

Power Failure:

How Virginia is Losing the Competition

For Clean Energy Jobs



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Executive Summary

Governor McDonnell has famously declared his goal of making Virginia the “Energy Capital of the East Coast.” To get there, he advocates an “all of the above” strategy for energy production—oil and gas drilling, coal mining, nuclear power, and renewable energy (though not, unfortunately, energy efficiency). The governor’s primary purpose is to create jobs, his top priority during the recession. He cannot, however, achieve his goal without new programs and incentives that are, so far, missing from his agenda.

As a result, Governor McDonnell’s “all of the above” approach is more of an “all of the status quo” approach. His rhetoric on the need for investment in renewable energy has not been matched by any administrative or legislative action. In fact, if one examines his legislative agenda for 2010, it is easy to see that the administration is playing favorites among our energy sources and is indeed hostile to renewable energy.

In April of this year, he effectively hung out a “Not Welcome” sign to wind developers and manufacturers when he announced Virginia’s resignation from the Governors’ Wind Energy Coalition because he opposes the mandatory renewable energy standards supported by the coalition.ⁱ While Governor McDonnell did sign into law this past April a bill creating the Virginia Offshore Wind Authority, to date the Governor has failed to implement the law by simply not making the required appointments to the Authority.

Governor McDonnell’s Strategy

A review of the McDonnell administration’s first year in office makes it abundantly clear that this administration dearly wants to make Virginia an energy capital. Unfortunately, the full energies of his administration have been focused on opening Virginia’s coast to offshore drilling, while failing to recognize and take advantage of the abundant opportunities that exist with energy efficiency and renewable energy.

The governor touted drilling in federal waters for its ability to create thousands of jobs for Virginians, and solve the Commonwealth’s current transportation funding crisis through revenue sharing of royalties. However, his job numbers were speculative, not relevant to Virginia, and derived from a back-of-the-envelope extrapolation of product developed off the coast of Canada with the economic model of the Gulf Coast, where a massive level of infrastructure is already in place.ⁱⁱ The vision of federal dollars flowing from revenue-sharing is equally speculative, requiring passage of federal legislation that Congress has previously considered and rejected. And of course, today’s transportation woes will not be solved by any kind of revenue that begins to flow only ten years or more from now, when any oil production might begin.

The McDonnell proposal also faces other potential obstacles, including conflicts with the Navy and NASA’s Wallops Island satellite launch facility over operational interference, as well as the environmental threat to the Commonwealth’s highly lucrative fishing and tourism industries. Furthermore, this summer’s BP Deepwater Horizon disaster in the Gulf of Mexico, and the resulting

suspension of new offshore drilling plans, have effectively taken oil and gas production off the table for the near future.

Other options exist in Governor McDonnell’s all-of-the-above approach to making Virginia the Energy Capital of the East Coast. One of those sources of energy that the governor often points to is nuclear power, but new nuclear power plants are many years away at best, making them poor job creators in any economic plan.ⁱⁱⁱ

This leaves Governor McDonnell with only two real options: coal and renewable energy. Yet as shown in Figure 1, coal mining employment has been steadily declining in Virginia, in spite of state tax subsidies that cost the commonwealth around \$45 million per year.

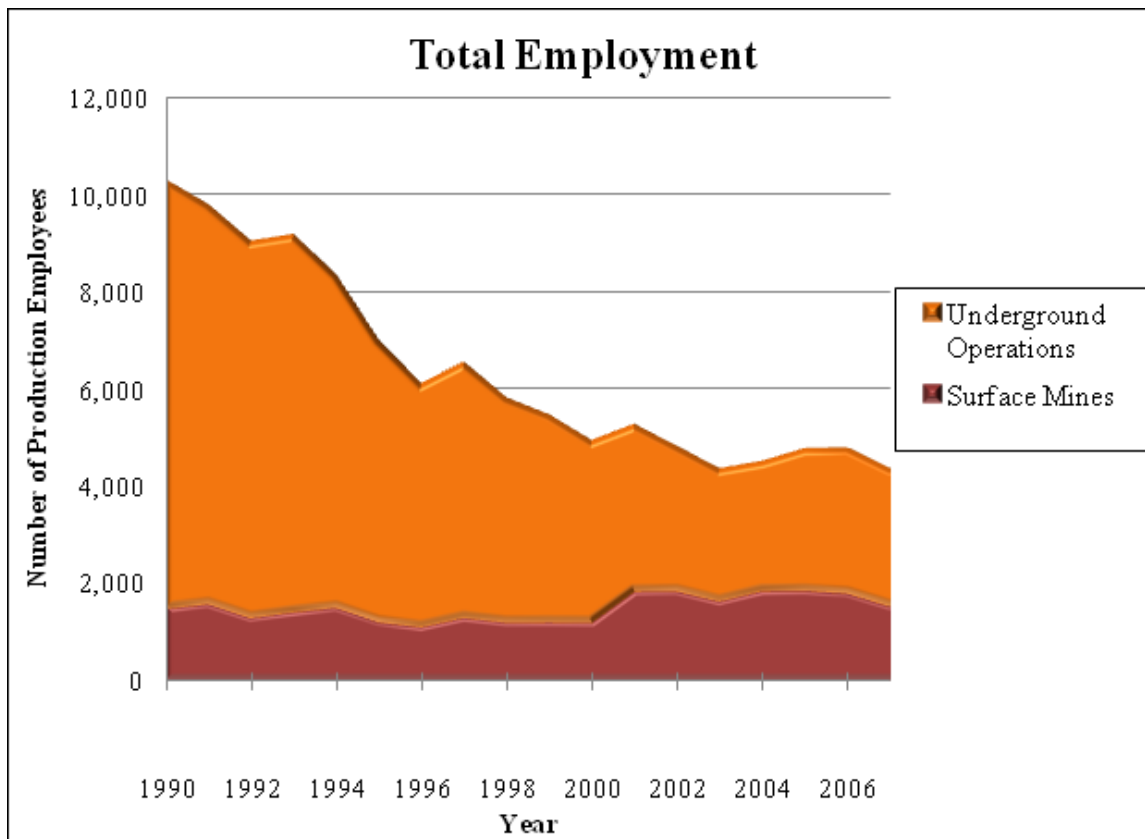


Figure 1: Coal Mining in Virginia, 1990 – 2006.^{iv}

Virginia coal production has dropped nearly in half from its highs in the 1980s,^v and coal fired power plants do not create many permanent jobs.^{vi} Relying on coal is not going to rebuild Virginia’s economy heading into the future.

Governor McDonnell has included mention of renewable energy as an element of the “all-of-the-above” approach through expressions of interest in offshore wind. Unfortunately, Virginia offers almost nothing in the way of incentives to bring renewable energy companies and industry to Virginia.^{vii} As a result,

Virginia is increasingly falling behind other mid-Atlantic states in meeting this challenge.

The Opportunities of Renewable Energy

The opportunities for renewable energy in the Commonwealth are tremendous, both for meeting energy demand and for putting Virginians to work. Renewable energy offers significant job creation opportunities compared to fossil fuel production, because labor makes up a much greater part of the overall cost of production of electricity from renewable sources. Manufacturers of renewable energy systems are unlikely to locate in Virginia if there is no market for that equipment here.

Governor McDonnell has also given little more than lip service to energy efficiency. Although not obviously a generation source, it is often called “the first fuel” because it enables a utility or consumer to meet its demand for electricity quickly and with fewer generation resources. Investments in electricity efficiency, such as air-sealing and insulation in residential buildings, cost approximately 3¢ per kWh over the lifetime of the improvement. This is by far the cheapest resource available to us.

As discussed later in this report, Virginia’s consumers use twice as much electricity per capita as consumers in the most efficient states, suggesting Virginia has low-hanging fruit that can be harvested at a fraction of the cost of new generation.^{viii} Energy efficiency improvements also create jobs for Virginians, many of them in the hard-hit construction industry.

But these jobs will not materialize without development of a marketplace. Virginia’s shareholder-owned electric utilities make more money by producing more power, so there is little incentive to invest in energy efficiency programs themselves or help consumers who want to go that direction. Recent legislation allows utilities to recover their costs for any efficiency programs they choose to implement, but nothing requires them to do so. Consumers, for their part, often don’t have the information or the up-front capital to invest in energy efficiency improvements. And renewable energy can’t compete on price in a state that subsidizes coal and ignores the pollution, health and carbon costs of fossil fuels in its drive to keep energy rates low.

This presents an opportunity for state action, and one that other states have eagerly seized in recent years. As a result of the actions taken by neighboring states, Virginia is in last place among the mid-Atlantic states in pursuing both energy efficiency and renewable energy. In the near term, we are missing out on the jobs these programs can create. Worse, we are missing out on long-term business development in the energy sector. No amount of talk about being the energy capital of the east coast can obscure the fact that we are only falling further behind.

The Big Picture: the future belongs to clean energy

Currently, fossil fuels dominate the energy supply of America. Anyone looking backward, as Governor McDonnell is, might be excused for thinking coal is king. U.S. oil production, on the other hand, has been in a steady decline for three decades, as shown in Figure 2. Yet it, too, plays an outsized role in today’s energy picture.

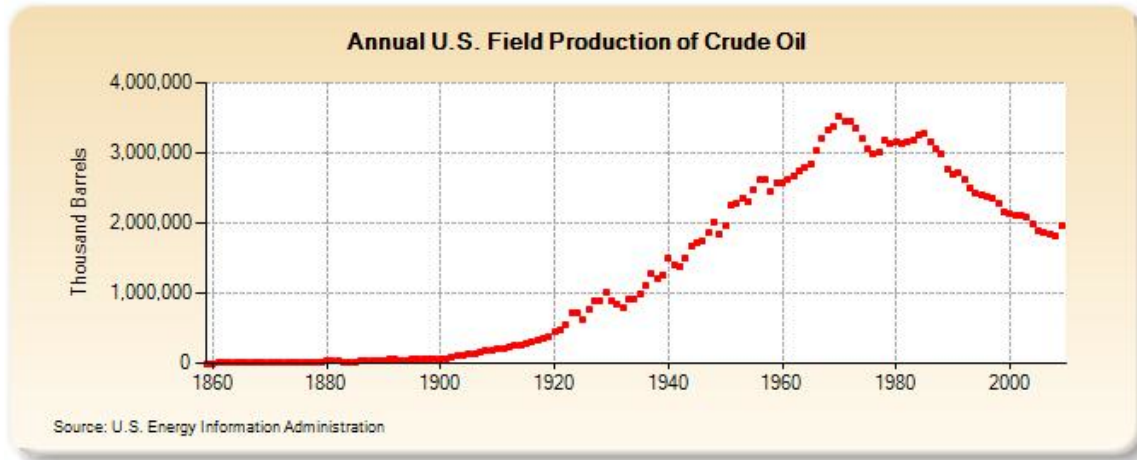


Figure 2: U.S. oil production

Anyone looking forward, however, sees a radically different picture: among new electricity production, wind energy and natural gas are neck-and-neck for first place, with coal a distant third. Wind energy is now generally cheaper than new electricity from coal, and employment in the wind industry rivals that of coal mining. Solar energy, long ignored in the east because it was expensive, also shows itself maneuvering into position to become a major twenty-first century fuel as the price drops ever closer to the launch-pad point of “grid parity.”

The view forward also takes in two new realities: climate change, which makes it urgent that we speed up this transition away from fossil fuels; and foreign competition, which is besting America in the race to get to the new energy future first, and by doing so is already commanding the greatest share of this huge new market. China just passed the U.S. “as the most attractive location in which to invest in renewable energy projects,” according to Ernst & Young,^{ix} with almost double the clean energy investments of the United States.^x

The urgency of our present situation has been recognized by President Obama, governors of both parties,^{xi} the United States military^{xii} and corporate leaders.^{xiii} As a new report backed by executives of several major U.S. corporations put it:

The energy challenge is much worse than most people realize. The problem is already imposing a heavy burden on our nation—a burden that will become even more costly. The economic, national security, environmental and climate costs of our current energy system will condemn our children to a seriously constrained future unless America makes significant changes to current policies and trends.^{xiv}

Case Study: Bremerhaven, Germany

Offshore wind development in Germany demonstrates how the right mix of incentives and existing infrastructure can lead to rapid economic growth for an entire region. Bremerhaven, a maritime city

that relied on shipping, shipbuilding and commercial fishing, experienced a significant downturn in the 90's due to competition from Asian shipbuilding and the loss of U.S. military shipping following the end of the Cold War. Its core strengths were a deep maritime technology base and a skilled workforce that specialized in shipbuilding and the design and manufacture of heavy machinery, which make it a good fit for offshore wind research and development, manufacture, assembly and development.

This foundation, when combined with German goals to build 25 – 30 gigawatts of offshore wind farms in the North and Baltic Seas by 2030, has led to rapid industrial and jobs growth for Bremerhaven. This new job growth has come in the form of turbine manufacturers such as REPower Systems and Multibrid (majority owned by Areva), rotor blade manufacturers PowerBlades, and SGL Rotec. Additionally, new companies have located to the region that construct offshore steel foundations, and two new research and development facilities for wind tunnels and rotor blade testing have opened. This new job growth, and the promise that it brings for the region's economy in the future, has led local universities to establish undergraduate and graduate degree programs in wind energy.

Comparable development can similarly occur for the Hampton Roads area of Virginia, which has physical, industrial and human resources comparable to Bremerhaven's. For this to happen there must be a clear signal from individual Atlantic states and the federal government to a build-out of many gigawatts of offshore wind farms. Certainly a big step in that direction is for Virginia to pass a sizable mandatory renewable portfolio standard, possibly with a significant carve-out for offshore wind energy.

Opportunity in Virginia

Energy Efficiency, the First Fuel: Cheapest, and Rich in Jobs

A number of recent reports point out how investments in clean energy pay off in energy savings, with a side benefit of creating new jobs that can't be outsourced and are primarily local. Energy efficiency is an especially cost-effective target for government action, because efficiency improvements tend to have a short payback time and create an economic benefit far greater than the cost of the investments.

A McKinsey & Company report concluded, "The research shows that the U.S. economy has the potential to reduce annual non-transportation energy consumption by roughly 23 percent by 2020, eliminating more than \$1.2 trillion in waste – well beyond the \$520 billion upfront investment (not including program costs) that would be required."^{xv}

Opportunities in Virginia and the rest of the South are even greater than elsewhere, simply because the region has made less progress on energy efficiency than in the nation as a whole, and so offers more fat to be cut. Virginia ranked 34th in energy efficiency in a state-by-state "scorecard" issued by the American Council for an Energy Efficient Economy, indicating how much catching-up we have to do.^{xvi} Rather than accepting our status as an also-ran, we can seize this opportunity to reap significant benefits.

According to the Southeast Energy Efficiency Alliance, aggressive energy efficiency policies "could set the South on a course toward a more sustainable and prosperous energy future." Following the policies it lays out, "In 2020, energy bills in the South would be reduced by \$41 billion, electricity rate increases

would be moderated, 380,000 new jobs would be created, and the region's economy would grow by \$1.23 billion." By 2030, the number of new jobs would rise to 520,000, and the economy would grow by \$1 billion.^{xvii}

Another report, focused on the Appalachian region, reached similar conclusions about both the cost savings (projected benefits were two and a half times the amount invested) and the potential job benefits.^{xviii}

The report also noted that the projected job numbers exceeded what could be expected in related sectors of the economy: "In Appalachia, the electric utility and the natural gas service sectors directly and indirectly employ about 5.3 and 3.7 jobs, respectively, for every \$1 million of spending but, sectors vital to energy-efficiency improvements, like construction and manufacturing, utilize 13.3 and 8.3 jobs per \$1 million of spending."^{xix}

This high return on investment also means jobs in energy efficiency offer a valuable bonus for government planners: when improvements return two dollars in savings for every dollar spent, those energy savings are likely to be put back into the economy as other spending.

Two reports specifically address the opportunities available in Virginia. *Energy Efficiency in the South* concluded that the energy efficiency policies it recommended "could reduce energy costs for Virginia consumers and could generate jobs in the State . . . Residential, commercial and industrial consumers could benefit from total energy savings of \$3.5 billion in 2020 (\$1.8 billion of which is specific to electricity), and \$6.3 billion in total energy savings in 2030. In comparison, the State spent \$7.9 billion on electricity in 2007. . . We estimated that Virginia would experience a net gain of 28,500 jobs in 2020, growing to 38,000 in 2030."^{xx}

Similarly, the 2008 ACEEE report on energy efficiency in Virginia concluded that efficiency measures could reduce energy consumption by 19% by 2025, saving ratepayers and utilities \$15 billion, and would create 9,820 new jobs. The new jobs would add up to \$583 million in annual wages and add \$882 million to the Commonwealth's gross state product.^{xxi}

Following publication of the ACEEE report, in both the 2009 and 2010 legislative sessions, the Virginia General Assembly considered bills that would have adopted some of the measures recommended, but these largely failed.

Virginia's failure to adopt efficiency legislation is a missed opportunity for both ratepayers and job-seekers, especially those in the hard-hit construction industry. It also means we are likely to fall further behind other neighboring jurisdictions including North Carolina (currently ranked 26th), DC (20th), and Maryland (11th) in the state energy efficiency scorecard.

Renewable Energy: the future at our shores

While energy efficiency offers the opportunity to create jobs immediately, the astounding growth curve of renewable energy means new economic development and job growth in coming years for states that are currently positioning themselves to take advantage of the opportunities.

A new study, *Job Impacts of a National Renewable Electricity Standard*, conducted by independent firm Navigant Consulting, Inc., and released by the RES Alliance for Jobs, found that a 25% by 2025 national RES would support an additional 274,000 renewable energy jobs.^{xxii}

In the absence of a nationwide standard, those jobs will go to the states with the right incentives to attract renewable energy businesses. But here, too, Virginia is behind other mid-Atlantic states, which are already creating jobs in this industry and attracting manufacturers who are likely to continue making their homes in the states that first drew them. Indeed, Virginia's subsidies for coal create an actual disincentive to other kinds of electric generation, including renewable energy.

In addition, Virginia is the only mid-Atlantic state that lacks a mandatory renewable portfolio standard (RPS), which creates a demand for renewable energy and offers additional returns through a market for renewable energy certificates (RECs). The problems associated with Virginia's voluntary standard are numerous.

First, the voluntary nature of the standard is seen as a negative for potential investors in renewable energy. Since the standard is voluntary, there is no commitment from either the utilities or the State Corporation Commission to support renewable projects. Investors see this as an uncertain marketplace where their investment could be rejected at anytime.^{xxiii} Moreover, the fine print on Virginia's voluntary RPS, nominally 15% by 2025, reveals it could be satisfied with less than 5% renewable energy, making it more of a token than a serious target.^{xxiv} Finally, a voluntary RPS, such as Virginia's, does not support a REC market.

In contrast, the other mid-Atlantic states are moving aggressively to attract new renewable energy businesses through mandatory minimums and other incentives.

Regional Progress on Renewable Energy

North Carolina, for example, has a mandatory RPS of 12.5% by 2021, with a solar carve-out, and corporate and personal tax credits for renewable energy systems of 35%. While Duke Energy Corp. recently scrapped a pilot project for offshore wind in North Carolina state waters, at the same time it reaffirmed its commitment to building commercial-scale wind turbines in federal waters, and has committed \$4 million to an offshore wind study at the University of North Carolina at Chapel Hill.^{xxv}

In Maryland, the Energy Administration created the "Million Solar Roofs" program following the state's adoption of a mandatory RPS of 20% by 2022 with a solar carve-out. Five new clean energy bills, signed into law in May 2010, include an acceleration of the State's solar Renewable Portfolio Standard to put more clean energy on the grid faster, extend renewable energy tax credits for businesses interested in going green, and offer tax credits for families to purchase plug-in electric vehicles as they become commercially available over the coming year.

Delaware was the first state to commit to building offshore wind turbines, with a power purchase agreement for a 450 MW wind farm off its coast. The agreement was a direct result of the state's commitment to an RPS of 20% by 2020. The state also offers rebates for installations of renewable

energy, and its RPS includes a solar minimum. The Delaware Sustainable Energy Utility (SEU) was recently established as the nonprofit entity that will deliver energy efficiency services to its households and businesses, and a public benefit fund will provide money for renewable energy research and development, as well as energy efficiency funding.

In Pennsylvania, the state enacted a mandatory renewable portfolio standard, included a solar minimum, and committed the government to purchasing 30% of its own power from wind (rising to 50% later this year). In 2008, the state launched a wind energy supply chain initiative to connect suppliers and purchasers and work with manufacturers to attract new renewable industry to the state. These initiatives have paid off with 748 MW of wind energy installed as of the end of 2009, and the arrival in the state of the Spanish wind turbine manufacturing giant Gamesa, which hired 900 people to run its Pennsylvania operations. Pennsylvania is now the east coast leader in wind energy jobs.

Finally, New Jersey will likely become the first state with an offshore wind farm, as Fishermen's Energy installs turbines in state waters, providing enough energy to power thousands of homes. The state has also committed to the development of wind farms 10-15 miles off its coast. Moreover, New Jersey has become the leading east coast state for solar power because of its early and aggressive commitment to solar photovoltaics; to date, over 5,800 solar electric systems have been installed statewide.^{xxvi} The state has an RPS of 22.5% by 2021, including the solar carve-out.

Will Virginia act?

Virginia should not accept its status as the laggard of the mid-Atlantic. Our solar resources are as good as any of our neighboring jurisdictions,^{xxvii} and we have some of the best shallow-water offshore wind resources in the nation.^{xxviii} One study suggests that solar installations could in time produce 21% of our power needs.^{xxix} More impressively, offshore wind alone could be supplying 10% of our electricity needs in the near term, with the potential to meet all of our needs eventually.^{xxx}

Estimates for job creation are just as impressive. The National Renewable Energy Laboratory estimated that 1,000 MW of installed land-based wind energy in Virginia would produce a total economic benefit of \$1.2 billion, with over 3,000 jobs created during the construction phase and more than 400 jobs long-term. An April 2010 report by the Virginia Coastal Energy Research Consortium, identifies the potential for 3200 MW of wind power 15 miles off the coast of Virginia Beach. The report also found that development of this wind resource could generate 9,700 to 11,600 career length jobs over two decades.^{xxxi}

As with energy efficiency, renewable energy means clean electricity generated right here in Virginia, bringing jobs for our residents and new businesses to strengthen our economy.

Yet we have not seized these opportunities. Virginia has established an Offshore Wind Development Authority to coordinate the groundwork needed for offshore wind farms, but it has done nothing to require utilities to purchase the power these turbines would generate or to reduce the current fuel price disparity that makes utilities reluctant to enter power purchase agreements. Making matters worse, the authority, which was established by law and effective July 1st, 2010, has not been activated due to the

fact the Governor still has not announced his appointments.. Also unsettling are recent decisions of the State Corporation Commission that indicate a lack of support for wind energy, suggesting the legislature needs to send the commission a clear directive to make renewable energy projects a priority.

From wishful thinking to reality: bringing clean energy jobs to Virginia

The following recommendations would launch Virginia into an energy economy centered on energy efficiency and renewable energy, the fuels of the 21st century.

Using energy more efficiently

- Virginia should pass a mandatory energy efficiency resource standard (EERS) to take advantage of the enormous efficiency gains that can best be introduced by utilities.
- Virginia should require utilities to sell residential power in blocks that increase in price as more power is used, rather than decreasing in price. An inclining block rate structure is designed to be neutral to the utility but reduces rates for those who use the least power, generally poorer residents with smaller homes, while creating an incentive for those who use the most energy, usually the most affluent residents, to take efficiency measures. About one-third of U.S. utilities use inclining block rates, achieving efficiency improvements of 1-6% as a result.
- Virginia should act to facilitate programs that assist homeowners to evaluate and retrofit their homes for improved energy efficiency and to obtain appropriate financing. Virginia should pass legislation that empowers the Virginia Resource Authority to provide clean energy financing for municipal energy efficiency and renewable energy projects. Furthermore, this funding could be used to provide loans to residents seeking to retrofit existing homes and businesses.

Harnessing the wind and sun

- Virginia should adopt a mandatory renewable portfolio standard (RPS) of at least 20% of total electric demand by 2025 in order to be competitive with other mid-Atlantic states in attracting renewable energy businesses. The RPS should include carve-outs (small mandatory minimums) for both offshore wind and solar power to ensure Virginia takes advantage of this labor-intensive technology.
- Virginia should pass legislation permitting “community net metering,” which would allow ratepayers to band together to install a renewable energy system at one house, farm or small business, and share in the credit for the electricity produced.
- Virginia should pass legislation creating a Green Power Partners program modeled on one run by the TVA and available in many other states, giving consumers the option to buy 100% wind and/or solar-produced power and paying producers the premium necessary to offset their costs.
- Governor McDonnell should rejoin the Governors’ Wind Energy Coalition to send a signal to the wind industry that his administration is not hostile to wind developers or manufacturers.

Creating a clean energy marketplace

- The State Corporation Commission (SCC) should be instructed via legislative language to consider all costs when evaluating applications for new generation. Currently the SCC does not take into account “externalities”; i.e., costs that are real and often quantifiable, but that are borne by the state, members of the public, and the environment rather than the utility proposing the generating plant. Health care costs alone have been estimated at 3.2 cents/kWh for coal-generated power. Recognizing and accounting for these real costs would allow the SCC to make a more balanced cost-benefit analysis as it considers new generation.
- The SCC should also be instructed to consider price stability when evaluating new generation. The volatility of coal prices in the year leading up to the recession, and the reality that the market for coal is now international, makes coal a much riskier fuel going forward for businesses that need to rely on stable, predictable energy prices in their planning.
- Virginia should rescind the existing tax credits paid to coal mining companies and utilities. These subsidize coal at the expense of all other fuels, and enrich two sectors of the economy that are thriving when other sectors that are not subsidized are struggling. The \$45 million annually lost to the state treasury through these subsidies could be put to better use, perhaps to fund new job creation efforts in the coalfields region or to support green jobs.
- Virginia should offer rebates or tax credits for investments in energy efficiency and renewable energy, similar to those offered in other mid-Atlantic states such as North Carolina and Delaware.
- Virginia should reinstate funding for the important research work of the Virginia Coastal Energy Research Consortium.

Notes

ⁱ http://voices.washingtonpost.com/viriniapolitics/2010/04/post_665.html

ⁱⁱ <http://blogs.wsj.com/environmentalcapital/2009/12/30/drill-baby-drill-does-virinias-gov-elects-call-for-offshore-drilling-add-up/?KEYWORDS=james+koch>

ⁱⁱⁱ Any new nuclear plant in Virginia also faces a number of hurdles, including dependence on giant federal subsidies in the form of loan guarantees that the country can ill afford. In 2008, the Department of Energy received applications for \$122 billion in loan guarantees for 19 nuclear plants, where only \$18.5 billion was allocated. The history of rising costs and construction overruns for nuclear power plant construction puts American taxpayers at risk for these guarantees. \$100 billion in loan guarantees represents a risk of \$1000+ for every U.S. family. It should be clear that no more than a few plants will be built because the cost of loan guarantees, not to mention catastrophic liability insurance, is simply too great for the country to afford.

^{iv} http://www.energy.vt.edu/vept/coal/graph_employment.asp#Graph_Employ_09-1

^v http://www.energy.vt.edu/vept/coal/historical_coal.asp

^{vi} Dominion Virginia Power's new coal plant in Wise County, for example, expects to employ only about 75 people once it is complete. <http://www.dom.com/about/stations/fossil/virginia-city-hybrid-energy-center.jsp>

^{vii} The only new state incentive is a \$500 "green jobs" tax credit. Federal stimulus funds paid for a tax credit for renewable energy systems that has since expired, and made possible the recent announcement of an \$800,000 grant to James Madison University for a small wind testing and training facility.

^{viii} <http://www.eia.doe.gov/cneaf/electricity/esr/table5.html>

^{ix} http://www.ey.com/CN/en/Newsroom/News-releases/2010_China-tops-renewable-league

^x <http://www.investnewz.com/investnewz-7->

^{xi} E.g., Governor Arnold Schwarzenegger, Governor's Remarks at World Environment Day Conference, June 1, 2005, <http://gov.ca.gov/speech/1885/>

^{xii} <http://www.cna.org/reports/climate>

^{xiii} See, e.g., American Energy Innovation Council, <http://www.americanenergyinnovation.org/the-plan/> ("if we continue with the energy status quo, we will expose ourselves to risks that pose significant threats to our way of life").

^{xiv} American Energy Innovation Council, "A business plan for America's energy future," page 3. 2010. Available at <http://www.americanenergyinnovation.org/full-report>

^{xv} McKinsey & Co., "Unlocking Energy Efficiency in the U.S. Economy." 2009. Available at http://www.mckinsey.com/client-service/electricpower/naturalgas/US_energy_efficiency/

^{xvi} American Council for an Energy Efficient Economy, "The 2009 State Energy Efficiency Scorecard," page iii. Available at <http://www.aceee.org/pubs/e097.htm>

^{xvii} <http://energyefficiencyworks.org/wp-content/uploads/2010/04/GT-Duke-Executive-Summary.pdf>

^{xviii} http://www.arc.gov/assets/research_reports/EnergyEfficiencyinAppalachia.pdf, page 107.

^{xix} Ibid, page 108.)

^{xx} http://www.seealliance.org/se_efficiency_study/virginia_efficiency_in_the_south.pdf, page 8.

^{xxi} ACEEE, "Energizing Virginia: Efficiency First." 2008. Available at <http://www.aceee.org/pubs/e085.htm>.

^{xxii} http://www.awea.org/pubs/factsheets/RES_General.pdf

^{xxiii} Indeed, the SCC recently rejected Appalachian Power Co.'s plans to buy power from two wind farms. See <http://www.roanoke.com/news/roanoke/wb/249145>

^{xxiv} Virginia's renewable energy target is 15% of non-nuclear electric production; thus it is effectively only 10% of total production. In addition, the statute allows double credit for wind and solar and triple credit for offshore wind, further lowering the actual goal.

^{xxv} <http://www.offshorewind.biz/2010/08/20/duke-energy-will-not-build-wind-turbines-in-pamlico-sound-usa/>

^{xxvi} <http://www.njcleanenergy.com/>

^{xxvii} See the photovoltaic solar resource map at http://www.nrel.gov/gis/images/map_pv_national_lo-res.jpg

^{xxviii} <http://www.nrel.gov/docs/fy10osti/45889.pdf>

^{xxix} <http://www.citizen.org/documents/RenewableEnergyVirginia.pdf>

^{xxx} Virginia Coastal Energy Research Consortium, "Virginia Offshore Wind Studies, July 2007 to March 2010 Final Report." http://vcerc.org/VCERC_Final_Report_Offshore_Wind_Studies_Full_Report_new.pdf

^{xxxi} Ibid