

# 7 MYTHS ABOUT GREEN JOBS

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## TO THE READER

The old adage “politics makes strange bedfellows” is illustrated in the case of green jobs. As President Obama pledged, green jobs will result in “building solar panels and wind turbines; constructing fuel-efficient cars and buildings; and developing the new energy technologies that will lead to even more jobs.” Although promised before the election, current economic conditions allow the green jobs initiative to be packaged in the massive “economic stimulus” plan—spending billions of taxpayer dollars to help create jobs.

Pouring resources into green jobs that allegedly are environmentally friendly and productive is supported by interest groups such as the Blue Green Alliance (founded by the Sierra Club and United Steel Workers) and the Apollo Alliance and is similarly supported by unions, environmental groups, and politicians.

The basis for the green jobs program is simple: Carbon emissions are causing global warming, so emissions need to be reduced. A way to do this is to encourage non-carbon sources of energy, such as wind turbines and solar power. The result of government action will be many new jobs and a healthier environment. A two-for-one deal!

This policy series, by two PERC senior fellows and two of their colleagues, is a summary of a larger study analyzing green jobs claims made by various special interest groups. The authors find that the claims are based on myths. Fundamental questions about what is at stake in this massive program need to be addressed before billions in additional deficit spending can be justified. The authors discuss the economic defects in the green jobs proposals and show that not only is the price tag of the programs unjustified, but that the costly implications to society could be even greater.

This essay is part of the *PERC Policy Series* of papers on timely environmental topics. This issue was edited by Laura Huggins and Carol Ferrie and designed by Mandy-Scott Bachelier.

# INTRODUCTION

Several prominent recent studies promise that a massive program of government mandates, subsidies, and forced technological interventions will reward the nation with an economy brimming with “green jobs.” These jobs are a cut above the norm as they improve the environment, the economy, and perhaps more. As Van Jones, the green jobs advisor to President Obama, stated, “We imagine formerly incarcerated people moving from jail cells to solar cells—helping to harvest the sun, heal the land and repair their own souls” (Schulz 2009). Unfortunately, these claims about the wonders of green jobs are built on seven myths about economics, forecasting, and technology.

This Policy Series provides a survey of the green jobs literature, analyzes its assumptions, and finds that the special interest groups promoting the green job agenda employ dubious assumptions and techniques in their analyses. Their recommended policies could lead to a smaller economy and a restructuring of society that will lessen the wellbeing of most people. Citizens deserve careful analysis of and informed public debate about green jobs claims and recommendations before such sweeping changes are initiated through the government. To help in the debate, this publication exposes the myths so the facts can be seen more clearly.

## MYTHS AND FACTS IN A NUTSHELL

*Myth 1: Everyone knows what a “green job” is.*

*Fact 1: No standard definition of a “green job” exists in the green jobs literature.*

Green jobs are asserted to be interesting, pay well, and produce products that environmental groups prefer in increasingly

unionized workplaces. Such criteria have little to do with the environmental impacts of the jobs. To build a political base, green jobs programs have become a mechanism to deliver something for many special interests to attract support for a radical transformation of society. Committing hundreds of billions of dollars to promoting a policy goal that lacks a transparent definition cannot be justified.

*Myth 2: Creating green jobs will boost productive employment.*

*Fact 2: Green jobs estimates include huge numbers of clerical and administrative positions that do not produce output.*

Green jobs studies by organizations such as the United Nations mistake any position that receives a paycheck as one that creates value. Simply hiring people to write and enforce regulations, fill out forms, and process paperwork is not a recipe for creating wealth. Much of the promised boost in green employment turns out to be in non-productive positions that raise costs for all citizens.

*Myth 3: Green jobs forecasts are reliable.*

*Fact 3: Green jobs studies make estimates using poor models based on dubious assumptions.*

The forecasts optimistically predict a green jobs boom that will take us to prosperity. The forecasts, which are sometimes amazingly detailed, are unreliable because they are based on:

- Questionable estimates by interest groups derived from tiny base numbers;
- Extrapolation of growth rates from small base numbers that do not take into consideration that growth rates eventually slow, plateau, and even decline; and

- A biased and highly selective optimism about which technologies will improve.

The estimates use a technique (input-output analysis) that is inappropriate to the rapidly changing technology of green power sources. The analyses yield seemingly precise estimates that give the illusion of scientific reliability to numbers based on faulty assumptions.

*Myth 4: Green jobs promote employment growth.*

*Fact 4: Promoting more jobs instead of more productivity leads to low-paying jobs in less desirable conditions.*

Green jobs estimates promise greatly expanded employment. This promise is false. The green jobs model is built on promoting inefficient use of labor. The studies favor technologies that employ large numbers of people rather than technologies that use labor efficiently. In a competitive market, the factors of production, including labor, are paid according to productivity. Economic growth does not come from political mandates; it comes from increases in productivity. The studies generally ignore the millions of jobs that will be destroyed by the restrictions imposed by governments on disfavored products and technologies.

*Myth 5: The world economy can be remade by reducing trade, relying on local production, and lowering consumption without decreasing our standard of living.*

*Fact 5: No nation can produce everything citizens need or desire.*

The green jobs literature rejects the benefits of trade, ignores opportunity costs, specialization, and fails to include consumer surplus in calculations. This is a recipe for an economic disaster.

Even favored technology, such as wind turbines or solar photovoltaic, requires expertise largely provided by foreigners. The last century saw experiments in creating societies that limited trade and did not value personal welfare. The economic and human disasters that resulted should have settled the question of whether nations can withdraw inside their borders.

*Myth 6: Government mandates are a substitute for free markets.*

*Fact 6: Companies react more swiftly and efficiently to the demands of customers and the market than they can to cumbersome government mandates.*

Green jobs supporters want to reorder the economy by mandating preferred technologies and expenditures through government entities. But the responses to government mandates are not the same as responses to market incentives. Market incentives have long prompted the resource conservation that green jobs advocates purport to desire. The rising cost of energy is a major incentive to redesign production processes and products that use less energy. People do not want energy; they want the benefits of energy. Those who can deliver more desired goods and services by reducing the energy—and thus the cost of production—are rewarded. There is no evidence to support the idea that command-and-control regimes accomplish productive conservation.

*Myth 7: Wishing for technological progress is sufficient.*

*Fact 7: Some technologies preferred by the green jobs studies are not capable of meeting today's demands.*

The preferred “green” technologies face significant problems in scaling up to the levels proposed by advocates. These problems are



documented in readily available technical literature, yet are ignored in the green jobs reports. Existing viable technologies that fail to meet the green jobs supporters' political criteria are rejected out of hand. This selective technological optimism is not a sufficient basis for remaking society to fit the dream of planners, politicians, or special interests.

## EXPOSING THE MYTHS

An aggressive push for a so-called green economy is underway. A recent report from the U.S. Conference of Mayors, *Current and Potential Green Jobs in the U.S. Economy*, contends that investing in green jobs would produce a remarkable range of benefits from technological innovation to increased income. It also claims that these jobs would yield lower energy costs while improving environmental quality (Mayors 2008, 2).

Advocates of green jobs see no downside to their preferred policies that would require hundreds of billions of public and private dollars to implement. As the solar-power industry trade association proclaims: "It is all good news" (ASES 2007, vii). The Mayors estimated that green jobs can provide "up to 10% of new job growth over the next 30 years" (Mayors 2008, 17). A think tank with close ties to the Obama administrations asserts that "a green economic recovery program . . . could create about 2 million new jobs within the U.S. economy over two years" (CAP 2008, 19).

Governments, non-governmental organizations (NGOs), and the United Nations (UN) seek to promote the creation of green jobs (UNEP 2008). Given the claims that every dollar spent on a host of green job programs will be repaid many times over, it is hard to see how creating green jobs or greening existing jobs could be anything other than a fantastic opportunity. When examined closely, however, the green jobs literature is rife with internal contradictions, vague terminology, dubious science, and a disregard of basic economic principles.

This essay examines green jobs claims contained in four green jobs reports that represent a range of special interest groups. By focusing on these reports, we take on the strongest cases made to date for green jobs mandates:

1. U.S. Conference of Mayors (Mayors), representing domestic politicians;
2. American Solar Energy Society (ASES), representing “green” industry interests;
3. Center for American Progress (CAP), representing left-wing think tanks tied to political interests;
4. United Nations Environmental Programme (UNEP), representing international organizations hostile to open or free markets.

The analysis has three major parts. First, it examines the attempts to define when a job qualifies as green. Second, it analyzes how the green jobs literature treats key economic concepts. Third, it provides an assessment of the assumptions and methods in the reports. The analysis reveals that the reports’ conclusions are unacceptable due to a lack of standard definitions of green jobs, fundamental economic errors, and poor assumptions combined to produce flawed methodology and thus flawed assessments. The conclusion is that deep skepticism is the most appropriate response to the hyperbolic claims of the green jobs literature. The debate should be based on facts—not myths.

## Defining “green” jobs

Several issues must be addressed to understand the claims made by green jobs supporters. First, studies differ on what constitutes a green job with both existing jobs and jobs that might be created by new environmental initiatives. Second, green jobs are presumed to be of value regardless of productivity. Paper-

pushing administrators are claimed as a benefit so long as the positions are related to an agenda declared to be green. Third, fantastic growth rates of green jobs are extrapolated from tiny bases constituting, at best, educated guesses. Fourth, economic multipliers, long used to justify many boondoggles such as government-funded professional sports stadiums, are asserted to exist in the green job area. Such claims are buttressed by input-output analysis that is inappropriate in a dynamic sector of an economy. Finally, the green jobs literature often defines a job as “green” because it makes inefficient use of labor in a production process favored by certain groups’ political and economic priorities.

*Deep skepticism is the most appropriate response to the hyperbolic claims of the green jobs literature. The debate should be based on facts—not myths.*

### **What counts as a “green job”?**

Being green differs depending on who is doing the classification. For example, the Mayors defined a green job as:

Any activity that generates electricity using renewable or nuclear fuels, agriculture jobs supplying corn or soy for transportation fuels, manufacturing jobs producing goods used in renewable power generation, equipment dealers and wholesalers specializing in renewable energy or energy-efficiency products, construction and installation of energy and pollution management systems, government administration of environmental programs, and supporting jobs in the engineering, legal, research and consulting fields (Mayors 2008, 5).

In an odd twist, the Mayors report counts current nuclear power generation jobs as green jobs, yet does not count future jobs in nuclear power as green jobs (Mayors 2008, 12). In contrast, the UNEP report defined green jobs more restrictively by excluding all nuclear power related jobs and many recycling jobs, while at the same time expanding the definition in other areas by including all jobs asserted to “contribute substantially to preserving or restoring environmental quality” (UNEP 2008, 3).

The differences among the loose definitions that are used produce very different results. The more expansive supply chain claims included in the UNEP report allows the authors to claim credit for many jobs. For example, wind turbine towers involve “large amounts of steel” and so the supply chain for the wind power industry involves green jobs extending back into the steel industry so long as the steel ends up in a turbine (UNEP 2008, 4). The steel industry jobs themselves are not required to have a low environmental impact; all that is necessary to qualify as “green” is that the steel they produce go into a favored product. As a result, important value judgments are embedded in the definitions and are not explained. Comparing these definitions illustrates the hurdles to establishing a consistent definition of a green job.

A related problem arises in the way some analyses label almost anything green if the technology does not use fossil fuel without considering the alternative’s environmental impact. For example, the Mayors report touts biomass as a “group of technologies where additional investment and jobs will help to develop the nation’s alternative energy infrastructure.” It extols the virtues of generating energy using “wood waste and other byproducts, including agricultural byproducts, ethanol, paper pellets, used railroad ties, sludge wood, solid byproducts, and old utility poles” (Mayors 2008, 9). Such energy generation includes burning wood, a means of production associated with smog, air pollution, and massive release of carbon.<sup>2</sup> Yet biomass is included “because of the short time needed

to re-grow the energy source relative to fossil fuels” (Mayors 2008, 9). In other words, biomass counts as green because it is not a fossil fuel, even though biomass has environmental costs.

Definitional issues are not simply inconveniences that make it impossible to compare the claims in different reports.<sup>3</sup> They represent fundamental confusion about the idea of a green job, a confusion that must be resolved before committing hundreds of billions of taxpayer dollars and even larger sums of private resources. The lack of transparency about the assumptions obscures policy choices that require thorough debate. Furthermore, these programs create incentives for special interest groups to work the political system to have their jobs designated as green and their rivals’ excluded. Developing open, clear definitions is critical to create public policy measures that promote productive green jobs and avoid turning the policy debate into special-interest extravaganzas unrelated to environmental quality.

### **The value of jobs**

The second major problem with the green jobs literature is that it consistently counts jobs that do not produce useful outputs as a benefit of spending programs rather than as a cost. For example, the Mayors report labels as green “government administration of environmental programs, and supporting jobs in the engineering, legal, research and consulting fields” (Mayors 2008, 5). Another estimate of green jobs found that the biggest increases from green programs were secretarial positions; management analysts; then bookkeepers, janitors, and lawyers. The primary consultant on the ASES report estimated that there would be fewer environmental scientists involved than any of these other categories (Bezdek *et al.* 2008, 66).<sup>4</sup>

These numbers illustrate the point that the purpose of a business, green or not, is not to use resources (e.g., labor, energy, raw materials, or capital). The purpose is to produce a good or

*Dooming the “environmentally friendly” sector to an unending regime of subsidies is fiscally irresponsible and harmful to any efforts to build a competitive and environmentally friendly economy.*

service desired by consumers that is valued more highly than the cost of production. For a given level of output, businesses that use more resources are less efficient—have higher costs—than those using fewer resources. Many jobs created in response to government mandates are not a benefit of environmental measures but a cost of such programs. Such costs may be worth incurring for the benefits a program produces, but they must be counted as costs not benefits.

Counting lawyers and administrators as benefits of green job spending raises an important problem. By making labor the end, rather than treating labor as a means to production of environmentally friendly goods and services, the literature makes a foundational error. Policies promoting inefficient use of labor steer resources toward technologies, firms, and industries that will be unable to compete in the marketplace without permanent subsidies due to the costs inherent in such inefficiencies. Dooming the “environmentally friendly” sector to an unending regime of subsidies is fiscally irresponsible and harmful to any efforts to build a competitive and environmentally friendly economy.

## Forecasting

Forecasts of green jobs are all optimistic. The Mayors report asserts that “wind energy is currently the fastest growing alternative energy source in the country” and “solar power is an alternative energy source providing opportunity for massive job growth” (Mayors 2008, 7). Similarly, the UNEP report claims that “[a]long with expanding investment flows and growing produc-

tion capacities, employment in renewable energy is growing at a rapid pace, and this growth seems likely to accelerate in the years ahead” (UNEP 2008, 6).

There are five major problems with these sunny forecasts:

1. Many of the sectors declared green are tiny. Even minor changes in capacity produce large percentage increases in growth. That is, it is easy to double the number of jobs when you have a small number of jobs in an area, but not as easy when you are in a large, established industry.<sup>5</sup>
2. The growth rate forecasts are huge and raise serious questions about whether such forecasts are reliable. In the energy field, the projections in green job reports assume an astonishingly fast spread of new technologies, some of which do not currently exist in economically viable forms.<sup>6</sup> Such assumptions are inconsistent with past experience with other technologies.
3. The green jobs literature exhibits selective technological optimism. It assumes away problems that might slow implementation of favored technologies and ignores the likelihood of technological improvements of disfavored ones. Selective optimism biases the forecasts, and is unsupported by evidence of systematically faster growth in favored technologies over their competitors.
4. Because many industries discussed as drivers of green jobs are small and new, no official statistics are available. As a result, many forecasts are based not on statistics collected by neutral analysts, but on estimates made by interest groups pushing for a particular outcome.<sup>7</sup> Caution must be exercised in making policy decisions based on unsubstantiated

- numbers estimated by special interest groups.
5. The reports often provide job creation forecasts that appear precise, giving the illusion of scientific certainty. The Mayors claim the adoption of the green jobs agenda will produce 1,171 new green jobs in Great Falls, Montana, by 2038 and 1,246 new green jobs in Greenville, North Carolina, by that date also (Mayors 2008, 27). Yet forecasts vary widely among various reports, illustrating the inappropriateness of reliance on their forecasts.

These reports provide impressive-looking statistical backing for recommendations and are illustrated with an array of tables filled with seemingly precise forecasts. The problems with the numbers underlying this apparent precision are immense and make the claims in the green jobs literature an unreliable basis for policy making.

### **Dubious technical analysis**

Those advocating green jobs claim that their favored programs will have a large impact because of the added jobs and benefits created as those hired into green jobs spend their paychecks. This claim rests on “economic multiplier” analysis. Economic multipliers are regularly used to advocate public subsidies for sports stadiums and higher education (Noll and Zimbalist 1997; Siegfried *et al.* 2008). Multipliers are based on the idea that an increase in activity by one firm leads to an increase in activity by other firms. The contractor for a new football stadium buys concrete, the concrete subcontractor buys new tires for its trucks, all the firms’ workers go out to dinner, and so forth. Multipliers are difficult to observe and must be estimated by indirect means, usually a technique known as “input-output analysis.”

Input-output analysis rests on two key assumptions that are



particularly inappropriate for green jobs estimates. One assumption is that the ratio of inputs to outputs remains constant. This means no technical progress or changes in the prices of inputs used in production (Tegen *et al.* 2007, 9–10). For example, a typical assumption would be that if a dollar of energy was required to

*Measuring success by the maximum number of jobs created to do any particular task is highly problematic.*

produce \$10 of steel at the time the input-output table was created, then the relation will continue.<sup>8</sup> In reality, if the price of energy increases, the production method will change as higher energy prices induce steel producers to change techniques to reduce the energy used to produce steel. Since green jobs proponents concede that green energy will cost more per unit than conventional fuels,<sup>9</sup> the ratio of energy costs to production will not be constant.

The second assumption in calculating input-output analysis is that the relationship among input prices is constant. Yet, a justification for green technology is that oil and coal will become more expensive, for technical reasons or because of a tax on carbon dioxide emissions. Because of the pervasive role that energy plays, these changes will alter prices paid for inputs, again making the input-output analysis inappropriate.

Even if one ignores the problems to create a reasonable multiplier, one must still address the issue of where the multiplier should be applied. Green jobs advocates' standard approach is to apply the multiplier to the total number of jobs in the green energy sector.<sup>10</sup> This is an overestimate, as many of these jobs reflect shifts of workers from disfavored industries, such as coal power plants, to favored industries such as wind energy, rather than an infusion of new economic activity. If an engineer loses a job at a coal power plant and finds work installing wind turbines, there is no gain in employment, yet much of the green jobs literature treats it as such.

The proper measure of the impact of a new program is not total jobs that exist in the area receiving a subsidy but additional *net* new employment. An increase in electricity generation from wind will substitute for energy from coal. The net impact on employment will depend on the labor intensity of energy production in wind compared to coal. The multiplier should only be applied to the *net addition* in jobs, not the gross number of jobs.<sup>11</sup>

Finally, most green jobs reports presume that spending public money is the source of the additional economic activity. However, that expenditure comes from higher taxes now or in the future. Because people try to avoid taxes, such as by hiring lawyers to figure out tax-avoidance schemes, the cost of the tax is more than the revenue from the tax.<sup>12</sup> This reduces the net benefit to the public program. The green jobs literature does not do this, again overestimating the benefits. Such issues are not even mentioned in the literature.

### **Is inefficient labor beneficial?**

Green jobs proponents have an inconsistent attitude toward efficiency. On the one hand, they see efficient use of non-labor inputs such as energy and raw materials as crucial to creating a green economy. The UNEP report states that “[g]reater efficiency in the use of energy, water, and materials is a core objective” (UNEP 2008, 4). On the other hand, green jobs proponents consider reducing the efficiency of labor as a virtue, not a cost. For example, the UNEP report argues that a negative feature of today’s economy is that it has increased labor productivity and so reduced the amount of labor necessary to deliver goods and services: “Any effort to create green jobs in food and agriculture must confront the fact that labor is being extruded from all points of the system, with the possible exception of retail” (UNEP 2008, 228). The same report criticizes the steel and oil industries for increasing labor productivity (184).

Measuring success by the maximum number of jobs created

to do any particular task is highly problematic. First, the ultimate goal of economic activity is not the employment of labor or of other resources. The ultimate goal is the production of goods and services that satisfy human needs and wants. A new method of production that uses fewer inputs to produce the same outputs as an existing method allows the “left over” inputs to address other human needs and wants, thereby raising the standard of living.

Second, even assuming that substitution of capital and other inputs for labor sometimes has negative environmental consequences, it does not follow that such substitutions are either net negative contributions to the environment or inappropriate. Whether particular techniques are better or worse for the environment or for the workers is not an issue that can be settled by assuming that all labor-intensive methods are to be preferred to all capital-intensive ones because it means more labor. Yet this is precisely what the green jobs literature does.

Third, even in the favored green industries, increasing labor efficiency has been an important component in making the technologies more commercially viable. For example, corn-based ethanol cost reductions in the United States have been driven in part by economies of scale in farm operations and the advanced technology necessary to convert corn into ethanol (Hettinga *et al.* 2008, 201). If instead, thousands of workers diligently squeezed corn by hand, there would not be more biofuel, but the number of green jobs would be vastly inflated and dramatically increase the cost of the fuel.

The green jobs literature’s focus on inefficient labor to maximize the number of jobs embodies three highly peculiar assumptions about human wellbeing:

- *Increasing labor productivity should be discouraged.* While various environmentalists have long promoted reduced consumption, adopting a policy of reducing

the goods and services available to all Americans does not produce better work conditions or living standards.

- *Low labor productivity does not produce low wages.* In a market economy, each input used in production is paid according to its marginal productivity. Providing workers with more capital goods increases their productivity and their compensation. Reducing capital intensity will have the opposite effect. Creating a world of high-paying, low-productivity jobs, as green jobs advocates suggest, would require an economic structure unknown in human history.
- *Subsidizing labor at the expense of capital will not delay the development of new technologies that increase the efficiency with which scarce resources are used.* Consider the case of petroleum refining. It is a highly capital intensive process. That intensity has yielded dramatic increases in the amount of fuels and specialty chemicals obtained from a barrel of crude oil. By increasing the yield, innovations have boosted the efficient use of that natural resource. Biasing production away from capital intensity reduces the incentive to produce such innovations.

The problems cited here with the underlying framework of the green jobs studies are grounds for caution in accepting their ultimate conclusions and recommendations. Before hundreds of billions of dollars in public and private resources are directed into promoting an ill-defined green jobs economy, the public and decision makers should have a better understanding of the goal and of the details of how such programs are expected to reach the goals.

## **Mistakes in economic analysis**

The various green jobs proposals have inconsistent definitions of what constitutes a green job; they also contain highly

problematic economic assumptions. That the literature contains so many basic economic errors is not accidental, but reveals that much of the green jobs literature is hostile toward free markets, and thus focuses on government solutions with no regard for market incentives that are imbedded in the American culture. Taken together, these reveal fatal flaws in the green jobs literature's analysis of the economics of green job policies.

- The green jobs literature rejects the existence of comparative advantage—incorporating policies to reduce trade.
- The literature makes inappropriate calculations of consumer surplus, giving misleading results with respect to the benefits of the proposed policies.
- The green jobs proposals frequently interchange responses to mandates and responses to free market—improperly extrapolating from one to predict the other.
- The literature ignores the opportunity costs of the resources it proposes to devote to green jobs programs—thus overestimating net gains in jobs.
- Green jobs analyses do not take into account how market incentives generate energy efficiency—instead assuming that energy efficiency results from government mandates.
- The literature exhibits a strong hostility to decentralized, market decision making.

### **Rejecting comparative advantage**

The green jobs literature often asserts that green jobs are not subject to comparative advantage and so will be distributed abundantly everywhere. For example, CAP (2008, 5) reports that green jobs will be created “in every region and state of the country,” while the Conference of Mayors (2008, 18–33)

takes pains to describe, in a 14-page appendix, how the green jobs will be distributed “so cities and their metropolitan areas across the country can and are expected to compete to attract this job growth.” The green jobs literature insists these jobs will occur nationwide.

This anti-trade—or “buy local”—sentiment is embedded throughout the green jobs literature and is part of a larger criticism of the global economy. The UNEP report is among the most explicit in stating its overall anti-trade agenda. The report argues:

Companies like Wal-Mart (with its policy of global sourcing and especially its policy of searching for cheap products, with potential negative impacts for labor and the environment) are major drivers and symptoms of [increased global trade] ... Ultimately a more sustainable economic system will have to be based on shorter distances and thus reduced transportation needs. This is not so much a technical challenge as a fundamental systemic challenge. (UNEP 2008, 162)

But the green jobs literature fails to acknowledge that its anti-trade assumptions are contrary to standard economic theory. It also ignores real world experience with trade and protectionism. By burying critical assumptions that are inconsistent with existing economic and trade policies (e.g. countries’ commitments to the World Trade Organization), the green jobs literature is slipping in protectionism under the guise of an environmental policy.

### **Consumer surplus**

The green jobs literature asserts benefits of green jobs policies using a flawed conception of improvements in human welfare. In

economics, policies are evaluated by the calculation of the net social benefits based on both consumer and producer surplus.<sup>13</sup> The green jobs literature contains little mention of the consumer side, focusing almost exclusively on costs and benefits to favored producers. For example, the UNEP (2008, 225) report criticizes in-

*A large number of jobs in solar and wind energy rely heavily on taxpayer subsidies or mandates.*

creased agricultural trade between the United States and Mexico because “cheap corn from the United States has hurt Mexican farmers who grow maize on small- to medium-sized plots in difficult environments using low levels of technology.” No mention is made of benefits of cheaper corn to Mexican consumers, only the costs to uncompetitive domestic producers are considered.

In general, economic concepts and technologies that the special interests behind these reports do not like (e.g. fossil fuels, nuclear power, free markets, trade, lower prices for many consumers) are assumed to produce net costs. Those that the advocates prefer (e.g. small farms, local production, solar power) are assumed to produce net benefits. Counting only the benefits from the favored technologies and activities and only the costs from the disfavored ones distorts the outcome. Both costs and benefits must be counted for an accurate comparison to be made. In particular, careful estimates of consumer surplus are necessary to compare policies’ impacts. This biased calculation is not an accidental oversight. The elimination of the benefits of market competition from the green jobs literature represents its sponsors’ rejection of modern economics.

### **Mandates vs. markets**

Many green jobs programs are based on government mandates to promote favored technologies over technologies that

evolve in a competitive economy. The rationale is that without such mandates, market actors would not make the choice to use green technology because they would not receive all of its benefits and/or would bear all the costs of using green alternatives. No doubt it is true that requiring all public buildings to be retrofitted or offering “strong financial incentives” to private building owners to engage in retrofitting would create jobs (CAP 2008, 6–7). Of course, so would requiring all public buildings to be painted purple or offering tax incentives to private building owners to paint their buildings purple. Painting jobs would increase, paint manufacturers would increase production of purple paint, paint stores may hire additional delivery help, paint brush manufacturers would increase production, and so forth.

The question is: What would have happened to the resources used to meet the purple paint mandate in the absence of the government program? Those resources would have been put to the building owners’ highest and best use, and those uses would have also created demand for goods and services, even if not for purple paint. The same is true of retrofitting mandates. The implication of the necessity of a mandate is that profit-seeking building owners are too foolish to make investments in energy saving despite the alleged short-term paybacks.<sup>14</sup>

While costs of alternative energy sources are unspecified in the reports advocating their adoption, the advocacy groups believe that the adoption of these alternative energy sources should be required. “To the extent that government mandates that such alternatives [such as solar power] be given equal access to the [electricity] grid, higher costs will be passed on to the consumers,” but, “as renewables mature technologically... cost disadvantages disappear and may turn into a cost advantage” (UNEP 2008, 47). Implicit in this discussion is that utility companies are too short sighted to make investments in renewable energy projects that would produce profits. That premise is at odds with the desire of a



number of utilities to be *allowed* to sink large amounts of capital to build nuclear and coal plants that take up to a decade to build and have a long recoupment period. The people who make their living in the energy industry do not see the wisdom of investing in massive wind and solar farms (unless heavily subsidized), so the economic feasibility of such green projects is dubious.

Further, the premise that reorienting our economy in a “greener” direction by shifting to “sustainable” energy production will increase net employment in the economy is questionable because most jobs in renewable energy sectors appear to be subsidy driven. A large number of jobs in solar and wind energy rely heavily on taxpayer subsidies or mandates. For example, a study done for the American Wind Energy Association and the Solar Energy Research and Education Foundation estimated that if the investment tax credit for solar/PV projects and the production tax credit for wind energy were not renewed at the end of 2008, then those industries could lose 77 percent of their jobs (Navigant Consulting 2008).

Indeed, U.S. subsidies for renewable energy projects are so attractive that in 2008, BP announced that it dropped plans to build wind farms and other renewable projects in Britain; instead it is shifting its renewables programs to the United States, where government incentives for clean energy projects provide “a convenient tax shelter for oil and gas revenues,” as a BP spokesman noted (Macalister 2008, 37). Royal Dutch Shell also announced it was abandoning wind energy projects in Britain in favor of the United States (Fortson 2008). These developments lend support to the idea that renewable energy is viable only where there is taxpayer support or mandates.

### **Neglecting opportunity costs**

A constant in the green jobs literature is the idea that maximizing employment, not maximizing human welfare, is the goal. Studies fail to consider what opportunities the government and

*Each green job created in Spain is estimated to have destroyed 2.2 other jobs.*

businesses will forego since they do not have that money to spend.<sup>15</sup> The costs are high: The CAP (2008, 9) paper asserts that if \$100 billion is spent on green activities that 935,200 jobs would be directly created, implying a cost of \$107,000 per new job created. Most people could

go to a modestly priced private or state university full time for four years for that sum.<sup>16</sup> Either the funds for these programs were taken from the pockets of people who now have \$100 billion less to spend on other things, causing an economic contraction in those other areas, or it is a bill passed on to the grandchildren of today's taxpayers in the form of deficit spending. These costs are real and must be considered in any debate. What does the nation give up to fund these programs? The green jobs literature ignores these questions.

This point is brought home in a study of green jobs in Spain. That country has poured resources into renewable energy sources and is hailed as a leader in solar and wind power. The authors accept the claims of the number of jobs generated in wind, mini hydroelectric, and photovoltaic energy sources. The 50,000 green jobs created in Spain required an expenditure of €28.7 billion (US\$38 billion or an astounding \$760,000 per job) (Calzada *et al.* 2009, 24). The net employment result was negative; the large sums spent on green jobs drained resources out of other parts of the economy and raised energy prices. Some companies moved production facilities to lower-cost energy countries (Calzada *et al.* 2009, 32). Each green job created in Spain is estimated to have destroyed 2.2 other jobs (Calzada *et al.* 2009, 1).

## **Ignoring incentive effects**

The green jobs literature focuses on public policies to induce

greater energy efficiency, both to reduce greenhouse gas emissions and because it seeks to shift expenditures away from fossil fuels. However, energy efficiency occurs naturally as a result of market processes even without forced taxpayer support. Because the literature ignores this trend, it overstates the benefits of its conservation measures. Given the existence of the trend toward more efficient use of energy even without the policy measures, the proposals will induce less conservation than the studies predict because conservation will occur anyway.

Because energy is costly, the market has an incentive to produce and consume less energy. From the late 1970s to 2000, energy utilization per dollar of real GDP produced fell by 36 percent (Joskow 2003, 37). Total energy usage increased because of economic growth over that time, but efficiency increased more than growth in all major energy-using sectors. Using data from the United States and Great Britain, it is possible to compare energy requirements across time. Compared to 1900, each unit of energy input in 2000 could provide four times as much useful heat, move a person 550 times farther, provide 50 times more illumination, and produce 12 times as much electricity (Ausubel 1995, 411–15).

A result of this increase in efficiency is that past forecasts of future energy use have *overestimated* future energy demands. For example, estimates done by knowledgeable researchers in the late 1970s for energy use in 2000 proved to be 60 to 80 percent higher than actual use in 2000 (Joskow 2003, 35). That is, experts who knew efficiency would increase still greatly underestimated technical progress. Given the bias against disfavored technologies in the green jobs literature, its predictions can be expected to be even more off base.

Data on energy consumption across both producer and consumer goods demonstrates three key lessons relevant to the evaluation of green jobs claims:

- *Market forces provide a powerful incentive that drives greater efficiency with respect to costly inputs.* Net gains from green jobs policies mandating conservation are likely to be less than claimed since some, or even more, than the efficiency gains claimed would occur in the absence of mandates.
- *Regulatory policies have, at times, slowed or blocked energy efficiency gains through unintended consequences.* Adopting mandates is thus not risk free with respect to energy efficiency.
- *The green jobs literature ignores history and fails to mention the extensive data on increases in energy efficiency over time in the industries they propose to regulate.* The authors of this paper are not experts on technical aspects of energy production or use, yet it was not difficult to find from widely distributed, credible sources, extensive data on crucial issues in the green jobs literature that it ignores. Such gaps suggest a need for great skepticism in evaluating their claims of energy efficiency.

## **Market hostility**

Underlying much of the green jobs literature is a deep hostility to free market societies that favor voluntary and decentralized decision making and a preference for centrally directed programs built on mandates. The unprecedented increase in human welfare resulting from the industrial revolution is dismissed: “The story of economic change is, however, also a story about political choices. More often than not, these choices have put the accumulation of wealth before the needs of the majority” (UNEP 2008, 278). As a result, the green jobs literature’s answer to a perceived or real problem is almost always massive public expenditure or regulation rather than less intrusive interventions. For example, the

UNEP report claims that the obstacle to greener buildings is due, in large part, to an information problem—people’s overestimation of the additional cost of green techniques. However, the recommendation is government intervention instead of the provision of information (UNEP 2008, 139). Nothing better captures the demeaning attitude toward ordinary people that is rampant in the green jobs literature than the

*Portland’s North Interstate light rail line is estimated to save about 23 billion BTUs per year while its construction is estimated to consume 3.9 trillion BTUs.*

suggestion that rickshaws could become a significant form of transportation in a green economy.<sup>17</sup> This contempt for decentralized, free societies leads to a focus on mandates and conceptual errors that render the results of these studies untrustworthy.

## **Ignoring the technical literature**

The green jobs literature routinely ignores important technical literatures that raise doubt about some of the assumptions underlying green jobs programs. Mass transit is examined first; then electricity generation.<sup>18</sup> In each case, the literature ignores important facts that cast doubt on its claims by engaging in the sort of selective technological optimism noted earlier.

### **Mass transit**

Green jobs proponents advocate investment in expanding public mass transportation as a way to create jobs with an environmentally friendly purpose. For example, CAP argues that building light rail and subway systems will produce “job growth in engineering, electrical work, welding, metal fabrication, and engine assembly sectors” and such investment in “both urban and rural communities . . . can be an engine for far broader economic

**TABLE 1:  
Modal Energy Consumption and CO<sub>2</sub>  
Emissions per Passenger Mile**

Mode	BTUs	Pounds of CO <sub>2</sub>
Ferry Boats	10,744	1.73
Automated Guideways	10,661	1.36
Light Trucks	4,423	0.69
Motor Buses	4,365	0.71
Trolley Buses	3,923	0.28
All Automobiles	3,885	0.61
Light rail	3,465	0.36
Passenger Cars	3,445	0.54
All Transit	3,444	0.47
Heavy Rail	2,600	0.25
Commuter Rail	2,558	0.29
Toyota Prius	1,659	0.26

Source: (O'Toole 2008, 4)

activity" (CAP 2008, 7–8). The report advocates more bus and subway services, reducing public transportation fares, increasing federal support for mass transit "to deal with increased ridership," increased federal subsidies for employer-based mass transit incentives, and higher funding for mass transit programs (CAP 2008, 7). It is an article of faith in the environmental community that mass transit is more energy efficient than automobiles.<sup>19</sup> A cursory examination of the amount of energy used to move a passenger by one mile reinforces this belief.

Table 1 shows the energy needed per passenger-mile for different modes of travel, starting with the least efficient and moving down to the most efficient. (Data for the Toyota Prius provide a sense of the possibilities of increasing efficiencies for automo-

biles.) Note that bus transit is less efficient than automobiles, while rail transit is more efficient than automobiles. However, the raw numbers can be misleading. First, they do not account for rail transit's need for an extensive bus feeder system to bring people to and from the rail stops. Taking this into account reduces, and may even eliminate, the savings in energy or reductions in CO<sub>2</sub> emissions shown in Table 1.

Further, transit agencies typically increase bus service when they add rail to boost train ridership. Bus routes that used to serve the rail corridor are turned into feeder bus routes for the rail. But since many people drive to rail stations, the average passenger load of the feeder buses tends to be smaller than for the corridor buses they replaced. Consequently, the advent of new rail transit lines can increase fuel usage because the average loads of the buses falls.

In 1991, before St. Louis built its light rail system, its buses averaged more than 10 riders and consumed 4,600 BTUs per passenger mile. After the light-rail line opened, average bus loads in 1995 declined to seven riders and energy consumed per passenger-mile increased to 5,300 BTUs. CO<sub>2</sub> emissions increased from 0.75 pounds to 0.88 pounds per passenger mile. Similarly, energy and CO<sub>2</sub> performance also deteriorated for Sacramento and Houston after rail transit was implemented (O'Toole 2008, 14–15).

Second, even if rail transit results in a net reduction in energy use and CO<sub>2</sub> emissions, these improvements may be more than offset by the energy required to construct the rail system. For example, Portland's North Interstate light rail line is estimated to save about 23 billion BTUs per year while its construction is estimated to consume 3.9 trillion BTUs. It will thus take 172 years to offset the energy used in construction (O'Toole 2008, 14–15). Not only would this exceed the lifespan of the line, but "long before 172 years, automobiles are likely to be so energy efficient that light rail will offer no savings at all" (O'Toole 2008, 15).

Mass transit critics make a compelling case that it provides few, if any, benefits over the automobile and may even be counterproductive once the energy consumed during construction is considered. Green jobs proponents need not agree with the mass transit critics, but a fair presentation would allow a debate on these issues, rather than continue the mantra that mass transit is an environmental panacea.

## Electricity Generation

The green jobs literature calls for massive shifts in power generation technologies. The literature is selectively optimistic about favored power generation technologies (e.g. wind, solar, biomass) and selectively pessimistic about disfavored ones (e.g. coal, nuclear). Next we comment on wind and solar power generation technologies, in contrast to nuclear power, and show how the green jobs literature fails to adequately address basic technical issues involved with each.

### Wind

Partly because of subsidies, the contribution of wind to *renewable electricity* generation is expected to increase from 7 percent in 2006 to 16 percent in 2020 and 20 percent in 2030.<sup>20</sup> However, despite being heavily subsidized, its total contribution to “energy security” is slight, and unlikely to rise to a significant level over the foreseeable future. Wind contributes less than 0.6 percent of total U.S. energy production (based on data from January through September 2008, according to federal statistics) (EIA 2008b). According to the DOE’s latest projections, it will account for less than 0.9 percent of total energy consumption in 2020 and 1.1 percent in 2030 (EIA 2008b, Tables 1,17). Wind plays an increasing role in electricity generation, but electricity is only a fraction of *energy* production in the United States, which is why wind is such a tiny share of energy.



Wind's contribution is diminished by its inability to deliver electricity reliably. Wind turbines cannot produce when wind speed is either too low or too high, or if the turbine blades are iced up. This lack of reliability and the fact that the electricity cannot be stored and so wind capacity must be backed up by other electric generation sources increases the cost of wind energy substantially.<sup>21</sup> So while wind is free, one must consider construction, installation and transmission costs, and acknowledge that wind turbines cannot satisfy consumers' need for reliability and continuous, round-the-clock availability.

*The analysis provided in the green jobs literature is deeply flawed, resting on a series of myths about the economy, the environment, and technology.*

Another problem associated with wind energy is that the most favorable locations for wind are often not accessible to the electrical grid (Wald 2008). According to the Department of Energy, it would require an additional 12,000 miles of high-voltage transmission lines costing \$60 billion to increase the contribution of wind to national electricity production to 20 percent by 2030 (DOE 2008, 95, 98).

Further, efforts to increase wind generation capacity have run into major hurdles with regulatory laws and opposition by area residents (Adler 2007).<sup>22</sup> Despite these widely known problems, which are never discussed in depth in the green jobs literature, green jobs policy proposals propose enormous increases in wind capacity without detailing a strategy for how these problems will be solved.

## **Solar**

Solar power is another favored technology in the green jobs literature. As with wind energy, substantial and largely

unacknowledged hurdles to a significant expansion in solar electric generation exist. First, despite decades of effort and high subsidies, the current contribution of solar to meeting the nation's energy needs is only 0.05 percent (EIA 2008a, Tables 1, 17). Most of this (95 percent) is from solar thermal and hot water production rather than electricity generation. The remainder is from solar photovoltaic (PV) (EIA 2008a, Tables 1, 17). By 2030, the contribution of solar to energy consumption is projected by the Energy Information Administration to rise to just 0.13 percent (EIA 2008a, Tables 1, 17). Although solar PV is projected to grow faster than other forms of solar energy, current technical analyses suggest that the costs of current solar PV installations far exceeds its benefits. Again, these issues are barely acknowledged in the green jobs literature.<sup>23</sup>

## **Nuclear**

In contrast to how favored technologies are treated, the green jobs literature essentially dismisses nuclear power. The U.S. gets about 20 percent of its electricity from nuclear reactors (EIA 2009, Table 1). This energy is essentially carbon free to generate, as is solar and wind, yet it is not acceptable. One reason appears to be its political unpopularity among green jobs proponents' constituents:

- "The Sierra Club opposes the licensing, construction and operation of new nuclear reactors..." (Sierra Club 2009).
- "Dangerous. High-Risk. Meltdown. Catastrophe... See why these words accurately describe nuclear energy and join us as we push for no new nukes" (Greenpeace USA 2009).
- "Clean, renewable energy like solar and wind power currently produces about 2 percent of our electricity nationwide. In contrast, nearly 90 percent of our

electricity still comes from polluting sources of energy like coal and nuclear power” (National Audubon Society and National Wildlife Federation 2008, 10).

- “But among currently deployed commercial technologies, scaling up nuclear power is not an effective course to avert carbon emissions” (World Wildlife Federation 2007, 28).<sup>24</sup>
- “Serious questions of safety, security, waste and proliferation surround the issue of nuclear power. Until these questions are resolved satisfactorily, Environmental Defense cannot support an expansion of nuclear generating capacity” (Environmental Defense Fund 2008).

This rejection of nuclear power is incorporated into the green jobs literature. For example, the UNEP (2008, 89) report states that “nuclear power is not considered an environmentally acceptable alternative to fossil fuels, given unresolved safety, health, and environmental issues with regard to the operations of power plants and the dangerous, long-lived waste products that result.”

The opposition to nuclear power raises questions about the expressed concern of advocates of “green power” to reduce carbon. Nuclear power is proven technology that is moving ahead in the rest of the world. Plants in operation today in the United States were licensed in the 1960s and early 1970s, so represent old technology. Opponents of nuclear power, including the green jobs advocates, talk as if 40-year-old nuclear technology is the norm.

While environmental groups claim to know that nuclear power should be off the table, that view is not the case among experts. The National Research Council (2008) recommends that to help deal with carbon emissions, a concerted effort should be underway to enhance research in nuclear energy and to streamline the process for new plant approval, as they take years to construct.

Experts at MIT issued a major report on greenhouse gases and urged that nuclear power generation be a major option (Deutch *et al.* 2003, 71). The MIT Study concluded that, for the foreseeable future, nuclear power may play an important role in reducing CO<sub>2</sub> emissions in electricity production. The MIT authors, less sure of themselves than the green jobs advocates and environmental groups, state that it is not possible to know, looking decades ahead, which strategy is best. Technical experts do not presume to predict what power-generation technology may exist in the future. A policy that eliminates major options, such as nuclear power, assumes that green jobs advocates know what will exist in decades to come.

## CONCLUSION

The costs of the green jobs programs proposed by various interest groups are staggering. For example, the UNEP (2008, 306) report concludes that “No one knows how much a full-fledged green transition will cost, but needed investment will likely be in the hundreds of billions, and possibly trillions, of dollars.”<sup>25</sup>

The scale of social change that would be imposed is also immense. Green jobs advocates propose dramatic shifts in energy production technologies, building practices, food production, and nearly every other aspect of life. These calls for radical economic changes are wrapped in green packaging. The promise is not only a revolution in our relationship with the environment, but the employment of millions in high paying, satisfying jobs. Unfortunately, the analysis provided in the green jobs literature is deeply flawed, resting on a series of myths about the economy, the environment, and technology.

To attempt to transform modern society on the scale proposed by the green jobs literature is an effort of staggering complexity and scale. To do so based on the wishful thinking and

bad economics embodied in the green jobs literature would be the height of irresponsibility. There is no doubt that significant opportunities abound to develop new energy sources, new industries, and new jobs. A market-based discovery process will do a far better job of developing those energy sources, industries, and jobs than can a series of mandates based on flawed data. The policy debate should be open so we can dispel the myths and focus on facts and analysis.

## NOTES

- 1 This is a shortened version of *Green Jobs Myths* by the same authors. The longer article can be found on SSRN at: [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1358423](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1358423) or by request from PERC ([perc@perc.org](mailto:perc@perc.org)). It contains more extensive documentation and analysis.
- 2 Wood burning, despite its status as a renewable source, can be a major source of particulate matter air pollution (Faust 2007, 2).
- 3 Even the UNEP study conceded that existing green jobs literature is made up of studies using quite different methodologies and assumptions. "One problem with the array of existing studies is that they employ a wide range of methodologies, assumptions, and reporting formats, which makes a direct comparison of their job findings—or any aggregation and extrapolation—very difficult or impossible" (UNEP 2008, 101).
- 4 Bezdek and his associates at Management Information Services are primary authors of the ASES report.
- 5 ASES estimates that there were 6,800 jobs in photovoltaics in 2006 (ASES 2008, 24); Mayors claim 4,000 jobs in that area the same year (Mayors 2008, 8). Regardless of which number may be correct, if an energy source that is now trivial becomes a massive source of energy, of course fabulous percentage growth would occur.
- 6 The Mayors claim solar-based electricity will increase from 700 million kilowatt hours in 2008 to 435 billion kilowatt hours by 2038 (Mayors 2008, 12).

- 7 For example, the Department of Energy estimated that if the United States attempted to achieve 20 percent wind power by 2030 (which would be an incredible undertaking given the slow rate of growth), there would be 500,000 jobs at that time in the wind-related field, of which 150,000 were manufacturing, construction, and maintenance (DOE 2008, 13). That contrasts to the ASES claim that to achieve a goal of 15% renewable energy (wind, solar, etc.) by 2030 would mean 3.1 million jobs by then; a goal of 30% would mean 7.9 million new jobs in that sector of the economy by 2030 (ASES 2007, 7). The ASES numbers are not broken down by energy source, but they are vastly higher than the jobs numbers projected by the DOE, which only looked at wind.
- 8 Even in the absence of rapidly rising energy costs, the amount of energy consumed per ton of U.S. produced steel declined by more than 60 percent from 1980 to 2006, and 29 percent from 1990 to 2006 (American Iron and Steel Institute 2009).
- 9 As CAP notes, \$1 million spent on solar energy currently produces considerably less energy than \$1 million spent on oil, precisely because of the relative inefficiency of alternative energy technologies (CAP 2008, 21).
- 10 This is the approach taken in the three of the four studies that we most closely analyze and which estimate induced employment resulting from green jobs (CAP 2008, 24–26; Mayors 2008, 12–17; and ASES 2007, 30, 39, 46).
- 11 Noll and Zimbalist (1997, 497–98) make this point. They provide an example of incorrect analysis leading to vast overestimate of impact.
- 12 This is known as a “deadweight loss.” Bradford (1986, 135) defines deadweight loss as “the effective waste of purchasing power owing to the distorting effects arising from the effort to avoid tax.” Subsidies, too, have a deadweight loss as people alter their behavior to become eligible for the subsidy.
- 13 Consumer surplus is the difference between the price that consumers are willing and able to pay for a good and the value they place on a good (the highest price they would be willing to pay).

Producer surplus is the difference between the price received by a producer when a good or service is sold and the lowest price the producer would have been willing to accept and still engage in the exchange. The existence of such surpluses is the reason exchange occurs—both parties gain (Miller and Meiners 1986, 583).

- 14 We recognize that some of the green jobs programs are directed at public buildings. No doubt such structures are not subject to the same incentives to conserve energy that exist for privately owned buildings.
- 15 CAP does give some consideration to the issue. It asserts that more jobs will be created by the “green investment” program than if the money is used in other ways. The report notes that if \$100 billion was spent on domestic oil industry jobs, only 542,000 jobs would be created—far fewer than the 935,200 their proposal would generate. Why? The oil industry would spend a lot of money “purchasing machines and supplies” (CAP 2008, 11). Apparently capital equipment is bad, as are the jobs creating the equipment, compared to the more labor-intensive green jobs.
- 16 Full tuition at York College of Pennsylvania in 2008–09 is \$13,680. See <http://ycp.edu/admissions/208.htm>. Full tuition for an in-state student at Penn State in 2008–09 is \$13,014 for a freshman or sophomore and \$14,070 for a junior or senior. See <http://tuition.psu.edu/Rates2008–09/UniversityPark.asp>. We are not arguing that a college education would necessarily be a better use of that much money (despite our self-interest in the growth of the higher-education industry), but the report gives no evidence that their prescription for the expenditure is better than the same amount spent on education or some other area of activity.
- 17 “Bicycles and modern bicycle rickshaws offer a sustainable alternative and create employment in manufacturing and transportation services” (UNEP 2008, 14). The romantic view of happy workers pulling or pedaling rickshaws for a joyful life in service to others is provided by wealthy UN employees who may ride in them when visiting poor countries to dispense wisdom.
- 18 Our longer paper also discusses biofuels.

- 19 “Railways are more environment-friendly and labor intensive than the car industry” (UNEP 2008, 13); “Public transit is less energy and carbon-intensive than automobiles” (UNEP 2008, 164).
- 20 (EIA 2008a, Table 17) The report provides the Department of Energy’s best estimate of future supply and demand for the energy sector, based on its judgments about economic growth, labor supply, technological change, and so forth. It “generally assumes that current laws and regulations affecting the energy sector remain unchanged” throughout the projection period (2030 for this document) (EIA 2009, 2).
- 21 While we have not found definitive work on this, there appears to be reasons to doubt the economic or environmental value of wind energy in Germany and Denmark, leaders in that development. In Germany, “green” sources produce about 15 percent of electricity, but CO<sub>2</sub> has not declined and the cost has been very high (Waldermann 2009).
- 22 The Cape Wind farm has some regulatory approvals after years of planning. Are all such permit requirements to be swept aside from now on? Cape Wind was proposed in 01; by early 09 it only had some permits; but was not finished with the permit process. Cape Wind: America’s First Wind Farm on Nantucket Sound <http://www.capewind.org/> (last visited Feb. 21, 2009).
- 23 As with wind energy, solar suffers from local rejection. Senator Dianne Feinstein (D-CA) wants to put huge chunks of the California desert off limits to solar or wind projects (Simon 2009).
- 24 The report calls for a “phase-out of nuclear power,”... “due to its costs, radiotoxic emissions, safety, and proliferation impacts,” (World Wildlife Federation 2007, 1, 8).
- 25 The head of the UNEP advocates that we begin with “investments” of \$750 billion in a “Green New Deal.” This sum is seen as so small that “It would be almost, if not totally, unnoticed by the consumer” (Doyle 2009).



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