A RATIONAL LOOK AT GREEN JOBS

AND THE IMPLICATIONS FOR THE U.S. POWER SECTOR

By Kimball Rasmussen | President and CEO, Deseret Power | September 2009

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Believe nothing, no matter where you read it, or who said it, no matter if I have said it, unless it agrees with your own reason and your own common sense.

-Buddha

The millions of green jobs promised by proponents of the American Clean Energy and Security Act are unsupportable based on models developed by the Department of Energy and the National Renewable Energy Laboratory

Recent public statements promote the American Clean Energy and Security Act (ACES) as a way to create millions of green jobs. But the esoteric definition of green jobs may deliver employment far below what these statements lead average Americans to expect. The electric sector is likely to provide less than two or three percent of these projections in terms of direct employment. Furthermore, the net jobs creation is even less if one considers the dampening affect on the economy of higher energy costs and jobs displaced by building wind projects rather than other types of power projects. If net offsets are taken into account, an aggressive build-out of renewable energy may actually result in a decrease of jobs within the economy.

On June 26th, 2009, House Speaker Nancy Pelosi addressed the House floor on the American Clean Energy and Security Act. She said, "No matter how long this Congress wants to talk about it, we cannot hold back the future. And so, in order to move on with the future, I want to … urge my colleagues to vote for this important legislation. And when you do, just remember these four words for what this legislation means: jobs, jobs, jobs, and jobs. Let's vote for jobs."[1]

"Make no mistake, this is a jobs bill," President Obama said, arguing that the bill would "create incentives to spark a clean energy economy."[2]

The American Clean Energy and Security Act (ACES), also known as the Waxman-Markey bill, narrowly passed in the House of Representatives 219 to 212, with the vote mostly following party lines (eight republicans crossed over and voted for the bill, while forty-four democrats voted against the bill). The action now moves to the Senate.

There is much rhetoric surrounding the notion that we can expect a retooled green economy to result in millions of new jobs. Indeed, the 2008 presidential campaign held promises of "… five million new [green] jobs …" which would be driven by "… an economy-wide cap-and-trade program to reduce greenhouse gas emissions 80 percent by 2050" and also a program to "ensure 10 percent of our electricity comes from renewable sources by 2012, and 25 percent by 2025."[3] The electric sector would appear to be a fundamental component of new jobs creation.

[1] Office of the Speaker of the House, "Pelosi: 'Remember These Four Words for What This Legislation Means: Jobs, Jobs, Jobs, and Jobs," *PR Newswire*, http://news.prnewswire.com.

[2] Barack Obama, ABC News report by Jake Tapper, *President Obama on Energy Bill: "Make No Mistake, This Is a Jobs Bill"*, ABC, June 25, 2009.

[3] Barack Obama and Joe Biden, "New Energy for America," *Organizing for America*, www.barackobama.com/pdf/factsheet_energy_speech_080308.pdf.

Analysis is Job One

So what is the basis, or hard calculation, to support the role of the electric sector as a major component in the creation of millions of new green jobs? For answers, we turn to the Department of Energy (DOE) and the National Renewable Energy Laboratory (NREL). These two organizations conducted a special study—called the 20 by 30 study—to determine the technical feasibility of meeting 20 percent of the U.S. electrical needs through the use of wind energy by the year 2030.[4] By comparison, the United States currently produces less than one percent of its electric energy with wind. The 20 by 30 study was a careful analysis conducted by more than 100 individuals from government, industry, utilities, and non-governmental organizations (NGOs). These groups analyzed wind's potential contributions to energy security, economic prosperity and environmental sustainability. The study took two years to complete. At the heart of the study is the Jobs and Economic Development Impact model, or JEDI.

Conclusions from the 20 by 30 study show the creation of 6.2 million new green jobs from the construction of wind turbines—apparently similar to, and consistent with, the five million jobs called for by the Obama campaign. On the surface, this would seem to validate the exciting prospect of a new green economy, flush with jobs, but let's take a closer look.

To understand the JEDI model, we must first define its parameters. JEDI modelers conducted extensive interviews with power generation project developers, state taxing authorities, and others in the electric power industry to determine appropriate basic values. These JEDI interviews included assessments of the economic impact of wind development as well as the economic impacts of coal- and natural-gas-fired electric generation projects.

[4] U.S. Department of Energy, *Wind Powering America*, www.windpoweringamerica.gov/economics_jedi.asp and www.20percentwind.org.

The JEDI model delineates jobs into three categories:

- **Direct impacts** are the on-site or immediate effects of spending money for a new wind project. In the JEDI model, the construction phase includes the on-site jobs of the contractors and crews hired to construct the plant as well as their managers and staffs. Direct impacts include personnel that are hired to operate and maintain the wind turbines, along with any support staffing, accounting, legal counsel, etc. Direct impacts also include jobs at the manufacturing plants that build the turbines as well as the jobs at the factories that produce the towers and blades. Note that demand of manufacturers and other goods and service suppliers will typically fall into the category of indirect effects, but for some reason, are included in the JEDI model as direct impacts.

- **Indirect impacts** refer to the increase in economic activity that occurs, for example, when a contractor, vendor, or manufacturer receives payment for goods or services and, in turn, is able to pay others who support their business. This includes the banker who finances the contractor and the accountant who keeps the contractor's books, as well as the steel mills, electrical part manufacturers, and suppliers of other necessary materials and services.

- **Induced impacts** are the changes in wealth that result from spending by people directly and indirectly employed by the project. For example, when plant workers and other local workers receive income from expenditures related to the plant, they in turn purchase food, clothing, and other goods and services from local businesses.

JEDI's indirect and induced impacts earn the green job label and are included in the JEDI jobs total. In fact, these **indirect and induced jobs comprise more than two-thirds of all green jobs**. These jobs are questionably green, though, because they could come from building fossil-fueled power generation facilities as well, and, in fact, the companies

and workers may only be vaguely aware of their contributions to the green economy. For instance, workers at a wind project might buy their boots and tools from the local hardware store. JEDI counts the hardware sales clerk as green. The cow that supplied the leather for the worker's boots becomes a green cow and the boot manufacturer is now making green boots. A trucker, with his diesel emissions, that delivers a blade for a wind tower is part of the green economy. The same trucker making a delivery to a coal-fired unit would revert to the grey economy. A steel factory that provides the raw material for a wind farm with all of its blast furnaces and emissions is now green. The toolmaker is likewise now part of the green movement, albeit unwittingly. As the wind farm workers stop at a local burger stand for lunch, the teenage hamburger flippers are induced green workers. Even the meat patties fit into the green supply chain, all the way back to the cows that provide the beef.

The line between indirect and induced impacts can be fuzzy. Generally, the induced impacts are wealth related, and JEDI runs on a premise that the more one spends, the more jobs one creates.

JEDI in Action

The JEDI model suggests a potential 6.2 million construction-related jobs from wind turbines to be installed as a result of the proposed legislation. This forecast, however, does not reflect the number of long-term, full-time jobs created; instead, it's a cumulative count of full-time equivalent workers aggregated for the 24 years in the study period (2007 through 2030). This questionable method of double counting misleads one to think that 6.2 million jobs equates with 6.2 million people that are employed at a time. This is far from the truth. For example, if an individual works for project "A" in Minnesota in 2007, and then project "B" in North Dakota in 2008, and so forth through 2030, the model counts that single worker 24 times.

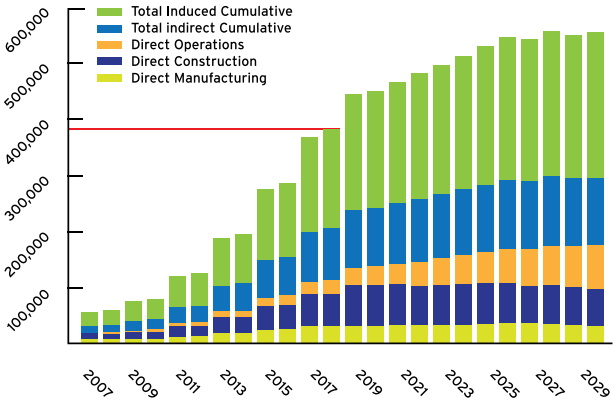
A better indicator of actual employment gains would be the average number of construction-related jobs in the economy at any point in time. According to the 20 by 30 study, this turns out to be approximately one quarter of a million jobs. To be exact, in an average year, only 258,755 construction-related jobs are forecasted.[5] The 6.2 million jobs never exist simultaneously. Of the 258,755 jobs, only 28 percent of these are direct green jobs, with the balance coming from indirect and induced impacts.

In an average year, only 258,755 construction-related jobs are forecasted.

In addition to the construction jobs, we must add the average number of operations jobs—a projected total of 138,168 (of which 35 percent are direct and the other 65 percent are indirect or induced).[6] Therefore, the total average number of jobs seen in the economy—including direct, indirect, and induced—is estimated at 396,923 jobs in a given year (258,755 construction jobs plus 138,168 operations jobs). The 20 by 30 study shows that the U.S. could eventually achieve that level in about one decade.

Jobs per year from direct, indirect, and induced categories

In the last ten years of the scenario, the wind industry could support 500,000 jobs, including over 150,000 direct jobs.



SOURCE: "20% Wind Scenario: Wind Energy Provides 20% of U.S. Electricity Needs by 2030."

[5] U.S. Department of Energy, *"20% Wind Energy by 2030,"* July 2008, 205.

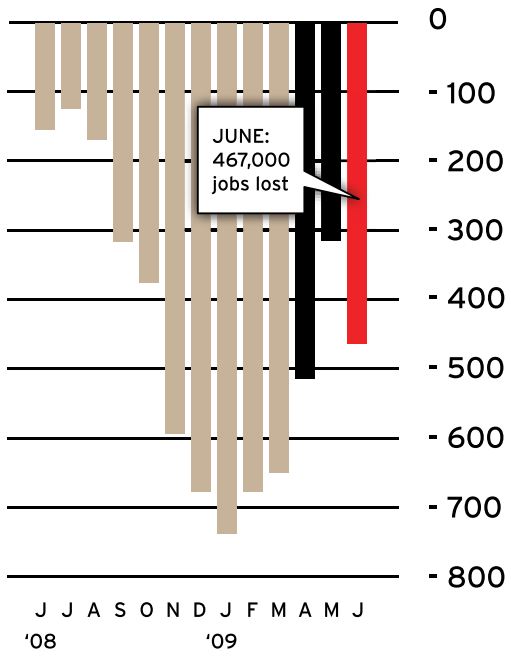
[6] Ibid.

The 20 by 30 average jobs gain—around 400,000 jobs in about ten years (including direct, indirect, and induced impacts)—is less than one-tenth the claim of five million new jobs. If we narrow this down to only the direct job impacts, then an average of 121,417 jobs are created over the 24-year study horizon.

This gain in jobs is so small that it can hardly be discerned in the background of the overall economy. In fact, the direct gain in green jobs, on average, for the 24-year study horizon, is approximately equal to the current rate of job loss in the U.S. economy per week.

More Jobs Lost

Monthly change in non-farm employment, in thousands (seasonally adjusted)



SOURCE: Bureau of Labor Statistics
THE WASHINGTON POST

During the month of June 2009, the number of long-term unemployed individuals (those jobless for 27 weeks or more) increased by 433,000. In June 2009, nonfarm payroll employment declined by 467,000 workers. The U.S. economy lost more jobs in one month than JEDI says we might gain in ten years through the retooled green policy. As the nation's unemployment rate neared 10 percent, a record 34.4 million people—or one in nine Americans—participated in food stamps in May 2009. That's an increase of 650,000 people from the previous month and an increase of 6 million from the same time last year. The promise of green jobs over the next one or two decades will not offset the damage in the economy, nor the rise in food stamp recipients, in just one month. Also, keep in mind that JEDI job gains do not include negative offsets in other industries, or the economic damage caused by cap-and-trade legislation.

Our economy lost more jobs in one month than the JEDI model says we might gain in ten years through the retooled green policy.

Caveats of the 20 by 30 Study

The 20 by 30 study warns of certain caveats or admitted shortcomings in its use of the JEDI model. Among these are (1) the model is static, (2) the model is based on gross, not net, jobs counting, (3) the model does not account for negative impacts on the economy resulting from power price increases, and (4) the internals of the model assume, with impunity, that the more one spends, the more jobs one creates.

1) The Static Model

The first shortcoming of the JEDI model is that it is considered static. As such, it relies on inter-industry relationships and personal consumption patterns at the time of analysis. The model assumes no electric price elasticity. In other words, the model assumes that industry and consumer electric demand will not react to price increases.

The model also assumes a single class of wind potential, or that all wind projects are created equal. It makes no attempt to account for lack of electric transmission to access the best wind sites. The model assumes adequate local resources and production

and service capabilities are readily available to meet demand. For new fossil-fueled power plants, the model does not automatically take into account improvements in industry productivity over time.

Coal-fired Power More Job Intensive

It is interesting to note that the JEDI Coal study shows that a 100 MW coal-fired power plant will result in only 10 direct onsite plant labor positions. This is a highly suspect conclusion since base-loaded coal units operate around the clock. A calendar week consists of 168 hours, and a work week consists of 40 hours, requiring at least five people to staff a single position to cover the day shifts, swing shifts, and graveyard shifts, as well as seven-day rotating schedules and vacations. Therefore, it is virtually impossible to expect that a power plant could run around-the-clock with a total of only ten employees, or two individuals on-site at any give time.

Based on an analysis of Energy Information Administration data, the average coal-fired power plant—per megawatt of peak capacity—employs 0.18 people in operations and maintenance on a permanent basis.[7] So under this assumption, a 1000 MW coal plant will employ 180 people. This is 80 percent higher than the JEDI estimate of 0.10 people per megawatt. In addition, for every power plant worker in the U.S. there are 1.9 people employed in mining and transportation of the fuel.[8] This boosts the direct job count for a coal-fired resource to 3.4 times the number estimated by JEDI. So the JEDI Coal versus 20 by 30 wind comparison, if anything, dramatically understates the job impacts in the coal sector.

[7] Virinder Singh & Jeffrey Fehrs, *The Work That Goes Into Renewable Energy,* Renewable Energy Policy Project, 2001, 26.

[8] Labor Force Statistics from the Current Population Survey, Bureau of Labor Statistics website, U.S. Department of Labor, accessed July 2008.

2) Gross Jobs Versus Net Jobs

The 20 by 30 study openly admits that it fails to offset its gross jobs claim by the lost net jobs (notably in the fossil-fueled sector). In Appendix C to the 20 by 30 study, "Wind Related Jobs and Economic Development," JEDI modelers state:

> *"Ramping up wind capacity and electricity output from wind would displace jobs and economic activity elsewhere. However, identifying such transfers accurately would be very difficult. Therefore, the impacts cited here do not constitute impacts to the U.S. economy overall, but are specific to the wind industry and related industries."*

Somehow JEDI can define the jobs creation side of the algorithm, including the complications of indirect and induced impacts, but JEDI modelers choose to ignore the job loss aspect because "identifying such transfers accurately would be very difficult."

The 20 by 30 study calls for the construction of 293,000 MW of wind turbines by 2030. This is more than a twenty-fold increase over the installed capacity that existed at the start of the study horizon (2007). We have already seen that JEDI forecasts an average of less than 400,000 jobs in the economy, resulting from this enormous build-out of new wind turbines. So, in spite of the fact that the modelers find it "very difficult" to quantify the net offset of jobs, let us, nonetheless, undertake this task using the JEDI Coal model.

Apples to Apples

Using the default parameters of the 20 by 30 study for capital investment, capacity factor, operations and maintenance expense, fuel cost, and so forth, we built a coal-equivalent model as a surrogate for the 20 by 30 wind build-out. The coal model incorporates exactly enough coal-fired electric generating stations to offset the annual build schedule and energy output of the 20 by 30 wind scenario. The jobs impact was developed using the JEDI Coal study. The results are eye opening:

- **The capital required on a net-present-value basis in the coal scenario is $105 billion less than wind.** This capital can therefore be deployed elsewhere in the economy to perform research and development or any variety of activities. No jobs were claimed on the coal side of the ledger for the capital savings.
- **The all-in operating cost of electric energy from the coal scenario is 40 percent less expensive than the all-in energy cost of the 20 by 30 wind scenario.** Coal enjoys lower cost per kilowatt hour of energy output because it is dispatched to operate on a seven-by-twenty-four schedule, and does so with high predictability and reliability, while wind produces intermittently, with much less energy per unit of installed nameplate capacity. Thus, the fixed costs of wind are spread over a lower energy output base, resulting in higher costs per kilowatt hour than the coal counterpart.
- **The coal scenario actually results in 50 percent more jobs than the wind scenario.** In other words, every new wind-related job comes at the expense of 1.5 coal-related jobs. The coal jobs impact is driven in large part due to the fact that coal-fired generating plants have operating and maintenance requirements that produce more jobs than wind. The wind farms tend to run with very little labor, once built, and the construction cycle for a wind farm—according to the 20 by 30 default parameter—is only one year, while the coal plants require four years to build. Coal-fired plants are more complex, therefore making them more labor intensive. Note that we used the JEDI default value of 0.1 coal jobs per megawatt. If we had used the industry average of 0.18 coal jobs per megawatt, then the coal scenario would actually result in 2.7 coal jobs lost for every wind job gained.

3) Negative Impacts of Power Price Changes

The 20 by 30 wind study overstates the green job potential in yet another way: it does not account for the loss of jobs in the general economy due to inflation of electric prices and general inflationary pressures caused by a large dependence on relatively more expensive energy, namely wind. Wind turbines typically do not compete in the market with conventional sources of electric generation unless government intervention makes the wind energy cheaper through tax incentives and subsidies and/or makes the coal-fired electricity more expensive by heavily taxing or curtailing the output, such as with a carbon tax. Note that in the scenario above, the coal-fired energy, prior to enacting a carbon tax, is 40 percent less expensive per kilowatt-hour than comparable wind-powered electricity.

Electric price increases will force businesses and consumers to cut back. This will result in a dampening of the economy, a loss of jobs, and a general outmigration of industry to China and elsewhere. Is there a way to get a sense of the cost pressure that might result from 20 by 30? The JEDI default cost of wind turbines is a bit more than $2 million per MW. Hence, the entire 293,000 MW will add about $619 billion in debt (and/or equity requirements) to utility balance sheets. In exchange for this investment, we might expect about one trillion kilowatt-hours of energy production by 2030.

By comparison, the book value of all existing coal-fired electricity in the U.S. is about $350 billion, which currently provides about two trillion kilowatt-hours of electric energy. The upward cost pressure is obvious—20 by 30 will add 50 percent more energy than we currently get from coal (one trillion new wind kWh compared to two trillion existing coal kWh)—but this will come at the cost of nearly tripling the current investment of our existing base of coal-fired electric generation (the current book value of $350 billion grows by $619 billion in wind investments to a total of $969 billion). As utility balance sheets soar, with only modest gains in kilowatt-hour sales, this will inevitably lead to higher electric prices to the end consumer.

4) The More One Spends, the More Jobs One Creates

The JEDI model assumes that expensive projects result in more jobs in the economy. For example,

according to JEDI Wind, a 100 MW, $2,022/kW wind farm results in 545 construction jobs and 27 operations jobs. If the same wind farm were priced at $2,999/kW—note that nothing has changed except the higher cost of the wind farm—this pricier wind farm (according to JEDI Wind) would result in 774 construction jobs and 29 operations jobs. So the hypothetical increase of 48 percent more capital results in 40 percent more jobs, even though the project itself is not more productive—it is identical in every way except for the installed cost. The job gains from deploying more capital are almost entirely indirect and induced. In fact, according to JEDI Wind, in both scenarios (whether we spend $2,022 or $2,999 per kilowatt of wind turbine capacity) there are exactly 6 people that actually operate the wind farm. The 545 to 774 construction jobs are transient in nature—expecting to last only one year. In effect, JEDI treats energy production facilities like a stimulus package where the more you spend, the more jobs you create, but the stimulus benefit is short lived, while the debt is long term. Yet, the "fiddler" must be paid. Utility balance sheets will swell, electric prices will increase, and debts will mount. Industry, manufacturers, and consumers will ultimately pay the tab. Based on the negative economic impacts, this is not a sensible means of creating jobs.

Key Findings

The promise of millions of green jobs claimed by proponents of the American Clean Energy Act is not supported by the JEDI model. Furthermore, if the indirect and induced impacts are excluded, the gross number of direct jobs is only 121,417, or 2.4 percent of the five million jobs promised. This level of direct green job creation—121,417 jobs—will not be achieved for another decade; yet we have recently lost more than 400,000 jobs each month based on current economic conditions.

JEDI also does not account for net job losses to the more traditional sectors of the economy. When wind jobs are compared head-to-head with coal-fired electric alternatives, the gross job gains in wind are more than offset by net job losses in coal. Every new wind-related job comes at the cost of 1.5 to 2.7 coal-related jobs.

In addition to the above, JEDI also fails to show the dampening effect on the economy of significantly higher power costs associated with wind power, as well as carbon tax programs. High energy prices catalyzed the breakdown in the financial markets that resulted in the current economic recession. It is quite clear that the country depends on low-cost abundant energy to power its economy.

With all factors considered, a green mandate in the electric sector is not likely to provide a major source of meeting the goal of "jobs, jobs, jobs, and jobs."

Specific Findings for Jobs at a Regional Power Producer—Deseret Power

Deseret Power is a vertically integrated generation and transmission cooperative. Deseret owns and operates the entire production supply chain of electrical generation and transmission including coal mining, coal washing and preparation, transportation, conversion to electricity at a coal-fired steam electric generating station (as well as shared ownership at other sites), and transmission to load centers. Deseret's member-owners (electric cooperatives) are then responsible to distribute the electricity to individual retail meters.

Deseret's primary power resources are the Bonanza and Hunter 2 Power Plants, both located in Utah.

To gain a Deseret-specific perspective, we used the JEDI model to forecast the impacts of developing enough new wind energy to exactly serve as a total replacement of Deseret's Bonanza and Hunter units, with the associated shutdown of the Deserado Mine. We then modeled the loss of employees in the coal-fired portion of the cooperative and added back new employees to operate the wind power. The switch to wind showed a startling look at how the company and the surrounding employment picture would look after going completely green.

Findings

The Deseret build-out of wind turbines resulted in 59 new, permanent, green jobs. But these came at the loss of 160 mining jobs and 100 power plant jobs, or more than four traditional jobs lost for every green job gained. In addition, the Bonanza unit equivalent wind farm will, according to JEDI Wind, come with a price tag of nearly $1.9 billion. The Hunter unit equivalent wind farm has an installed cost of over $0.4 billion. Combined, these two projects would add $2.3 billion of new debt to Deseret, without adding one additional kilowatt hour of energy output above Deseret's current plant capacity. This staggering debt would increase Deseret's net utility plant book value by a factor of more than ten.

In addition, the combined wind farms (as shown by JEDI Wind) would add more than $383 million of annual operation and maintenance (O&M) expenses, in addition to debt service. Deseret's current coal-fired O&M of $222 million would be reduced to approximately $104 million to cover continuing costs, such as transmission and substation expense, communications, protective relaying expenses, and continuing general and administrative expenses reflecting the employee base discussed at the beginning of this section. Hence, Deseret's new total O&M after installing the wind farms would be $487 million, or more than double the current O&M.

The bottom line: Deseret's debt service would swell by a factor of ten, and it's O&M would more than double. This also spells large trouble for the electricity consumer in terms of huge upward pressure on rates.

It is also interesting to note that this Deseret-specific result is materially consistent with what might be expected nationally.

These results were presented in depth to a joint House and Senate Western Caucus on Energy Issues, July 30, 2009.

Eyes Wide Open

As our nation embarks on the path of a green policy, we should expect—even demand—an honest assessment and portrayal of the consequences, both good and bad.

Likewise, as we consider how best to transition to a green energy economy, we must do so as a means to improve the environment. But we should simultaneously recognize that, in the electric sector, the environmental benefits will come at a price: a net job loss in the electric sector, an increase in electric rates, and an increase in capital requirements. As we understand the cost of improving the environment, with our eyes wide open, we can strike an informed balance and adopt a thoughtful energy policy without the pretense of "jobs, jobs, jobs, and jobs."

Common Sense

This paper was prefaced by Buddha's famous quote: "Believe nothing, no matter where you read it, or who said it, no matter if I have said it, unless it agrees with your own reason and your own common sense." Common sense suggests that we set aside promises if they seem too good to be true, such as more jobs and greater economic prosperity brought on by investments in costlier, and less-reliable means of energy production. In this discussion, our common sense is informed by a few simple, undisputed facts:

- Wind energy is more expensive than conventional fossil-fueled energy, as evidenced by the DOE's own modeling.
- Wind energy is an intermittent resource, and is inherently less reliable and harder to predict and manage than fossil-fueled energy.
- Wind energy is relatively simple to build and has less need for operator oversight; therefore, it creates fewer permanent operating jobs than comparatively more complex fossil-fueled projects.

There is nothing wrong with investing in wind, solar, geothermal, and other so-called alternative energies. The notion of responsible subsidies to promote further development of these alternatives is supportable—but we should pursue development in an economically sustainable and measured manner. What is objectionable are deceptive and misleading gimmicks—including promising a "green jobs bonanza," which effectively ignores the net loss in jobs that will occur if we move too precipitously toward more expensive and less stable technologies.

Common sense dictates that the balance we strike must be a wise one, not one-sided and not based on inaccurate, incomplete analyses. There is no justification for panic, overstatement, and hyperbole in this policy decision. Let's fairly and honestly face the truth: promoting a cleaner environment does and will require trade-offs between net costs and benefits. We owe it to ourselves and the generations to follow to recognize and weigh all the costs of each of the options available to us and then responsibly pursue a path that fairly represents the trade-offs between costs and benefits.