: Toward Decent Work in a Sustainable, Low Carbon World, 2008).

A 2010 Report by the Organisation for Economic Cooperation and Development states “green jobs are defined as jobs that contribute to protecting the environment and reducing the harmful effects human activity has on it (mitigation), or to helping to better cope with current climate change conditions (adaptation) (OECD/Martinez-Fernandez et al., 2010).” Eurostat, the statistical arm of the European Commission, uses the OECD’s definition.

The European Commission commissioned a study by Gilmore Hankey Kirke which concluded that, under a core definition based on organic agriculture, renewable energy, water extraction and supply, and sustainable forestry, Europe has 4.4 million green jobs. Under a broader definition, including all agriculture and forestry, fishing, mining and quarrying as well as all electricity generation and water supply and extraction, the number of green jobs is 21 million, over four times higher (Slingenberg et al., 2008).

3. The American example: Federal definitions of green jobs

In the United States, the 2010 Consolidated Appropriations Act included \$8 million for the Bureau of Labor Statistics to work with other Federal agencies in measuring green collar jobs. The agency was instructed “to identify green economic activity and produce data on the associated jobs (U.S. Department of Labor, Bureau of Labor Statistics, 2010).”

The Bureau of Labor Statistics at the Department of Labor decides which jobs are green and which are not. It is responsible for the federal definition of green jobs under Title X of the Energy Independence and Security Act of 2007, signed into law by President George W. Bush. Title X was originally a separate bill sponsored by then-Representative Hilda Solis, a California Democrat, who now, as Secretary of Labor, is responsible for implementing the legislation. The bill authorized funding for green-collar job training in the areas of retrofitting buildings, installing solar panels and setting up wind farms, and building energy efficient buildings, among others.

¹ Based on the July 3, 2012, Euro/USD at US close, of \$1.26 per Euro.

The bill authorized funds for states to offer grants for labor management training programs and apprenticeships in order to coordinate green jobs programs with union officials ([Energy Independence and Security Act of 2007a](#)). Other sections contained incentives for construction of green buildings, with particular reference to federal buildings ([Energy Independence and Security Act of 2007b](#)).

Some of these jobs qualify for tax preferences or subsidies. For example, U.S. transportation policy favors green jobs, with 20% of Highway Trust Funds reserved for mass transit. Tax subsidies are given to electric vehicles, both for companies to produce them and Americans to buy them.

BLS has defined green jobs either as “jobs in businesses that produce goods or provide services that benefit the environment or conserve natural resources,” or as “jobs in which workers’ duties involve making their establishment’s production processes more environmentally friendly or use fewer natural resources.”

Included are long lists of potential jobs that might qualify. Energy from renewable sources, such as wind, biomass, geothermal, and solar, qualifies. The manufacture of energy efficient products, and those that pertain to pollution reduction and recycling, are also counted as green. Jobs in conservation qualify, such as organic farming, land and water management.

BLS has compiled a list of 333 detailed industry groups that can be classified as green. Many jobs in those industries qualify as green jobs and those who are employed in those industries can be counted as “green workers ([Bureau of Labor Statistics](#)).”

In order for the firms in that industry to be considered “green” they have to meet one of five goals, namely (1) Energy from Renewable Sources, (2) Energy Efficiency, (3) Pollution Reduction and Removal, (4) Natural Resources Conservation, (5) Environmental Compliance, Education, and Training and Public Awareness. BLS describes examples of work that people in the particular industries could be performing to be classified as “green workers.”

In agriculture, for instance, one of the major categories of workers is organic farmers and growers, whose workers are credited with accomplishing both natural resource conservation and creating energy from renewable sources. The biggest economic contributor from this category is likely to be producers of corn. When a farmer produces corn to eat, it is not counted as a green job. But when he produces it for ethanol—the Department of Agriculture estimates that for the 2010/2011 marketing year 45% of the U.S. corn crop was used for ethanol—he has a green job ([U.S. Department of Agriculture, 2011](#)).

If the farmer produces some corn to eat, and other corn to make ethanol, as countless corn producers do, then by Agriculture Department definitions, he has a green job. As long as the farmer sells at least some corn to ethanol producers, he is green.

A farmer who grows hundreds of acres of corn to feed Americans or starving people does not have a green job. But if he were to sell some corn to a processor to produce ethanol to fuel a Cadillac SUV on the other side of America, the farmer is counted as green.

Organic producers of fruits and vegetables count as green jobs, but owners of large farms do not. Unlike most green jobs, many organic farmers are low-paid and unskilled. Measurement of the workers in this area is imprecise, since farming is a seasonal workforce with highly varying annual demand. Similarly, businesses that purchase locally-produced food are considered green—but not if they import food from other countries ([U.S. Department of Labor, Bureau of Labor Statistics](#)).

What if a business sells some locally-produced food, and some from overseas? Just as with corn producers, if even a few workers are engaged in selling local produce then the business can count itself as green. Calculations do not include self-employed workers, however. Hence, if an employee of a green farm strikes out on his own, and becomes self-employed, then a green job is lost—even if he is selling organic produce ([Bureau of Labor Statistics](#)).

With farming, it is possible to calculate the percentage of employment that is dedicated to ethanol or organic produce, but in other

areas the numbers are not so clear. One example is “wood chips used for biomass.” Wood chips are largely a byproduct of milling, and milling is not considered a green job. Yet if companies sell the wood chips for biomass they become green, according to Labor Department definitions.

Electricity production is another gray area. Wind and solar installation, maintenance, and operation are clearly green. But what about increasing the efficiency of a power plant that uses fossil fuels, such as oil, coal, or natural gas? After all, since the introduction of electricity, its production has been getting gradually more efficient, as new technology replaces old.

Those energy efficiency operations that qualify as green jobs include construction of Leadership in Energy and Environmental Design (LEED) certified structures, installation of energy efficient windows, and manufacturing and repairing Energy Star appliances. LEED certifications, granted by the U.S. Green Building Council, a non-profit organization ([U.S. Green Buildings Council](#)), and Energy Star certifications granted by the Environmental Protection Agency and the Department of Energy ([About Energy Star](#)), are national standards.

It is puzzling to say that a construction worker is doing a different job installing a gas insulated window, rather than a traditional pane window. Installing a “Lo-Flo” toilet is a green job, but a regular toilet is just plumbing. In his November 2011 testimony before the House Subcommittee on Regulatory Affairs, Stimulus Oversight and Government Spending, Brett McMahon, a construction contractor, lamented the tax dollars and effort that have been wasted on things like convincing the public that “the plumber who installs the ‘Lo-Flow’ toilet should now be called a Green Collar plumber, and that that new label should count as a new job. ([McMahon, 2011a,b](#))” Like many of the workers the government is trying to capture, these workers exist in industries that are already counted and classified under existing industry and occupational categories. What is different: the Labor Department may provide funding for “retraining” workers to install this different toilet.

Another perplexing class of green workers is in public transportation. Buses and trains are included, but not taxis. But in many cases building and operating a rail line uses more energy than buses. And in other cases it makes more sense to take a taxi than a bus. Further, if rail service is green, should not planes be included? The carbon emissions of planes per mile travelled are substantially less per mile of travel than those of cars (“[Carbon Calculator](#)”, [The Carbon Fund](#)).

Many industries in the federal government’s categories border on the absurd. [Table 1](#) shows a few examples.

People who work in museums have green jobs, but only in environment and science museums. A job in an art gallery is not a green job. The securities and commodity exchange industry counts as green—but only for emissions allowance trading. News syndicates are green—as long as they publish environmental media. Book publishers are green, if they issue environmental books or training manuals. This article qualifies as environmental content, since it is about green jobs, so this makes the publisher of *Energy Economics* a green company. The author of this article is doing a green job.

It is not clear why the federal government needs to make these distinctions between green jobs and other jobs. It might be less expensive for someone in the environmental movement to manage the classification system. This would mean that the green jobs movement could proceed without imposing the cost on the federal government. To cite one potential comparison, weight loss companies, such as Weight Watchers or Jenny Craig, decide which foods qualify as diet products, and individuals select which foods they want to purchase.

The green job designations have more psychological than economic effects. These labels serve an advertising and public relations function, the insight they provide is merely attempting to create classifications of workers that are not comparable with existing industry classifications. Businesses want to be more efficient to cut their costs, and consumers do the same, seeking products to help them reduce their fuel bills.

Table 1
Industries where green goods and services are classified.

NAICS	2007	Title examples
712110	Museums	Environment and science museums
712130	Zoos and botanical gardens	Botanical gardens, zoos
551114	Managing offices	Headquarters for environment-related companies
541810	Advertising agencies	Environmental advertising for public awareness
541820	Public relations agencies	Environmental public relations for awareness
541922	Commercial photography	Environmental photography
523130	Commodity contracts dealing	Emissions allowance trading
523140	Commodity contracts brokerage	Emissions allowance trading
523210	Securities and commodity exchanges	Emissions allowance trading
515120	Television broadcasting	Environmental content for TV broadcasting
515210	Cable and other subscription programming	Environmental content for cable distribution
519110	News syndicates	Environmental news media
511130	Book publishers	Environmental or training books/manuals
511140	Directory and mailing list publishers	Industry association directories or mailing lists
511199	All other publishers	Environmental or association calendars, etc

Source: Bureau of Labor Statistics: Industries where Green Goods and Services are Classified. August 24, 2010. http://www.bls.gov/green/final_green_def_8242010_pub.pdf.

One sector that has gained jobs is the federal bureaucracy, with taxpayer funds used for workers who create memos and manuals. This does not help to contribute to any of the major goals of green jobs outlined by the Bureau of Labor and Statistics.

4. Green jobs in the States

In addition to BLS, states also have their own methodologies of green job definitions. States have not done any better than the federal government in crafting green jobs definitions. Many states, including Arizona, Idaho, Maryland, and others drew upon or simply adopted the BLS definition, and others created their own definitions.

The Department of Labor's Employment and Training Administration released a Solicitation for State Labor Market Improvement (LMI) Green Jobs Grants in July 2009, which led many states to form consortiums and study the green jobs within their states and regions (Employment Security Department, Washington State, 2009).

The Rocky Mountain & Northern Plains Green Job Consortium (Utah, Montana, Wyoming, South Dakota, Nebraska and Iowa) defined a green job as "one in which an employee produces a product or service that improves energy efficiency, expands the use of renewable energy, and/or supports environmental sustainability (Northern Plains and Rocky Mountain Consortium, 2011)."

Another consortium, the Mid-Atlantic Regional Collaborative, consisting of Maryland, Virginia and the District of Columbia, concluded that

Green jobs are jobs involved in economic activities that help protect or restore the environment or conserve natural resources. These economic activities generally fall into the following categories: Renewable Energy; Energy Efficiency; Greenhouse Gas Reduction; Pollution Reduction and Cleanup; Recycling and Waste Reduction; Agricultural and Natural Resources Conservation; Education, Compliance, Public Awareness and Training ("What is a Green Job?" MARC Regional Green Jobs website).

Louisiana and Mississippi partnered in surveying green jobs in their states in 2009. To be a green firm in Louisiana or Mississippi, employees should spend more than 50% of their time in one of

seven green activity categories, specifically renewable energy; energy efficiency; greenhouse gas reduction; pollution prevention and clean-up; recycling and waste reduction; sustainable agriculture; natural resource conservation and coastal restoration; and education, compliance, public awareness and training supporting the other categories (Louisiana Workforce Commission, 2011a).

The Louisiana Workforce Commission reported results of a survey which took place during the fourth quarter of 2010, and found an estimated 30,205 primary green jobs (or 1.6% of Louisiana's employment). The survey also counted "support green jobs," which were jobs in which employees spent less than 50% of their time on green activities, and found 67,591 support positions (Louisiana Workforce Commission, 2011b).

Alabama created its own definition of green jobs as those that relate to the identifiable green activities of "increasing energy efficiency; producing renewable, clean transportation and fuels; agriculture and natural resource conservation; pollution prevention and environmental cleanup; and research, consulting and environmental support. ("Alabama Green Definitions" Alabama Department of Industrial Relations website)."

Other states which worded their own definitions include Pennsylvania and Oregon. Pennsylvania defines green jobs as "those that promote energy efficiency, contribute to the sustainable use of resources, prevent pollution and reduce harmful emissions or clean up the environment (Pennsylvania Workforce Development Commission)." Oregon has a similar definition. The Oregon Employment Department defines

a green job as one with essential job duties related to providing a service or producing a product in any of these categories: Increasing energy efficiency; Producing renewable energy; Preventing, reducing, or mitigating environmental degradation; Cleaning up and restoring the natural environment; Providing education, consulting, policy promotion, accreditation, or other services supporting the above categories.

As of 2010, the Department estimated that Oregon had 43,148 green jobs which made up 3% of Oregon's total employment (Oregon Employment Department Workforce and Economic Research Division, 2009).

Some states have lengthy and highly-specific definitions. For example, California's extensive working definition is based on the following GREEN acronym:

Generating and storing renewable energy
 Recycling existing materials
 Energy efficient product manufacturing, distribution, construction, installation, and maintenance
 Education, compliance and awareness
 Natural and sustainable product manufacturing

New Jersey perhaps has the most accurate definition, saying "It turns out that, in most cases, a green job is not an entirely new job, but a traditional job that contributes to reducing carbon emissions or pollution or otherwise benefiting the environment (New Jersey Department of Labor and Workforce Development)." New Jersey's Department of Labor found that in 2009 there were 200,521 workers in its "green economy" 68% of whom were in "energy efficiency—green building/construction/design" followed by 24.5% working in "green energy production/renewable energy" and 7.5% in "environmental remediation/waste management reduction (New Jersey Department of Labor and Workforce Development, Labor Planning and Analysis)."

Some definitions of green jobs specify that they consider green jobs to be full-time positions which pay a living wage. For example, Wisconsin gave out grants to companies to create green jobs, defined as "full-time jobs in businesses that manufacture green clean energy

products (for example wind, solar, biofuels, and advanced electrical storage systems) or otherwise help reduce the consumption of fossil fuels. (Wisconsin Department of Commerce, 2011)."

But most state definitions, following the lead of the Labor Department, do not clarify how much time must be spent on "green activities" to qualify a position as a green job. This could mean that either the person's entire workday is focused on such green activities, or that having one green duty bumps a job into the green category.

A report of the Northern Plains and Rocky Mountain Consortium found that only 26% of employees reported spending all of their efforts on green activities, and only 48% of employees reported spending half or more of their time on green activities. (This is shown in Table 2.) In other words more than half of employees counted as green are not spending half their time on green activities.

Universities are examples of the easy creation of so-called green jobs. Many colleges have environmental studies programs and would therefore qualify as an industry where green goods and services are classified under NAICS code 611310, "(colleges and universities", Department of Labor, Bureau of Labor Statistics, September, 2010)." (Green Goods Services Industries by NAICS CODE, 2011) Some have renamed their civil engineering departments "Departments of Environmental Engineering," and some ask their cafeterias to compost scraps. But these actions do not require hiring new employees.

The ambiguity of the definitions of green jobs is one reason why efforts to create them have been so unsuccessful.

5. U.S. expenditures on green jobs

Green jobs may not be different, but they are costly. The United States provides many benefits for green products. The American Recovery and Reinvestment Act of 2009, known as the stimulus bill, provided many grants to companies. One for example, was Solazyme, Inc., which received \$21.8 million to develop algae fuels as a substitute for gas (Recovery.gov, 2010). In a speech at the University of Miami on February 23, 2012 President Obama again endorsed the idea. "We're making new investments in the development of gasoline and diesel and jet fuel that's actually made from a plant-like substance – algae." The President said, "Believe it or not, we could replace up to 17% of the oil we import for transportation with this fuel that we can grow right here in the United States. (Obama, February, 2012)"

In addition to Department of Energy loan funding, solar, wind, and other renewables manufacturers enjoy a number of tax preferences. On January 8, 2010 the Obama Administration announced it had awarded \$2.3 billion in Recovery Act Advanced Manufacturing Tax Credits to "clean" manufacturers, which were to produce over 17,000 jobs. The 183 projects supported included solar and wind energy, building efficiency and energy management, and smart grid technologies.

In addition to producer tax credits, in 2009 the Federal government also began offering consumers tax credits of up to \$7500 for purchasing electric plug-in cars (Department of Energy). Despite this advantage, the success of American electric car sales was underwhelming. Chevy's electric car, the Volt, caught fire for catching fire. The plug-in hybrid car's batteries apparently burst into flames after some government crash tests. In March 2012 a five-week suspension of the Volt's

production was announced in reaction to low sales numbers. Meanwhile, within the same week Chrysler and General Motors announced plans to produce pick-up trucks with dual fuel tanks, capable of running on both natural gas and gasoline.

The stimulus bill provided the Department of Labor's Employment and Training Administration (ETA) with \$500 million for grants in research and training for green jobs.

The ETA's definition of green jobs was "jobs associated with products and services that use renewable energy resources, reduce pollution, and conserve natural resources." Grants were issued through the Energy Training Partnership, Pathways Out of Poverty, and State Energy Sector Partnership. Grantees served 52,762 individuals, 46,627 individuals enrolled in training, and 26,142 completed the training. As of June 30, 2011, 8035 participants had entered employment, and 1336 had retained employment for 6 months (Lewis, 2011a).

At a hearing on November 2, 2011, before a House Oversight and Government Reform subcommittee, the Inspector General of the Energy Department and an Assistant Inspector General of the Labor Department testified that funds authorized by Congress to create green jobs had not been spent or, if spent, had yielded meager results.

Elliot Lewis, the Labor Department's assistant Inspector General for audit, testified that an audit of the Department's green jobs training program showed that only 2.5% of individuals originally enrolled were still employed in the jobs for which they were trained six months after the start of their job as of June 30, 2011. (Lewis, 2011b) Whether they had gone on to other jobs, green or otherwise, or become unemployed, the Department's tracking system did not say.

Gregory Friedman, Inspector General of the Energy Department, testified that as of late October, 45% of funds appropriated by the 2009 American Reinvestment and Recovery Act (the stimulus bill) for green energy had not been spent, because few "shovel ready" projects existed.

The testimony of the two Inspectors General shows why green jobs programs have not succeeded in increasing employment. Instead, government money, at best, remains unspent.

As of June 30, 2011, ETA had awarded \$490 million of the \$500 million provided by Congress for the program. The funds were awarded to state workforce agencies, community colleges, and nonprofits.

ETA money trained some workers in green jobs such as hybrid and electric-car auto mechanics, weatherization of buildings, and solar panel installation. Other workers received job referrals, training in basic workforce readiness skills, and credentials and support services to overcome employment barriers.

Yet, almost three years after Congress passed the Recovery Act, grantees had spent only \$257.3 million, about half of the funds earmarked for them. Elliot Lewis's testimony showed that as of June 30, 2011, out of 53,000 people who were served by the ETA programs, 47,000 enrolled in training. Of them, 26,000 completed training, and 8000 found jobs.

On April 2, 2012, in response to a request from Iowa Senator Chuck Grassley, a Republican, Assistant Secretary of Employment and Training Administration Jane Oates provided updated outcomes and expenditures data through December 31, 2011. Ms. Oates's data showed that 8,400 found new jobs by June 30, 2011, and of them, 5,400 were employed six months later on December 31, 2011. Of the 53,000 who had participated by the end of the second quarter of 2011, 5400 were still employed in their new positions by the end of the fourth quarter of 2011, or 10.2%.

By December 31, 2011, combined expenditures of the Energy Training Partnership, Pathways Out of Poverty, and State Energy Sector Partnership, totaled \$257.3 million, or \$47,754 per new job retained more than 6 months.

The number employed by the green jobs program is less than 8% of ETA's target of 69,717. Another \$243 million is left unspent. The

Table 2
Time spent on green work, Northern Plains and Rocky Mountain Consortium.

Percent of time dedicated to green work	Number of workers	Percent of workers
1%–49%	65,607	41
50%–99%	35,609	22
100%	41,423	26
Not reported	19,241	12

Source: Northern Plains and Rocky Mountain Consortium Final Report.

program does not appear to be on track. In its defense, Assistant Secretary Oates told the House Government Reform and Oversight Committee on June 6, 2012, “Many of these grants have ongoing training activity, with some of the programs not finishing until 2013. As the economy continues to strengthen and growth industries emerge, we have encouraged grantees to modify training plans and curricula to meet the needs of local green energy employers. (Oates, 2012)”

The Energy Department had similar problems spending its recovery funds. Out of the Energy Efficiency and Conservation Block Grant Program, almost a third, or \$879 million, had not been spent as of March 31, two years after enactment. In Energy Delivery and Energy Reliability, \$2.6 billion, or 57%, was unspent.

The Energy Department reported that when the funds were spent, the work was often of poor quality. In one state audit, 9 out of 17 weatherized homes failed inspection due to substandard workmanship. One subcontractor gave preference to relatives and employees, even though the target population was elderly and handicapped residents.

Friedman said, with regard to weatherization programs, “The main abuses were charging for work that wasn’t completed or done at all, abusing priority sequence, premiums for things that could have been gotten for a lower cost.”

He explained that state and local governments were unprepared to receive the grants. “Not to make light of a serious situation, but it was like attaching a lawn hose to a fire hydrant,” he said. “The governments were overwhelmed.”

It is not only agency inspectors general who found that stimulus funds did not create jobs. In a series of reports entitled “Green Jobs Created or Saved by the Recovery Act,” the Council of State Governments (CSG) came to the same conclusion. During the first two quarters of stimulus (July to December 2009), and the 6th quarter (October through December of 2009), CSG concluded that the Department of Labor Programs created 1365 jobs. This is almost identical to the Assistant Inspector General’s report of 1366 jobs created in the entirety of the stimulus program up until June 20, 2011.

6. Green jobs for America, green growth for Asia

Some believe that federal incentives for green energy, such as wind and solar, must benefit the United States. Advocates declare that these technologies will result in the production of new systems, creating American green jobs.

The theory goes as follows. Congress passes laws requiring the use of certain forms of alternative energy, just as it mandated ethanol and electricity produced from renewables. As a sweetener, Congress subsidizes them, perhaps with refundable tax credits for both businesses and households. Then, Americans produce them, eschewing old-fashioned technologies such as oil and coal. The supposed result is that America will grow faster, winning the modern equivalent of the Race for Space.

On some level, this sounds appealing. But the reality is that, other than onshore wind in certain regions, large-scale alternative technologies manufacturing requires government subsidies or policies in place. This is because their leveled costs of generation are higher than other sources (U.S. Energy Information Administration, 2012). And the technology is not Made in America, but Made in Asia. In fact, much mandated equipment, such as solar panels and wind turbines, is made abroad and imported.

China’s growth has averaged 11.2% over the past five years (Author calculations and Country Statistical Profile: China, 2011–2012). As can be seen in Table 3, despite the seemingly significant investments the Chinese government has made in renewable energy, the actual reliance on renewables for electricity generation is negligible. According to the Energy Information Administration, less than 2% of Chinese electricity generation came from renewables such as

Table 3
Electricity generation for selected countries, 2010.

	Net renewable (billion kWh)	Total generation (billion kWh)	Renewable as percent of total	Hydropower as percent of total	Renewable ex-hydro as percent of total
Australia	18.21	241.45	7.54	5.11	2.43
Brazil	429.67	489.53	87.77	81.92	5.86
Canada	360.25	580.58	62.05	59.94	2.11
China	764.54	3964.95	19.28	18.00	1.28
France	78.53	538.96	14.57	11.53	3.04
Germany	104.23	576.76	18.07	3.26	14.81
India	132.36	879.99	15.04	12.53	2.51
Italy	76.19	279.01	27.31	17.95	9.36
Japan	102.84	1013.23	10.15	7.25	2.90
Mexico	46.01	254.36	18.09	14.44	3.65
Russia	167.47	983.20	17.03	16.73	0.30
Spain	94.09	279.65	33.65	14.95	18.70
U.K.	26.25	352.66	7.44	1.00	6.45
U.S.	436.47	4120.03	10.59	6.24	4.35

Source: U. S. Energy Information Administration, *International Energy Statistics*, Accessed November 17, 2011, <http://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm?tid=6&pid=29&aid=12>.

Note: Hydropower generation figures are for 2008 for France, India, Italy, Russia, Spain, and the UK.

wind, solar, and biofuels as of 2010, the latest international data available (U.S. Energy Information Administration, *International Energy Statistics*, 2011a). India, another powerhouse, generates under 3% of its electricity from non-hydropower renewables. (U.S. Energy Information Administration, *International Energy Statistics*, 2011b)

At the opposite extreme, Spain generates 19% of its electricity through non-hydropower renewables. These expenditures have not helped to alleviate Spain’s climbing unemployment rate which was 24.6% as of May 2012 (U.S. Energy Information Administration, *International Energy Statistics*, 2011c). Germany is second highest, with 15% of electricity derived from such renewables. The United States stands at 4%, Canada at 2% (U.S. Energy Information Administration, 2011).

With hydropower, the U.S. share of electricity generation from renewables rises to 11%. But environmental advocates often view hydrological power as an ecological nightmare, because it dams rivers and destroys the movement of fish. Hydropower, by a wide margin, is the largest contributor to renewable electricity production. In Brazil, 82% of total power generation comes from hydropower (U.S. Energy Information Administration). Many of the major energy consumers of the world economy have yet to adopt renewable forms of power generation that are not hydropower. Hydropower is limited by geographic and meteorological constraints, and meteorological constraints can result in the amount of power generated to vary greatly from year to year. Solar and wind gather a lot of attention, but they have yet to garner a sizable piece of the current world electricity generation portfolio.

But for all of the discussion of non-hydropower renewables over the last decade, the world is still a fossil fuel driven economy (Fig. 1). All major economies in the world are still large consumers of fossil fuel. The United States, Canada, and the Arabian countries are the highest per capita fossil fuel consumers. The choice between various fuels involves both user demand and domestic supply, especially for fuels where transportation is a higher portion of user cost (coal and natural gas).

This is demonstrated in countries such as China and Russia. China is the largest producer and consumer of coal, whereas Russia and the United States are the two biggest producers and consumers of natural gas. Coal, with all of its sulfur and carbon, has witnessed tremendous growth over the previous decade, with China leading the way.

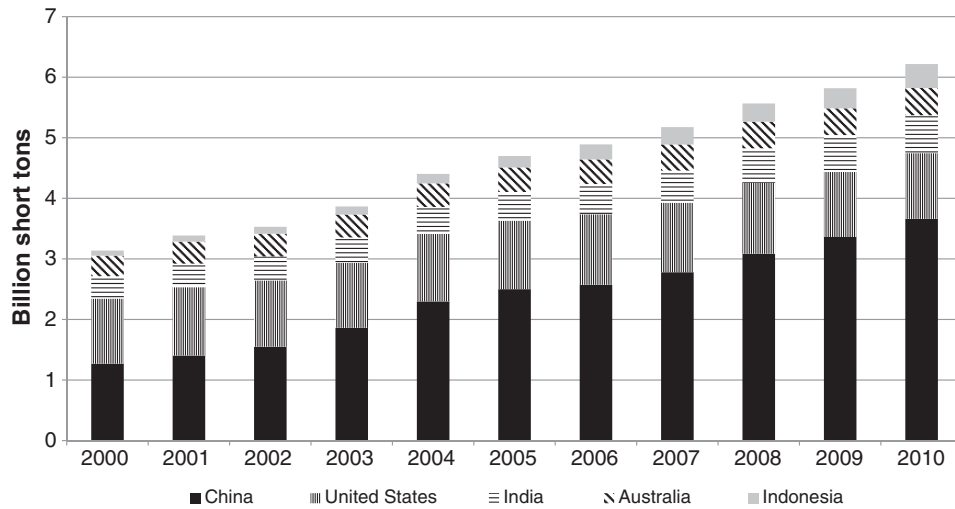


Fig. 1. Top five coal producing nations, 2000–2010. Source: U.S. Energy Information Administration, *China Dominates Global Coal Production*, October 4, 2011, Accessed November 16, 2011, <http://www.eia.gov/todayinenergy/detail.cfm?id=3350>.

7. To copy China, America should use fossil fuels

Many politicians justify American investment in green technologies on the grounds that we have to catch up to China.

This reduces the costs of Chinese manufacturing, allowing it to be far more efficient and globally competitive. China's manufacturing value-added more than doubled from \$893 billion in 2006 to \$1,906 billion in 2010 (Country statistical profiles: Key tables from OECDa). Though America started out with the higher manufacturing value-added figure of \$1712 billion in 2006, it has shown little growth since then, and was overtaken by China in 2010. (Country statistical profiles: Key tables from OECDb)

China would be even more efficient if it halted subsidies to its renewable market. Currently Chinese renewables are subsidized by the government because of a desire for Chinese companies (especially state-owned ones) to get a head start in green technology in order to expand their influence in Western markets. The Chinese government's clean energy initiative has yet to translate into large non-hydro renewable power generation use, but China has been effective at capturing a large share of wind and solar manufacturing (Pew Charitable Trusts, 2011).

Unlike the American government, the Chinese government will only use renewable energy if it is cost effective to do so. John Lee of the Hudson Institute argues that China's purported commitment to going green is solely for the appeasement of Westerners. He notes estimates that by 2030, 80% of China's energy needs will be met by fossil fuels, two thirds of which will be powered by coal alone. While China has been shuttering inefficient coal plants, it has been opening new plants at twice the rate. China consumes 47% of the world's coal, and is the world's largest consumer, according to the Energy Information Administration, compared with 13% for the United States (see Table 4). Coal fuels 70% of the country's total energy supply (Energy Information Administration.com, 2011). However, China profits from the West's obsession with going green (Lee, 2011).

Chinese wind energy is still 20 to 40% more expensive than its coal-fired power, and its solar power is at least twice as expensive. Further, the Chinese government charges a renewable energy fee to all residential electricity users, which raises electricity bills by 0.25% to 0.4%. Industrial users of electricity must pay an additional 0.8%. This tax revenue goes to electric grid companies to make up the cost difference between renewable energy and coal-fired power (Chen, 2009a). In addition, much wind power is wasted due to the underdevelopment of grid construction. Solar energy per watt in China costs three or four times that of traditional coal energy (Chen, 2009b).

State-owned banks in China provide substantial funding for renewable energy programs. In 2009 alone the Chinese government spent \$45 billion in upgrading the electricity grid. While the public and private sectors play a role in the renewable energy market, public investment is the dominant of the two because of profitability challenges for private investors (Chen, 2009c).

According to Chi Zhang, chief Asia economist at BP China and a leading expert on renewables, the Chinese government has substantial reserves of cash to fund renewable energy initiatives, not necessarily driven by profitability or private-sector participation (Chen, 2009d).

Table 4

Fossil fuel consumption for selected countries, 2010.

Country	Petroleum (thousands of barrels per day)	Natural Gas billion cubic feet	Coal thousand short tons
Australia	959	1141	119,737
Percent of world	1.1	0.99	1.5
Brazil	2654	890	26,886
Percent of world	3.05	0.77	0.34
Canada	2237	2936	52,118
Percent of world	2.57	2.54	0.65
China	9189	3768	3,733,733
Percent of world	10.57	3.26	46.9
France	1814	1699	16,994
Percent of world	2.09	1.47	0.21
Germany	2489	3437	250,695
Percent of world	2.86	2.98	3.15
India	3182	2277	759,698
Percent of world	3.66	1.97	9.54
Italy	1503	2930	25,235
Percent of world	1.73	2.54	0.32
Japan	4423	3718	206,909
Percent of world	5.09	3.22	2.6
Mexico	2141	2135	19,413
Percent of world	2.46	1.85	0.24
Russia	2937	17,495	227,306
Percent of world	3.38	15.15	2.86
Spain	1440	1265	18,240
Percent of world	1.66	1.1	0.23
U.K.	1626	3330	54,473
Percent of world	1.87	2.88	0.68
U.S.	19,148	24,088	1,048,295
Percent of world	22.02	20.86	13.17
World	86,962	115,454	7,960,922

Source: U.S. Energy Information Administration, *International Energy Statistics*, Accessed November 17, 2011, <http://www.eia.gov/cfapps/ipdbproject/iedindex3.cfm?tid=1&pid=1&aid=2&cid=regions&syid=2006&eyid=2010&unit=TST>.

A University of Pennsylvania study concludes that “the Chinese government has the funds and willpower to fuel the renewable energy investments necessary to reach its 2020 goal of 15% of energy consumption regardless of whether the private sector participates or not (Chen, 2009e).” But the study notes that China’s initiatives in renewable energy “are largely for pragmatic reasons rather than environmental concerns (Chen, 2009f)...”

Although China is already the world leader in the solar power market, both in terms of production and consumption, solar energy in China accounts for less than 1% of its total domestic energy (“An Overview of China’s Renewable Energy Market”. *China Briefing*, June 16, 2011a). The Chinese government provides subsidies to the solar industry in the form of the Golden Sun Program. These subsidies include 50% of grid-connected solar investments and 70% of off-grid photovoltaic power investments. (An Overview of China’s Renewable Energy Market, 2011b) China boasted 65% of the world’s solar water heaters in 2010 (An Overview of China’s Renewable Energy Market, 2011c).

In 2010, one out of every two newly-installed wind turbines in the world was installed in China. Secretary General of the Global Wind Energy Council Steve Sawyer said, “China has become the single largest driver for global wind power development.” Among the government tax incentives specifically targeted at this sector is an immediate value added tax rebate (50%) applied to selling self-manufactured electric power generated from wind power (An Overview of China’s Renewable Energy Market, 2011d).

Many of these renewable energy market developments in China can be traced to the enactment of the momentous 2005 Renewable Energy Law, which took effect in 2006. China mandated a provision for renewable portfolio standards (also called “mandated market share”); feed-in tariffs for biomass; “government-guided” prices for wind power; an obligation for utilities to purchase all renewable power generated; and new financing mechanisms and guarantees (Schwartz, 2010a).

An update to the 2005 Renewable Energy Law was adopted in December 2009 by the People’s Congress, and went into effect on April 1, 2010. The update included more detailed planning and coordination between renewable energy producers and transmission planning. This provision deals with the inability of grid storage companies to transmit and store large amounts of wind power being produced. (Schwartz, 2010b)

In addition, provisions were established to guarantee that electric utilities purchase all renewable power generated. Previously, utilities were only obligated if there was sufficient demand on the grid, but now they must always purchase renewable power, with an option of then transferring it to the national grid company for use elsewhere. Utilities face deadlines and penalties for failing to comply with the guaranteed-purchase requirement.

Other policy changes have also recently occurred in China. The goal for total share of renewable energy by 2020 was raised to 15%, up from the 8% goal made in 2006 (Schwartz, 2010c). This may be compared to the European Union’s 2008 goal of a 20% share by 2020. However, China also changed the wording of their target from “renewables” to “non-fossil fuel sources,” which includes non-renewable nuclear and hydropower. Therefore, it is difficult to predict what the levels of renewable energy will be in 2020.

8. Asia is growing through fossil fuels

America’s GDP growth rate has not come close to matching China’s since 1989. In 2000, China’s GDP growth rate was 8.4%, America’s was 4.2%. In 2006, China’s growth rate of GDP was 12.7%, America’s was 2.7%. In 2010, China grew at 10.4%, while America grew at 3.0%, in comparison with a global average of 4.2%. Unlike China, which has only recorded one instance of negative growth in 1976, America has seen negative or stagnant growth rates at least 5 times since 1970

World Bank national accounts data, OECD National Accounts data files, 2011a).

Similarly, over the five-year period from 2006 to 2010, Korea consistently outpaced America’s GDP growth rate by two to three percentage points. Over the same period, India’s GDP grew faster than America’s. Whereas India only saw a downturn in 2008 (descending to 5%) the U.S. growth rate was on a steady downward projection from 2006 through 2009 (World Bank national accounts data, OECD National Accounts data files, 2011b).

In 2010 America’s unemployment rate was 8.9%, more than double the unemployment rates of 4% or less in China, India, and Korea (International Labour Organization, 2006–2010).² Although statistical surveys to measure unemployment vary, the fundamental difference still exists.

Not all of the differences are due to energy prices, of course. China, India and Korea have lower labor costs and a different structure of regulation. Furthermore, these countries are in a different stage of development, and therefore have more to gain from adopting technologies that more advanced nations have long ago implemented. But these countries are not choosing to adopt non-hydropower renewables on a large scale, as are the United States and many countries in the European Union.

Brookings Institute senior fellow Charles Schultze has written that national energy goals based on industrial policy will fail for two reasons. First, democratic governments are generally not capable of choosing among competing technologies. Second, even if governments knew how to pick winners, letting losers go is another matter entirely that is greatly hindered by the bureaucratic inertia inherent in said governmental systems. Parochial interests within the government can exert undue influence on the decision, as could be the case with Solyndra and Abound Energy.

It is ironic that policymakers are calling for America to invest in alternative technologies to enable us to catch up to China. Yet China uses a tiny fraction of non-hydropower renewables to generate its power. It produces this technology and equipment to sell to us, not for its own use.

If we wanted to be like China, we would use more coal and fewer renewables. And, with no more subsidies for renewables, China would have to sell its solar panels and wind turbines elsewhere.

9. Conclusion

For several years the public has been told that “green energy”—an expansive term that embraces renewable energy, pollution reduction, and conservation—will create jobs in America, lots of jobs. And that the federal government must subsidize green energy to create these jobs.

But no one knows what green jobs are.

Neither the federal government nor state governments can agree on the function or characteristics of a green job, although so many people seem to want them. Some green jobs, such as home insulators, have been around for decades and are being renamed as green jobs. Other jobs, such as manufacturing electric vehicles, are green jobs, but come at the expense of ending other auto industry jobs. Jobs in clean coal production are green jobs, but jobs in coal mining are not.

Green jobs sometimes are eligible for government subsidies, giving them an advantage over other jobs. Yet green jobs often are not economically viable. They are frequently a waste of taxpayer resources, a drain on the federal budget.

² U.S. Bureau of Labor Statistics, Labor Force Statistics from the Current Population Survey.

Not only is there no clear federal definition of a green job, but states have their own definitions. This means that federal grants to states to create green jobs do not produce even results.

America has not succeeded in creating many green jobs. Instead, federal and state governments re-label traditional jobs, in an attempt to convince themselves and the public that such jobs exist. American mandates to use non-hydropower renewables benefit China, which uses fossil fuels to produce solar panels and components of wind turbines. Partly as a result, jobs grow in Asia, and the cost to the American taxpayer rises.

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