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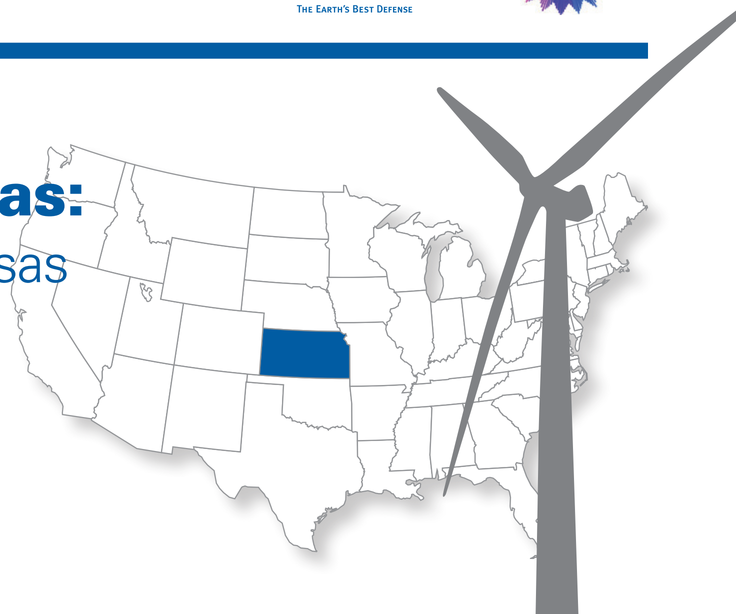
The Renewable Portfolio Standard Works for Kansas:

Revealing the Distortion in the Kansas Beacon Hill Report



AUTHORS
Scott W. White
Kansas Energy Information Network

Cai Steger
Kimi Narita
Natural Resources Defense Council

In 2009, Kansas legislators, in a heavily bipartisan effort, approved the Renewable Energy Standards Act, creating a renewable portfolio standard (RPS), which required many of the state's utilities to generate or purchase increasing amounts of renewable energy over the next decade.[1] Since that time, the RPS has helped to create jobs and grow Kansas's economy. Nonetheless, the RPS is now under fire from fossil-fuel interests arguing that the Kansas RPS drives up electricity prices, and therefore acts as a drag on a state's economy. [2] This joint review by the Natural Resources Defense Council and the Kansas Energy Information Network shows that those claims are based on false assumptions and a flawed methodology.

It has been more than three years since the passage of the RPS, and all six Kansas utilities affected by it are on track to achieve the standard's targets. Three of the six have already met the 20 percent threshold, seven years ahead of schedule.[3] Kansas has some of the best wind resources in the nation, and the 19 wind projects currently in operation are creating thousands of jobs and providing millions of dollars to local economies, particularly in Western Kansas.[4]

However, these economic benefits are being questioned in a report titled "The Economic Impact of the Kansas Renewable Portfolio Standard," published by the Beacon Hill Institute (BHI) and the Kansas Policy Institute, which claims that the RPS will hurt the Kansas economy. (Beacon Hill has co-published reports in 12 other states arguing the same thing.) The Kansas Policy Institute and the Beacon Hill Institute have encouraged the Kansas legislature to use their report as a basis for rolling back the renewable portfolio standard in Kansas.[5]

But BHI's study methodology is severely flawed and leads to inaccurate results. It escalates the expected cost for renewable power above mainstream forecasts, while maintaining fossil-fuel power costs at or below those forecasts. This inflated difference is then converted into an increase in customer electricity bills that escalates over time based on the individual state's RPS targets. BHI argues that these rising electricity costs constitute a state economy-wide "sales tax," which allows BHI to use its non-transparent and proprietary economic model to quantify the economic effects of this new tax. BHI claims that the effects include job losses as well as income and investment reductions in an individual state.

The Beacon Hill study is at best a one-sided methodology, driven by the selective picking of outlier studies and data to argue for an unrealistically high cost of renewables and low cost of fossil fuels, while ignoring all elements that could bring the cost of renewables down or fossil prices up. Separately, the reports ignore any benefits that are generated by more clean energy (such as lower electricity prices, cleaner air, local job creation, lease payments to landowners, and increased local tax revenues).

Following is a collection of the errors found in BHI's methodology, which leads to a preordained and erroneous conclusion that the Kansas RPS will harm the state economy and its citizens. This review is based on patterns of recurring results that we observed from NRDC and KEIN's review of its 13 studies published to date, including the Kansas study.

1. Inflates the cost of renewable energy

- Overstates the costs of renewables based on projected increases in land costs and decreases in availability of wind resources
- Reduces industry-standard capacity factors
- Exaggerates costs of addressing renewable energy's variability
- Overstates costs of new transmission for wind power

2. Reduces the cost of competing fossil fuels

- Ignores historic, current, and projected volatility in fossil-fuel prices and potential impacts from policy
- Reduces fossil-fuel costs due to renewable variability

3. Eliminates any methods and policies that could mitigate possible cost impacts from an RPS

- Disregards all cost-containment mechanisms that help control energy costs for customers
- Discounts the value of energy efficiency, and the energy bill savings it provides, in keeping prices low
- Ignores current real-world evidence that could be integrated into these proposed future scenarios

4. Models questionably higher electricity costs as a sales tax on the economy

- Uses an unrealistic and simplified methodology to convert the difference in renewable and fossil costs into higher electricity costs
- Analyzes the resulting costs as an additional general sales tax across a state's economy

5. Disregards net economic benefits from renewable energy and energy efficiency to further ensure negative impacts

- Ignores the positive impact from the creation of new jobs, benefits to local communities, consumer savings, and cleaning up the environment

BREAKING DOWN THE ERRORS IN BHI'S FINDINGS

1. BHI inflates the cost of renewable energy

BHI uses different tactics to wrongly predict that the cost of renewable technologies will be much higher than Energy Information Administration (EIA) forecasts. The EIA is a nonpartisan agency, considered by many experts to be the benchmark for data on energy in the United States, and is, in fact, used selectively by BHI in other sections of its reports.

BHI argues that EIA data on renewables are "excessively optimistic," with no sourcing to back up its claim, and that EIA projections should be considered at the low end of the range of future cost estimates. As a result, BHI takes EIA cost data on renewables and inflates it in a number of ways. Particularly significant, BHI's methodology drives up the cost of wind energy in a number of ways:

BHI overstates the cost of renewables based on increases in land costs and decreases in availability of wind resources. Forecasting future wind prices (how much utilities will pay for wind power, for example) is complex, but there is a strong expectation from technical experts that technological innovation and economies of scale will lower the cost of developing wind in the long run. Decades of experience and learning-curve theory demonstrate that wind and solar power costs are falling; a 40 percent reduction in operating costs for wind in the past four years, and an 80 percent drop for solar modules in the last decade bear this out.[6] EIA analysis has demonstrated this for wind, and the agency forecasts a continued reduction in the cost of various renewable technologies over the coming years.[7]

BHI, however, erroneously assumes that the project costs of wind energy will increase in the long run. They develop this theory by making two predictions: 1) that the land the wind turbines are installed on will get more expensive for wind projects, and 2) that new wind resources will be sited in areas with reduced wind resources. To address each briefly:

- **Land Cost:** Based on industry estimates, the cost of land acquisition for a wind site (primarily through leasing) is about 1-2 percent of total wind project cost, which is amortized over 20 years. A massive increase in land costs would have very limited impact on pricing. Additionally, with thousands of gigawatts (GW) of potential wind resources (see next section), including tens to hundreds in the individual states studied by BHI, land will be on the lower end of cost concerns for wind projects.
- **Availability of Wind Resources:** EIA agrees with BHI that the best wind sites have already been utilized.[8] This is not necessarily true in Kansas, as many excellent wind sites have not yet been built due to transmission constraints that are currently being addressed. First, more

innovative turbines are constantly being developed that are capable of running more efficiently on lower wind speeds and using less wind-intensive lands. According to Lawrence Berkeley National Laboratory, "The amount of land area meeting or exceeding certain capacity factor and LCOE [Levelized Cost of Electricity] thresholds has substantially increased as a result of…technology improvements."[9] Second, offshore wind is also becoming more likely, both off the East Coast and in the Great Lakes, and even possibly off the West Coast, as deep water technology matures. Third, some of the best potential onshore wind resources in the country have not yet been tapped, including in the Midwest and Rocky Mountain states—awaiting connection to a backlogged and antiquated transmission system. This has been particularly true in Kansas, which has many sites remaining that are comparable to the best sites already developed. The recently completed Spearville-to-Axtell, Neb. (also known as the Kansas KETA project)[10] line is already allowing more power to be moved out of Western Kansas, and when the V-Plan line from Spearville to Medicine Lodge to Wichita is complete in 2014, even more wind power will be able to be moved from western Kansas to eastern markets.[11] Fourth, the National Renewable Energy Laboratory (NREL) calculated that we still have more than 600 GW of economic wind resources in the United States (at a levelized cost of $60 to $100 per MWh which would make it competitive with other new energy resources over the long run), with thousands of gigawatts more of technical potential.[12] Additionally, each of the states modeled by BHI has excellent on- or offshore wind resources as per updated NREL maps.[13]

All of this means that, while it is quite likely that land could become more expensive and that the best wind resources have been used up, what matters is the *scale of impact* of these developments. BHI makes no attempt to provide empirical data to their claims, while a number of reputable experts and studies (some of which are highlighted above) demonstrate clearly that this rationale is a dubious argument to base cost increases on.

BHI reduces industry-standard capacity factors: BHI argues that the standard capacity factors (the amount of time a wind turbine is generating power), which have been quantified by decades of experience and a rich technical literature, are wrong, based on two studies, only one of which was published in a peer-reviewed journal.[14] Lowering the capacity factors allows BHI to reduce the estimates of power generated by wind turbines, and further increase the cost. In fact, according to NREL, wind capacity factors have improved by a third in the last decade, and now stand at 33 percent. Kansas's capacity factors are greater than 37 percent for all projects with at least one full year of generation data through November 2012, according to data from the Energy Information Administration.[15]

BHI exaggerates costs of addressing renewable variability. Managing the variability of renewable power is essentially the challenge of matching a more unpredictable resource like renewable energy to the needs of the electricity grid. BHI makes aggressive assumptions that call for excessive amounts of natural gas to balance out the variability of wind and solar power.

It is well justified to assume that with increasing levels of variable renewable power like wind and solar, additional dispatchable capacity (i.e., through measures such as demand curtailment and variably controlled power units that can be easily ramped up or down depending on power demand) will be needed to meet resource adequacy requirements for a given electric grid.[16] However, BHI's approach to this issue (as described in its Michigan study, which is assumed to carry forward into its other studies) is to generate a simple equation to determine the need for more backup power for wind, that takes the difference in the (lowered) capacity factor of wind and compares it to the higher capacity factor of baseload fossil fuels. In doing so, it appears to arrive at a calculation that for every 1 MWh of renewables, one-third of a MWh of natural gas is needed as backup. This arbitrary approach is opposite to what is needed on a state-by-state basis, and likely leads to an overstatement of backup generation required. It ignores the fact that we have a variety of means for addressing variability and firming power, including greater energy efficiency, more demand-response, expansion of balancing authorities, improved transmission and distribution infrastructure efficiency, and in the future, energy storage.

Further, utilities have dealt with electric system variability (e.g., unplanned generator outages, extreme weather, fluctuating customer demand, operator error) for more than 125 years—and been able to keep our lights on more than 99.9 percent of time.[17] In addition to utilities, broader state and regional planning authorities and system operators (called ISO's) are addressing these challenges and framing sensible, cost-effective policies to integrate these variable output technologies.

In fact, it is not even clear how much fossil-fuel variability will occur at higher penetration levels of renewable energy. The amount of fossil reserves necessary will largely depend on the geographic and technological diversity of the renewable resources—as well as the cost of non-fossil fuel back-up (e.g., hydroelectric power, pumped hydro, demand-side management, molten salt, and eventually electric batteries).

BHI overstates the costs of new transmission for wind power. Finally, BHI escalates the cost of renewable energy by applying a uniform transmission "adder" of $60/Megawatthour (MWh) from the start of the RPS. Allocating incremental new transmission costs across all energy technologies is generally appropriate in a modeling exercise. However, the first years of an RPS will have low renewable energy targets, which can likely be met with existing transmission, meaning that it is inaccurate to provide such a high transmission adder for the first several gigawatts of new renewable capacity. And because the electric system would need transmission upgrades and additions in any case, much of the investment in transmission would happen anyway; the question is not about more or less transmission but rather which transmission projects are prioritized.

2. BHI reduces the cost of competing fossil fuels

Having escalated the cost of renewables much higher than other technical approaches, BHI reduces the forecast cost of fossil energy technologies. It does so through a couple of approaches.

BHI ignores historic, current, and projected volatility in fossil fuel prices and potential impacts from policy. BHI ignores the considerable historic volatility of fossil power pricing in the United States, and the likelihood that natural gas and coal prices could rise by 2025, and assumes a static price for coal and natural gas over the next 20 years. While this is at least plausible on some levels, it is unlikely. Gas prices have hit all-time lows, and have upward pressure from several directions. Recent prices were below extraction costs for many drillers (and motivated by expectation of higher prices). Coal-to-natural gas switching is increasing demand pressure on natural gas. Increasing demand from emerging countries and the building of U.S. export facilities could lead to a more uniform pricing curve around the world (thus increasing U.S. prices). Current future pricing curves on trading markets point to a doubling of natural gas prices in the next 10 years. Given the aggressive analysis underlying renewable cost inflation in other sections, a more technically robust and realistic approach to fossil-fuel pricing would be preferable.

BHI reduces fossil costs due to renewable variability. In probably its least explained or understandable assumption, BHI assumes that the variability of wind and solar power reduces the avoided cost of conventional energy. It gives no further justification or sourcing for this approach, but simply decreases the cost of fossil technologies by an indeterminate amount and uses this new figure in its calculations.

3. BHI eliminates any methods and policies that could mitigate possible cost impacts from an RPS

Given that renewable energy is currently more expensive than fossil-fuel technologies, policymakers who develop RPS policies have incorporated a range of cost-containment mechanisms. This recognizes that electricity customers should be shielded from excessive electricity cost increases, and that a cost-containment mechanism can act as insurance in case renewable costs don't fall as rapidly as anticipated, or if the target for adding renewable energy has been set too high. According to Lawrence Berkeley National Laboratory (LBNL), nearly half of all states have capped retail rate increases at a maximum of 5 percent, and only eight states possessed no explicit caps on RPS compliance costs.[18]
In Kansas, regulations state that the Kansas Corporation Commission (KCC) shall exempt any noncomplying utility from administrative penalties if the utility demonstrates that compliance with the RPS causes a retail rate impact of one percent or more.[19] No utility has requested this exemption. The KCC has confirmed on several occasions that the RPS in Kansas has had a zero to minimal cost to consumers.[20] Most recently the KCC reported that the impact of the RPS is about 0.16 cents per kWh in the state.[21]

BHI disregards all cost-containment mechanisms that help control energy costs for customers. BHI ignores or downplays the effect of cost-containment mechanisms, essentially using an arbitrary worst-case scenario as a business-as-usual baseline. For example, in the case of Michigan, BHI assumes that the legislated cost cap (i.e., a law) will be ignored by the utility regulator—in other words, that the Michigan's Public Service Commission would break the law in order to let consumers' bills increase. In Delaware and Maine, it assumes that mechanisms like renewable credit banking and Alternative Compliance Payments—both used in some fashion in a variety of pollution trading markets to keep costs down—will have no impact on electricity pricing.

BHI discounts the value of energy efficiency, and the energy bill savings it provides, in keeping prices low. BHI utilizes an artificially high electricity consumption scenario that ignores expected increases in energy efficiency, recession-induced reductions in power demand, and the changing industrial mix of our economy. Aside from disregarding existing efficiency policies and budgets that are reducing electricity demand (112 million MWh in 2010),[22] this approach assumes no elasticity of demand, essentially claiming that consumers would be unresponsive to rapidly escalating electricity prices, and would not take steps to increase conservation or efficiency. This erroneous scenario ensures that power prices will stay higher than forecasted or as market theory would dictate (as efficiency is not "available" to take pressure off pricing). While this approach theoretically benefits renewable energy (as greater amounts of renewable energy will be required to meet renewables state targets in BHI modeling), by escalating the cost of renewable energy in the first step (see page 2), this no-efficiency assumption further elevates the impact of an RPS on electricity bills.

BHI ignores current real-world evidence that could be integrated into these proposed future scenarios. There is increasing evidence in many states of the real-world impact of both wind and solar power on power markets, and on the actual cost impacts of RPS. According to LBNL, "the rate impacts of state RPS policies have generally been 'modest' so far."[23] This is not borne out in the approach and assumptions of BHI, nor are they considered in its analysis.

- Texas, for example, has had an RPS since 1999 (ratified by then-Governor George W. Bush) and met its initial goal (primarily through wind power) six years early; the state Public Utility Commission determined that renewable energy has either reduced wholesale and retail power prices or moderated price increases from other energy technologies.[24]
- In Michigan, the state commission has determined that new renewable energy projects are contracting for 30 percent less than new coal plants, and reducing costs for customers overall.[25] In Colorado, the largest utility, Xcel, has stated that the state RPS will save customers $100 million over 25 years.[26]
- A study by the Center for American Progress found that "There are no data showing a nationwide pattern of these standards leading to rate increases for consumers. Instead, the data show that these standards do not cause electricity rates to go up faster than they otherwise would have, and that the standards are not responsible for electricity rates increasing faster than average."[27]
- Using EIA data on electricity price increases from 2005-2010, states with the lowest wind energy have seen electricity prices increase significantly more than top wind states. The "bottom 30" wind power states saw 26.7 percent jump in electricity prices during that period, compared to only 10.9 percent in the "Top 10" wind power states.[28] Of course, many factors influence the price of electricity, but these data stand in opposition to those claiming more wind energy will inherently drive up electricity prices.

4. BHI models questionably higher electricity costs as a sales tax on the economy

With artificially higher renewable costs and lower fossil-fuel prices, BHI can quantify supposed increases in electricity prices paid by customers, and determine the theoretical impact of these price increases as a tax.

BHI uses an unrealistic and simplified methodology to convert difference in renewable and fossil costs into higher electricity costs. Having calculated an excessively large difference in costs between renewables and fossil fuels, BHI determines the impact of this difference on electricity pricing. Whereas utilities, regulators, and other grid authorities expend extensive resources looking at the potential impacts of different pricing scenarios, BHI uses a simple shortcut, multiplying the difference in price between renewable and fossil alternatives by the amount of renewable energy targeted by an RPS, dividing it by forecasts of power consumed in future years (which were not run based on those much higher pricing scenarios) and arguing that electricity prices will rise by that amount. While on its face, this may seem reasonable, electricity pricing does not work this way. For example, power prices in competitive markets are set at a single clearing price, which becomes the marginal cost, and so the average cost of power resources (as computed in the BHI approach) is irrelevant. Also, much of our solar power is a distributed resource, and the costs should be calculated in a different way.

BHI analyzes the resulting costs as an additional general sales tax across a state's economy. BHI maintains that this increase in electricity prices is essentially a "tax" on income for citizens and companies. Using its proprietary, black-box general equilibrium economic model, designed especially for the purposes of determining the negative economic impacts from any tax increase, BHI models the negative economic impacts of this new "tax" in a particular state, calculating the resulting decrease in state employment, investment, and disposable income.

There are many concerns regarding the approach of both BHI's proprietary "STAMP" model (the acronym stands for the State Tax Analysis Modeling Program) and the appropriateness of using a sales tax as a proxy for higher electricity prices. These concerns are further elaborated in Appendix A.

5. BHI disregards net economic benefits from renewable energy and energy efficiency to further ensure negative impacts

While modeling the effects of this artificial tax, BHI ignores any net benefits from clean energy like renewables and energy efficiency, so as to ensure the negative economic impacts that BHI projects from the artificial tax it is modeling. The benefits described below would help to offset any of the negative economic impact BHI predicts from higher electricity prices.

Among the many different benefits that are not considered by BHI:

Creation of new jobs: While BHI calculates jobs lost from mandating higher-cost renewables, it does not consider any localized net benefits from renewable job creation, such as manufacturing or ancillary supply-chain job creation in that region, or installation jobs. Recently, NRDC, with the help of independent economic consultants, took a look at the job impact of one large wind farm and the benefits to local communities from hosting that wind power.[29] NRDC found that over the multi-year cycle of developing that wind project, nearly 1,200 jobs were created from that one wind farm, in areas ranging from engineering to construction to manufacturing to administration. Also not included in BHI's report is the positive job and economic development from displacing imported fossil fuels and the indirect economic impacts that can come from increasing local spending on construction, manufacturing, operations, and maintenance.

Benefits to local communities: BHI's modeling also does not account for the new revenues that wind power and other renewables inject into local communities. In a separate report, profiling communities benefiting from wind installations, NRDC found that wind farms bring large benefits to rural communities, including several million dollars in annual tax revenues for schools and local infrastructure, land lease payments of up to $8,000 per year per turbine for farmers and ranchers, and increased spending in local businesses.[30] The Department of Energy recently conducted an analysis to see if the benefits to local communities from wind power were real or imagined.[31] They found that a typical wind farm of 100MW would generate $1.1 million in county-level income and 50 jobs to that county. Similarly, a recent report shows that local benefits to Kansas communities includes more than $13 million per year in landowner lease agreements and more than $10 million in donation agreements with local communities.[32]

CONCLUSION

The end result of the Beacon Hill methodology is an inaccurate, one-sided study repeated across states and weighted to produce the false conclusion that renewable portfolio standards are bad for a state's economy. Given the importance of ensuring a clean energy future alongside a healthy, growing economy, and the importance of state RPS policies to those efforts, it is critical that we have a more reasoned and fair approach to this type of analysis.

APPENDIX A

Critiquing the Methodology of the Beacon Hill STAMP Model

Laurie T. Johnson, Ph.D., Chief Economist,
Climate and Clean Air Program, NRDC

There are several potential concerns with the BHI approach to modeling the theoretical electricity price increase from state RPS policies ("potential" is used in this instance as there is a lack of clarity regarding their model assumptions of the efficiency of the economy, the treatment of externalities, and the availability of investment capital).

First, the use of a Computable General Equilibrium (CGE) model suggests BHI assumes a perfect and fully efficient market. This does not address the reality that the U.S. economy does not always account for the market failure of environmental externalities such as carbon and other fossil fuel pollutants. A CGE model could account for the market inefficiency imposed by externalities by adding them to the cost of production, for instance, as a tax on electricity generation. To the extent that renewable energy is more expensive than fossil fuel energy, a renewable standard can be thought of as an indirect tax on pollution that could increase economic efficiency.

In that case, such a tax would only hamper economic efficiency to the extent that it exceeded the marginal damages from the externality (or, if the policy were an emissions cap, to the extent that the marginal cost of emission reduction exceeded the marginal damages from pollution). There are marginal damage estimates for both carbon emissions and traditional fossil fuel pollution that are frequently used in regulatory studies that BHI could have used to do a proper analysis. Instead, BHI models neither the externality nor the policy (in this case a renewable energy standard) intended to internalize it. By positing a sales tax, BHI fails to address the original distortion of the environmental market failure. In other words, instead of using a CGE model to propose a more efficient economy (by addressing the market failure that is distorting economic output), BHI estimates the effect of a poorly justified sales tax, which could increase or decrease economic efficiency (a priori, the introduction of a sales tax on economic efficiency in an economy with existing distortionary taxes is ambiguous).

Second, the choice of a sales tax results in a failure to include benefits from an additional market inefficiency that could be addressed by a tax on electricity production: insufficient investments in energy efficiency caused by market barriers to the efficient use of energy (such as split incentives and information asymmetries). Rising electricity prices (as previously discussed in this report), should lead to a change in consumption of electricity—primarily through conservation, increased energy efficiency, and changing consumer preferences. Using a sales tax as a proxy for increased power prices eliminates that feedback mechanism, leading to inflated electricity bills and costs on businesses and consumers. Increased electricity prices not only reduce the negative market externality intended by the price increase, all else constant, improved energy efficiency increases economic efficiency by increasing the capital stock (i.e., energy) available to the economy.

Relatedly, BHI's estimates of elasticities with respect to a sales tax increase are entirely inappropriate. Instead, BHI should have estimated the elasticity of demand with respect to an electricity price increase, both in terms of direct demand for electricity, and in terms of how demand for goods and services changes whose sales prices are affected by increased electricity prices. Economy-wide price increases resulting from a sales tax will have very different economic impacts than a more narrow tax focused solely on electricity.

Fourth, BMI's CGE model assumes that all markets are in equilibrium, so that supply equals demand. However, in an economy that is not operating at full employment, there is unused capital and labor that is being wasted—to the extent that cleaner energy is more labor intensive and costs more to generate than the fossil fuel energy it would replace, these unused resources can be mobilized without alternative investments being "crowded out"—i.e., they can stimulate additional economic growth. In fact, the economy is projected to grow slowly over the next several years, leaving a large amount of unused capital and labor on the sidelines. These idle resources could be employed through standards that drive new renewable energy projects.

Fifth, because CGE models typically assume all markets are in equilibrium (i.e., the supply for capital and labor equals demand for each), it is not clear whether the decrease in jobs it projects is a result of *voluntary unemployment*, i.e., a result of the *supply* of labor decreasing, or an assumption imposed on the model forcing labor markets not to clear. The study does not explain this aspect of its job loss projections. It also fails to discuss the jobs that would be created through the expenditures of the collected sales tax revenue.

Finally, it is not clear whether the total revenue generated from the sales tax corresponds to the total increased cost of electricity production consumers would face under a renewable standard. Assuming that a sales tax is a good proxy for increased electricity prices (which we argue it is not), the total revenue generated from it should equal the total increase in electricity production expenditures resulting from a renewable electricity standard (for example, if electricity production costs increase by $100 million—a purely illustrative number—then the sales tax percentage should be designed such that the total revenue collected by it equals

$100 million). The report does not discuss the total sales revenue generated from the tax versus the total increased production costs that would result from a renewable standard. It appears that BHI may have assumed an equal percentage increase in the sales tax as the percentage increase in electricity prices it assumed, but the report is not clear. If BHI did this, the absolute value of the sales revenue would be far greater than the total increase in electricity production costs, because the tax applies to many goods rather than just one.

Endnotes

1 Specifically, the Renewable Energy Standards Act, which required the state's investor-owned and cooperative utilities to reach a 10 percent renewable energy target in the years 2011-2015, 15 percent in the years 2016-2019, and 20 percent by 2020. http://www.kansas.gov/government/legislative/bills/2010/2369.pdf

2 http://heartland.org/sites/default/files/the_economic_impact_of_the_kansas_rps.pdf

3 http://www.kcc.state.ks.us/electric/2011_kansas_generation_planning_survey.pdf

4 http://kansasenergy.org/documents/PS-KEIN_KansasWindReport_1112.pdf

5 http://cjonline.com/news/2013-02-14/experts-debate-renewable-energy-costs

6 http://www.bloomberg.com/news/2012-11-01/wind-farm-operating-costs-fall-38-in-four-years-bnef-says-1-.html; http://emp.lbl.gov/sites/all/files/LBNL-5919e-PRESENTATION.pdf

7 http://www.windpoweringamerica.gov/filter_detail.asp?itemid=3207

8 ftp://ftp.eia.doe.gov/forecasting/0554%282011%29.pdf

9 http://eetd.lbl.gov/ea/ems/reports/wind-energy-costs-2-2012.pdf

10 ITC Great Plains, Kansas KETA project, http://www.itc-holdings.com/itc-great-plains/projects/item/61-kansas-keta-project.html

11 ITC Great Plains, V-Plan, http://www.itc-holdings.com/itc-great-plains/projects/item/62-kansas-v-plan.html.

12 http://www.nrel.gov/docs/fy08osti/41869.pdf

13 http://www.windpoweringamerica.gov/filter_detail.asp?itemid=2542

14 Nicolas Boccard, "Capacity Factors for Wind Power: Realized Values vs. Estimates," Energy Policy 37, no. 7

(July 2009): 2680, as found in http://www.beaconhill.org/BHIStudies/RPS/MO-RPS-BHI-2012-1115.pdf. Also, "The Capacity Factor of Wind, Lightbucket," http://lightbucket.wordpress.com/2008/03/13/the-capacityfactor-of-wind-power/, and National Wind Watch, FAQ, http://www.windwatch.org/faq-output.php.

15 The capacity factor was compiled using monthly average data for all Kansas wind farms with at least one full year of wind data as found at the Energy Information Administration, Annual Electric Utility Data - EIA 906/920/923 Data File, 2001-Dec. 2012, http://www.eia.gov/electricity/data/eia923/index.html. The monthly average generation data and capacity factors can be found at he Kansas Energy Information Network, http://www.kansasenergy.org/documents/Kansas_wind_capacity_Factors_122012.pdf.

16 http://www.windpoweringamerica.gov/pdfs/2011_annual_wind_market_report.pdf

17 http://www.greatachievements.org/?id=2988

18 http://www.cleanenergystates.org/assets/2012-Files/RPS/RPS-SummitDec2012Barbose.pdf

19 K.A.R. 82-16-3(c).

20 http://www.kcc.state.ks.us/presentations/2012/kcc_testimony_glass_kcc_jceep_2012.pdf

21 Retail Rate Impact Report, Kansas Corporation Commission, March 1, 2013. http://www.kcc.state.ks.us/pi/2013_retail_rate_impact_report.pdf

22 http://www.edisonfoundation.net/iee/Documents/IEE_CEE2011_FINAL_update.pdf

23 http://www.cleanenergystates.org/assets/2012-Files/RPS/RPS-SummitDec2012Barbose.pdf

24 http://www.puc.texas.gov/industry/electric/reports/scope/2009/2009scope_elec.pdf

25 http://www.michigan.gov/documents/mpsc/implementation_PA295_renewable_energy2-15-2012_376924_7.pdf

26 http://votesolar.org/2011/11/colorado-to-achieve-30-renewables-8-years-early-ratepayer-savings-of-409-million/

27 http://www.americanprogress.org/issues/green/report/2012/04/11/11397/renewable-energy-standards-deliver-affordable-clean-power/

28 http://www.eia.gov/electricity/sales_revenue_price/

29 http://www.nrdc.org/energy/files/american-wind-farms-IP.pdf

30 http://www.nrdc.org/energy/wind-powered-communities/default.asp

31 http://www.windpoweringamerica.gov/pdfs/economic_development/2012/county_income_wind_development_impact.pdf

32 Anderson, Alan et al., "The Economic Benefits of Kansas Wind Energy," November 19, 2012, http://kansasenergy.org/documents/PS-KEIN_KansasWindReport_1112.pdf