Secretary of Natural Resources for the Commonwealth of Virginia
Molly Joseph Ward
P.O. Box 1475
Richmond, VA 23218

Re: AEE Institute's Comments on Governor McAuliffe's Executive Order 57

Dear Secretary Ward and members of the EO-57 Work Group,

Advanced Energy Economy Institute (AEE Institute) appreciates the opportunity to comment on Governor McAuliffe's Executive Order 57 (EO-57). AEE Institute has been engaged throughout the EO-57 stakeholder process, having presented to the stakeholder committee in October 2016 and our participation in the Department of Air Quality's Clean Power Plan stakeholder group.[1] Our organization is deeply invested in the future of Virginia's energy markets and any policies that may allow for increased growth in the advanced energy market, and we strongly support the Administration's Virginia Energy Plan to allow for the expansion of in-state energy market.

Throughout the stakeholder process, we saw a variety of constructive proposals suggested to the committee, many of which would reduce market barriers to entry for advanced energy technologies and services. Although we are not backing any single policy proposal, AEE Institute supports policies that would allow for technologies to compete in a Virginia market that acknowledges their positive attributes, including but not limited to job creation, increased reliability, consumer savings, and carbon reduction. Through our own modeling of the Clean Power Plan, performed by experts in the advanced energy market, we saw that reduction of carbon could lead to increased employment in the Commonwealth, with the peak year of job growth being equivalent to that of the current construction industry in Virginia. In addition, AEE Institute modeled the rate impacts of carbon reduction through the Clean Power Plan, and the results showed that by allowing more advanced energy businesses to compete, the ratepayer would see nearly no impact (or potentially see rate savings).

AEE Institute understands that the Administration is considering a cap on carbon emissions in Virginia, calling for a 30 percent reduction in emissions by 2030 (30x30). Based on modeling of different scenarios, Virginia can easily achieve the 30x30 goal through investment in advanced energy technologies and services with little or no impact to electricity rates. Separate modeling also showed that investment in carbon reducing technologies can lead to an increase in overall employment for Virginia compared to business as usual.

---

[1] AEE Institute is a 501(c)(3) charitable organization whose mission is to raise awareness of the public benefits and opportunities of advanced energy. AEE Institute provides critical data to drive the policy discussion on key issues through commissioned research and reports, data aggregation, and analytic tools. AEE Institute also provides a forum where leaders can address energy challenges and opportunities facing the United States. AEE Institute is affiliated with Advanced Energy Economy (AEE), a 501(c)(6) business association, whose purpose is to advance and promote the common business interests of its members and the advanced energy industry as a whole. Visit https://www.aeeinstitute.org/home for more information.

How Advanced Energy Can Help

By implementing a carbon reduction policy with a flexible design that allows for a variety of technologies and services for that best suit the state, Virginia could be presented with an opportunity to modernize its electric grid for the benefit of consumers and the economy to accelerate a transition to a higher performing grid that is reliable, resilient, and affordable.

To achieve those improvements in the Commonwealth's electricity system, Virginia must continue to invest in 21st century electricity generation and grid technologies. Luckily, these same technologies will also lower the state's carbon emissions. Forty such technologies are detailed in an AEE report, *Advanced Energy Technologies for Greenhouse Gas Reduction*.[2] These technologies include, among others, energy efficiency, demand response, natural gas electricity generation, solar, wind, hydropower, smart grid technologies, electric vehicles and infrastructure, and energy storage.

Renewable energy and energy efficiency are competitive resources in today's marketplace that will not only be cost-effective mechanisms for carbon reduction but should also be expected to grow strictly on the basis of cost. Based on data from Lazard, a financial advisory and asset management firm, the levelized cost of electricity (LCOE) for utility-scale wind and solar power has declined by 66 percent and 85 percent, respectively, from 2009 to 2016, such that these technologies are increasingly competitive.[3] These prices are continuing to decline rapidly. In June of 2015, Austin Energy in Texas announced it was procuring PV projects at a record of $0.04/kWh, only to be outdone the next month by NV Energy, which agreed to a PPA at $0.0387/kWh in July 2015.[4,5] Utility renewable energy purchases that were once driven primarily by state policies (e.g., renewable portfolio standards) are now increasingly made based on economics.

Generation from zero- and low-carbon-emitting technologies such as natural gas combined cycle, dispatchable hydroelectric power, biomass, and waste-to-energy can be used to meet baseload generation. These resources can integrate with variable renewable energy and also complement each other both technologically and economically, allowing the electricity system to provide reliable, low-carbon energy.

High voltage direct current (HVDC) transmission can facilitate the integration of renewable energy technologies and reduce transmission line losses 30-50 percent compared to traditional alternating current (AC) systems.[6]

Demand response also provides grid benefits, including firm capacity reserves, system-wide peak shaving when demand is high, and ancillary services to facilitate the integration of renewable resources in a low-carbon manner. A November 2014 Navigant report found that DR can directly reduce CO_2 emissions by more than 1 percent through peak load reductions and provision of ancillary services, and that it can indirectly reduce CO_2 emissions by more than 1 percent through accelerating changes in the

---

[2] Report available at: http://info.aee.net/epa-advanced-energy-tech-report
[3] https://www.lazard.com/media/438038/levelized-cost-of-energy-v100.pdf
[4] http://www.greentechmedia.com/articles/read/cheapest-solar-ever-austin-energy-gets-1.2-gigawatts-of-solar-bids-for-less
[5] http://www.utilitydive.com/news/nv-energy-buys-utility-scale-solar-at-record-low-price-under-4-centskwh/401989/
[6] Siemens, High Voltage Direct Current Fact Sheet (Jul. 2012), http://www.siemens.com/press/pool/de/events/2012/energy/2012-07-wismar/factsheet-hvdc-e.pdf

fuel mix and increasing renewable penetration.[7] Demand response can also strengthen reliability, as evidenced during the 2014 polar vortex when demand response was credited with helping to maintain reliability of the system.[8] In addition, , demand response also provides cost-effective alternatives to meeting peak demand, both locally and at the wholesale level, and can improve reliability while reducing peak power costs. According to the PJM Internal Market Monitor, demand response and energy efficiency saved PJM customers $11.8 B in capacity costs between June 2013-June 2014.[9] Neighboring states, including Maryland, Pennsylvania, and New York, are reducing energy costs for their customers through the deployment of utility peak-shaving demand response programs. In New York, where the Ratepayer Impact Measure (RIM) test is used, the utility demand response programs have achieved results as high as 1.89.[10] These programs also boost the local economy, as the majority of program payments are given to local businesses and organizations (e.g. school districts) that participate.

Distributed resources can also provide grid benefits such as reduced congestion and increased reliability and flexibility. These resources include distributed generation such as residential and commercial solar and wind, combined heat and power (CHP), industrial waste energy recovery, and fuel cells. Similarly, energy efficiency reduces congestion and peak demand, and reduces the impacts of changes in the firm capacity associated with retiring EGUs. Advanced grid technologies such as advanced metering infrastructure (AMI), distribution automation, microgrids, high temperature superconducting (HTS) transmission, and smart grid management technologies can help integrate and manage the growing diversity of renewable, low-emitting and traditional fossil generation. Energy storage also helps integrate renewables and reduces the need for peaking power plants – leading to fewer emissions – and thermal units to provide ancillary services such as frequency regulation and spinning reserves, allowing these traditional units to operate at more efficient heat rate blocks leading to fewer emissions.[11]

Additionally, plug-in electric vehicles (PEVs) can be an important component to aid in greenhouse gas reduction and grid support as market penetration continues. PEVs are beneficial in both reducing emissions and providing grid energy storage. PEVs reduce transportation-related greenhouse gas emissions, even when considering power plant emissions associated with vehicle charging. This benefit varies depending on the power generation mix, but even in regions with relatively high electricity-related emissions there is a net benefit. With full, bi-directional integration with the grid, PEVs can also be used for energy storage, providing grid support functions such as peak shaving, load shape smoothing, renewables integration, and power quality services. As the size of the PEV fleet grows, the ability to aggregate and manage vehicles in a coordinated fashion has the potential to create a large source of energy storage. Virginia could consider adoption of additional electric vehicle charging infrastructure, as well, to reduce range anxiety for consumers and encourage support for PEVs.

Importantly, these advanced energy technologies can ensure that deployment of these technologies will have no significant adverse impacts on grid reliability and cost. The Brattle Group published a report on

---

[7] Navigant Consulting. "Carbon Dioxide Reductions from Demand Response." November 25, 2014

[8] https://www.pjm.com/~/media/documents/other-fed-state/20140707-dccircuit-11-1486.ashx

[9] Monitoring Analytics, the Internal Market Monitor for PJM. "Analysis of the 2013/2014 PJM Base Residual Auction Revised and Updated." September 20, 2010. Page 52

[10] Orange & Rockland Utilities, Inc. Annual Report On Program Performance And Cost Effectiveness Of Dynamic Load Management Programs. Case Number 14-E-0423. December 1, 2016

[11] California Energy Commission, *Integrated Energy Policy Report* (2011), available at: http://www.energy.ca.gov/2011publications/CEC-100-2011-001/CEC-100-2011-001-CMF.pdf

reliability, *Integrating Renewable Energy into the Electricity Grid: Case Studies Showing How Technologies and Operations are Maintaining Reliability*, analyzing how variable renewable generation is being managed by grid operators today.[12] The Brattle Group found that "ongoing technological progress and ongoing learning about how to manage the operations of the electric system will likely allow the integration not only of the levels of variable renewable capacity now in places like Texas and Colorado but even significantly larger amounts in the future."

Advanced energy technologies and services will help Virginia balance cost, energy system performance, environmental, and public health considerations. These technologies are also well established in the United States and global marketplaces, as illustrated in *Advanced Energy Now 2017,* a market report produced by Navigant Research.[13] The assessment found that the 2014 market for advanced energy technologies was $1.4 trillion globally and $200 billion in the United States. The wide-spanning industry generates twice as much revenue on an annual basis as the airline industry globally, and equal to domestic pharmaceutical manufacturing domestically.

Virginia's Ratepayers Would See Benefits of Carbon Reduction Policy

In early 2016, Advanced Energy Economy Institute released a study showing the rate impacts new carbon policy might have on the Commonwealth of Virginia. Prior to releasing our study, we worked with other members of VA DEQ's Clean Power Plan stakeholder group to finalize the assumptions and raw data that went into our State Tool for Electricity Emissions Reduction (STEER) model.[14] We then ran the model using the final U.S. EPA Clean Power Plan targets for the state. The model examined the options available to Virginia for carbon reduction and optimized for the least-cost option for compliance. The tool can run thousands of different scenarios with various inputs, and AEE Institute examined two primary scenarios: (A) PJM sales growth projections and Dominion Virginia Power's 2015 energy efficiency potential study extrapolated to the entire state; and (B) PJM sales growth projections and the State Corporation Commission (SCC)'s 2008 energy efficiency potential study. Under neither scenario is any existing generating plant expected to close beyond those already announced for retirement. Certain components of a mitigation plan, such as energy efficiency improvements in both the distribution network and end-use of electricity by customers, are present in both scenarios as they are cost-saving measures, even outside of the Clean Power Plan.

In Scenario A there is a minor rate increase seen, less than a half of a penny per kilowatt hour ($0.004/kWh), compared with a business-as-usual projection. In Scenario B, the scenario using the SCC's efficiency potential study, we see a decrease in electric rates compared with business-as-usual ($0.002/kWh). In neither scenario do we see significant costs imposed on Virginia ratepayers as a result of Clean Power Plan compliance. The result is likely due to the substantial contribution to compliance made by low-cost resources such as energy efficiency and renewable energy. The scenarios shown here demonstrate that Virginia can achieve significant carbon reduction without imposing costs on ratepayers compared with business as usual.[15]

---

[12] http://info.aee.net/integrating-renewable-energy-into-the-electricity-grid
[13] http://info.aee.net/aen-2017-market-report
[14] More information about the STEER model and the tool itself can be found at: http://info.aee.net/steer.
[15] The paper "Modeling Low Cost Approaches to Clean Power Plan Compliance for Virginia" can be found at: http://info.aee.net/steer-virginia.

Although the scenarios described in our 2016 analysis were tied to the Clean Power Plan, the results showed that there are cost-effective and cost-saving means of reducing carbon by increased utilization of advanced energy technologies. It should be noted that energy efficiency is likely to play a major role in any carbon reduction plan that the Commonwealth considers. Energy efficiency measures make up a significant amount (up to 90% in one scenario) of the cost-effective carbon mitigation options in Virginia in the STEER model runs, and under any scenario run, energy efficiency measures in both the distribution network and end-use of electricity would be cost-saving measures to the consumer, even without carbon reduction policy in place. Furthermore, the STEER tool can be used to examine the rate impact of any proposed carbon reduction target that the Commonwealth might consider in the future.

AEE Institute highlights the results of the STEER modeling within the current context of electricity rates and existing law after the passage of Senate Bill 1349 (SB 1349). In 2015, Gov. McAuliffe signed SB 1349 into law halting the review of rates for Dominion Virginia Power for five years. The legislation was signed as a protection for consumers because of the claimed costs of a federal carbon reduction policy, known as the Clean Power Plan. The STEER modeling scenarios demonstrate that SB 1349 was signed under a faulty premise that carbon reduction automatically leads to increased costs to the electric system. AEE Institute encourages the Working Group to be skeptical of any proposal that argues a carbon reduction policy under EO-57 would inevitably lead to increased costs to Virginia businesses and consumers at large.

Virginia Would See Employment Benefits with More Advanced Energy

Additionally, a carbon reduction policy across Virginia would likely result in significant employment growth in the Commonwealth. The 2015 Meister Consulting report, *Assessing Virginia's Energy Future: Employment Impacts of Clean Power Plan Compliance Scenarios*, summarizes employment modeling that compares CPP implementation scenarios to a "business as usual" future by looking at new labor needs in Virginia associated with building and operating new power plants and efficiency improvement projects and labor lost from plants retiring and other planned changes.[16] The analysis considers a "Diversified Portfolio" that achieves carbon reduction by implementing fleet changes already planned by utilities, and the addition of renewable energy and energy efficiency measures that would result in carbon reductions. In addition, since Virginia has long examined ways to limit its electricity imports, which provide just under 40 percent of the state's electricity, the report also considers an "Import Reduction" scenario that utilizes additional renewable energy, energy efficiency, and natural gas generating resources to eliminate the state's electricity imports while also reducing carbon.

By 2030, the Diversified Portfolio option would result in **54,231 cumulative additional job years** that result from compliance actions, and the Import Reduction scenario would result in **122,912 cumulative additional job-years**, more than double the employment gains of the Diversified Portfolio scenario. These numbers are in addition to the 7,964 net job-years that are anticipated due to changes that are already planned by the state's utilities. Under the Diversified Portfolio scenario, job gains would peak in 2029, with more than 5,700 net jobs that year, near the current employment in beverage production in

[16] Report available at: http://info.aee.net/virginia-energy-future

Virginia. Under the Import Reduction scenario, the employment peak would come in 2027, with 12,600 additional jobs that year – nearly equal to existing jobs in commercial construction.[17]

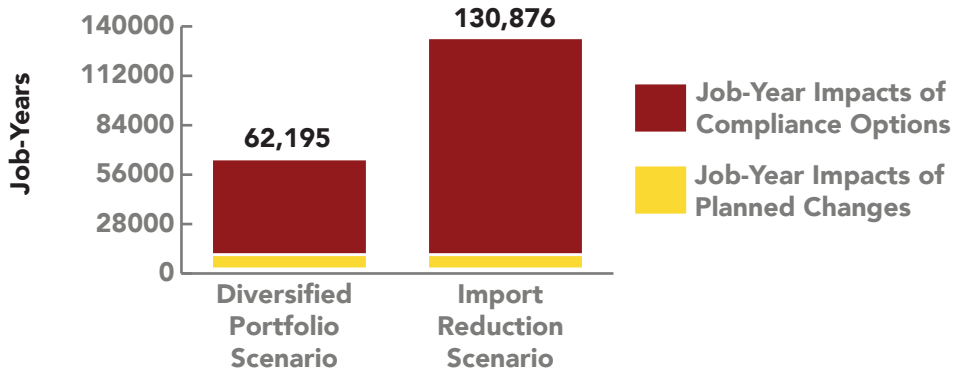


Figure 1. Summary of Cumulative Employment Impacts from the report *Assessing Virginia's Energy Future.*

Maintaining Formal Coordination Between State Agencies Is Key to Energy Policy Progress

A clear benefit of EO-57 has been formal coordination between agencies to discuss advanced energy policy. Because of this executive order, the Department of Environmental Quality (DEQ) Air Division has openly discussed its findings around the Clean Power Plan more broadly, sharing its work more broadly with the Department of Natural Resources (DNR) and the Department of Commerce and Trade (DCT). This information sharing is crucial to enact effective policies at the state level, especially considering the current uncertainty around federal policy concerning both advanced energy markets and carbon reduction policy in the power sector.

In addition, multiple state departments and commissions oversee the power market from various perspectives, including environmental, economic, and reliability, yet there is no mandate for the agencies to consult one another in decision making. One agency that has significant oversight of the power market in Virginia is the State Corporation Commission, which was not a formal partner in the EO-57 Working Group, and should be able to consult more regularly with other agencies about decisions being made about Virginia's energy future. As a hypothetical example, the Air Division may seek to reduce pollution at a fossil-fired plant by approving costly pollution control technology without consulting the SCC. This cost would be passed through to the ratepayer, even though the SCC may be able to provide useful information on the long-term economic benefits of replacing this plant with advanced energy – such as a renewable energy project or a cost-effective energy efficiency upgrade – instead of adding the expensive controls being approved under the current approach.

On the other end of the spectrum, the SCC is asked to consider new project proposals without necessarily having the full context on forthcoming Clean Air Act requirements that power plants will be expected to meet in the next decade; only the Air Division is fully aware of this kind of information. In

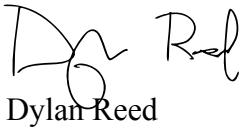
[17] U.S. Census Bureau's 2012 County Business Patterns Data, available at: http://www.census.gov/econ/cbp/

addition, the energy office is responsible for running innovative energy pilot programs, and there is no formal opportunity to share the results of these pilots with other agencies across the state.

For these reasons and more, we recommend that the Governor create a **formal commission** to coordinate energy and environmental planning, which would increase intra-governmental knowledge sharing as well as streamline processes and reduce market barriers in the power sector. This commission should consist of representatives from the DNR, DEQ, SCC, DCT and other key stakeholders that can provide input on decisions surrounding Virginia's energy markets.

Again, we appreciate the opportunity to provide comment on EO-57. Please do not hesitate to reach out with any questions or concerns you may have about our comments, our presentations, or any topic concerning the advanced energy industry.

Sincerely,



Dylan Reed
Advanced Energy Economy

Cc:
Todd Haymore, Secretary of Commerce and Trade
David Paylor, Director of the Virginia Department of Environmental Quality
John Warren, Director of the Virginia Department of Mines, Minerals, and Energy
John Daniel, Deputy Attorney General for Commerce, Environment and Technology