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**VCCER Response to Critique  
from Dr. William Shobe  
Regarding the VCCER Report  
“Appendix A-1 of the Virginia Energy Plan 2014”**



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## **VCCER Response to Critique from Dr. William Shobe**

### **Regarding the VCCER Report “Appendix A-1 of the Virginia Energy Plan 2014”**

On July 14, 2015, Dr. William Shobe of the Weldon Cooper Center for Public Service and the Frank Batten School of Leadership and Public Policy at the University of Virginia issued a report critiquing Appendix A-1 of the Virginia Energy Plan, which was prepared by a team from the Virginia Center for Coal and Energy Research (VCCER) and issued by the Office of the Governor in September 2014. It should also be noted that EPA issued its final Clean Power Plan rule, the subject of Appendix A-1 of the Virginia Energy Plan, on August 3, 2015, long after the Virginia Energy Plan was released.

While the VCCER does not intend to engage in ongoing public debate with Dr. Shobe, we believe that the specific criticisms in his report require a response and clarification from the VCCER. Clarification is important because Dr. Shobe's critique reflects upon the integrity and competency of the VCCER team. In addition, it will be important to subsequent discussions of the EPA Clean Power Plan (CPP) rule. We believe that many of Dr. Shobe's criticisms are a result of his failure to understand our report and methodology and of incorrect assumptions about how we arrived at the projections in the report.

A number of reports have been released regarding the draft EPA regulations. The VCCER report was one of the few that provided source data, explained methodologies, and relied solely on government or peer-reviewed information for its analysis. The analysis of the scenarios studied was based on widely-used and accepted methodologies and the standard practices of regional power grid operators and utilities in the Commonwealth and nationally.

In his critique, Dr. Shobe raises questions about the qualifications, expertise and standing of the VCCER team. The VCCER has a long history as a Commonwealth center of providing research and analysis for the executive and legislative branches of Virginia government, federal scientific and regulatory agencies, private industry, foundations and non-governmental organizations, international bodies, and professional organizations and societies. The VCCER team that prepared the report included professionals with over 25

years of regulatory experience, over 25 years of managing emissions trading and other programs for a major utility in the U.S. (including selling and buying billions of dollars' worth of allowances), experience in representing the EPA on cap and trade issues with foreign governments, over 30 years of experience related to the efficient operation and environmental compliance of electrical power generation plants, and over 35 years of energy research experience. The VCCER economic experts have developed and tailored economic models for industry, non-governmental organizations, and legislative and executive branches of government over more than three decades. Further, the VCCER team has over 30 years of experience and direct involvement in assessment of technology readiness levels (TRL) and direct participation in the development of the Clean Air Act Amendments of 1990. The team members also have been involved in energy efficiency, renewable energy, electrical transmission, fuel acquisition and other issues directly related to the topics requiring VCCER input in the Virginia Energy Plan.

## **Background**

The Virginia Center for Coal and Energy Research was created by an Act of the Virginia General Assembly on March 30, 1977, as an interdisciplinary study, research, information and resource facility for the Commonwealth of Virginia. Derived from its legislative mandate, years of experience, and subsequent legislation, the mission of the VCCER involves five primary functions:

- Research in interdisciplinary energy and coal-related issues of interest to the Commonwealth
- Coordination of coal and energy research at Virginia Tech
- Dissemination of coal and energy research information and data to users in the Commonwealth
- Examination of socio-economic implications related to energy and coal development and associated environmental impacts.
- Assist Commonwealth of Virginia in implementing the Commonwealth's energy plan.

First enacted in 2007 (SB 262), **The Virginia Energy Plan (VEP or Plan)** is a vehicle for establishing energy policy for the Commonwealth. During the 2014 session, the VEP was amended to include a new Item 8 (in § 67-201. Development of the Virginia Energy Plan. Subsection B), described below:

*8. With regard to any regulations proposed or promulgated by the U.S. Environmental Protection Agency to reduce carbon dioxide emissions from fossil fuel-fired electric generating units under § 111(d) of the Clean Air Act, 42 U.S.C. § 7411(d), an analysis of the (i) costs to and benefits for energy producers and electric utility customers; (ii) the effect on energy markets and reliability; and (iii) the commercial availability of technology required to comply with such regulations...*

Under Section § 67-202.Schedule, Subsection C., the new submission deadline for the VEP is defined as October 1, 2014, and every fourth October 1 thereafter. In addition, for the first time, interim updates on the Plan are requested by October 1 of the third year of each administration, to reassess goals, progress and lessons learned. According to Subsection D., the Plan should discuss

*...energy policy positions relevant to any potential regulations proposed or promulgated by the State Air Pollution Control Board to reduce carbon dioxide emissions from fossil-fired electric generating units under § 111(d) of the Clean Air Act.*

The Plan is also directed to ensure that Virginia promotes overall fuel diversity, assesses impacts to consumers—including disproportional impacts of energy price increases—and to identify options and measures that further the interests of the Commonwealth and its citizens.

Virginia statute gives the Division of Energy of the Department of Mines, Minerals and Energy (DMME) the overall responsibility to prepare this comprehensive Plan, in consultation with the State Corporation Commission, the Department of Environmental Quality and the VCCER at Virginia Tech. The report under discussion, which served as Appendix A-1 of the 2014 Virginia Energy Plan, addresses the new requirement of the revised VEP legislation, under Item 8 referenced above, and was developed by the VCCER by request of the DMME.

The VCCER report was based on the specific requirements of the Virginia Energy Plan and the approach taken by the EPA in its June 18, 2014, proposed rule. Given the short time available to complete this analysis and report, complex modeling exercises were not possible. The analysis was, therefore, based on previously published data and analyses,

usually on behalf of federal agencies, and was augmented by personal interviews and the professional experience of the report team.

Much of the following explanation is copied verbatim from Section 5 of our September 2014 report, and is included here to explain the stated limitations and assumptions included in our report. To examine the impact in Virginia of complying with the EPA's proposed rules, six scenarios of different power generation portfolios were developed with the input of the Virginia Department of Environmental Quality, the DMME, the State Corporation Commission, and the VCCER report team. The VCCER did not develop those scenarios independently. The baseline scenarios are straightforward and simply required an assessment of the Virginia power generation portfolio as adjusted by announced retirements, conversions, and new capacity, and were derived from the baseline data included in the EPA docket for its rulemaking, including the capacity factors for all fossil units. The emissions of CO<sub>2</sub> and the CO<sub>2</sub> emission rate using the net power output delivered to the grid were based on federal Energy Information Administration reports.

All subsequent scenarios (beyond the baseline) required reducing the capacity factor of coal-fired units, oil- and gas-fired steam boilers; increasing the capacity factor of existing natural gas combined cycle (NGCC) units; and assigning capacity factors for new state-of-the-art units. The objective of these changes to the generation portfolio was to abide by the CO<sub>2</sub> limit specified by EPA, while providing the requisite amount of power for the least possible cost (for the economic case) or to meet EPA renewable energy and conservation targets (for the green case). The study abided by the constraints established in the EPA rule proposal. These constraints included the EPA's definitions of affected units and of new capacity. Based on the publication date of the proposed rule for new sources under the EPA's 111(b) rulemaking, only those facilities for which construction commenced on or before January 8, 2014, were eligible for consideration in Virginia's portfolio and compliance calculations. Additionally, the EPA specified that only six percent of existing nuclear generation capacity could be included in compliance calculations. The VCCER did not introduce any additional constraints.

In order to ensure that total electrical demand in Virginia was met under all scenarios, additional electrical generation not subject to EPA's proposed rule was assumed to continue to be built as previously announced by the utilities. This additional generation consists of

smaller megawatt (MW) coal-fired units that are projected to produce less than 219,000 megawatt hours (MWh) annually and thus considered non-affected units by the EPA under the proposed rule. This additional generation also included small biomass generating units, and new generation where construction began after January 8, 2014, totaling about 11.5 MWh annually by 2030.

Several assumptions were also made about the costs and availability of fuel, the ability of the transportation infrastructure to deliver fuel (particularly natural gas) as needed for generation, and the reliability and balancing of the electrical grid to deliver the power generated. While investigations of many of those assumptions in depth were beyond the scope of the VCCER report, where those assumptions are critical to the analysis specific reference was made to show how those factors may have influenced the outcomes of the study. Divergences from the EPA's stated assumptions or goals for capacity factors, heat rate, or other efficiency and generation constraints were also noted and explained in detail.

Dr. Shobe identifies eleven main criticisms of the VCCER report, listed below:

1. VCCER double counts the compliance cost by \$400 million annually because the report added together two different estimates of compliance costs.
2. VCCER overstates the expected fossil fuel generation by at least 5,800 GWH's per year by understating the likely use of renewable fuels and conservation.
3. VCCER made calculation mistakes that cut the estimated benefits of emission reductions by more than 40 percent.
4. VCCER overstated the estimates of the negative economic effects of the regulations by mischaracterizing Virginia coal markets.
5. VCCER used inappropriate and incomplete economic analysis in estimating total economic cost and associated job losses, inflating cost and job losses.
6. Assumes unrealistically low capacity factors for Virginia new natural gas power plants in Warren and Brunswick counties.
7. Fails to provide a full analysis of the option of building a third reactor at the North Anna Nuclear Power Station.
8. Overestimated the rate of growth in electricity.
9. Does not analyze any cases of cooperation between the states even though such cooperation is a known way to lower compliance costs.
10. Misinterpreted on at least two occasions analysis provided by the EPA regulatory impact analysis of its proposed rule
11. Incorrectly characterized the results of a US GAO report on EPA's use of "social cost of carbon" estimates.

For ease of reference, we address each of these critiques individually in the following pages.

**1. VCCER double counts the compliance cost by \$400 million annually because the report added together two different estimates of compliance costs.**

In his critique, it seems that Dr. Shobe misunderstood the compliance cost discussed in our report. There is no “double counting” in the total compliance cost as presented in Table 8-3 in the VCCER report.

In the EPA official documentation of the Clean Power Plan, as published in the Federal Register, compliance cost is defined as the following:

*The compliance costs of this proposed action are represented in this analysis as the change in electric power generation costs between the base case and the proposed rule in which states pursue a distinct set of strategies beyond the strategies taken in the base case to meet the terms of the EGU GHG emission guidelines, and include cost estimates for demand-side energy efficiency<sup>1</sup>*

It is clear that the compliance cost specifically means the change in the electric power generation costs. It should not be lumped together with other costs such as business or consumer costs. As a result, the compliance cost estimate in Table 8-3 of the VCCER report has no “double counting.”

We assume Dr. Shobe’s allegation of double counting is referring to the business and consumer costs shown in Table 8-9 of the VCCER report. This is the worst-case scenario for business and consumer costs. We did not label these costs as the likely or realistic estimates of business or consumer costs, but rather, our report specifically states that these numbers are presented for illustrative purpose only, assuming 100 percent compliance cost can be passed along to customers. However, these costs are not the same as the compliance cost, and this is the cost to businesses and consumers where 100 percent of the compliance cost from electricity producers is passed along to electricity users and is added to the increased cost of electricity from increased fuel costs, etc. The more likely scenario for business and

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<sup>1</sup> Source: EPA Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, published at Federal Register. <https://www.federalregister.gov/articles/2014/06/18/2014-13726/carbon-pollution-emission-guidelines-for-existing-stationary-sources-electric-utility-generating>.

consumer costs is represented in Table 8-5 of our report, which also does not include “double counting.”

Throughout his critique, Dr. Shobe characterized our estimate of business and consumer cost under the worst-case scenario in our report as “total compliance cost”. This approach was used to support his conclusion that VCCER compliance costs are over-stated.

As stated in our report, in order to evaluate the economic impacts of the proposed substantial changes to regulation of the existing power generating fleet, it was necessary to include both consideration of the (1) costs of compliance and (2) sensitivity to fuel pricing. The cost of obtaining capital (e.g., interest on loans, bonds, etc.) and rates of return were not considered in the analysis. Costs and savings are presented as annualized costs for the stated compliance years (2020, 2025 and 2030). Actual costs and savings in other years will vary.

The strategies taken by Virginia electricity producers to be in compliance with new EPA CO<sub>2</sub> emission targets will also affect residential and business customers in Virginia. Again, as stated in our report, these effects will primarily impact residential consumers and businesses through change in electricity prices. It is assumed that electricity producers will attempt to recoup compliance cost via electricity price increases. If demand conservation programs are implemented, consumers and businesses will also share the cost of implementing such programs.

The determination of the price of electricity is a complex matter, affected by market demand, generation cost, and government regulations and policies. In Virginia, any electricity rate change needs to be approved by the State Corporation Commission. As a result, the rate does not always reflect market supply and demand. Sometimes, electricity producers choose to absorb a portion of compliance cost rather than to request a rate increase.

Because of this complexity, the VCCER report used the national study conducted by EPA economists on how the EPA’s Clean Power Plan might affect national and regional electricity price as a basis. In addition, irrespective of the impacts of CPP, the EPA study estimates that baseline electricity price will increase due to inflation and fuel costs by 2.4 percent in 2020 and 3.0 percent for both compliance years (2025 and 2030) and we adopted those increases in our study.

**2. VCCER overstates expected fossil fuel generation by at least 5,800 GWH's per year by understating the likely use of renewable fuels and energy conservation.**

The US DOE/EIA in its 2012 Table 5 for the Commonwealth of Virginia documents approximately 2.358 million megawatt hours of renewable generation in 2012, which is the “baseline” year for all EPA CPP calculations, as stated in the EPA June 2014 proposed rule.

North Carolina State University's Clean Technology Center maintains the DSIRE database of renewable energy programs in the US at

<http://programs.dsireusa.org/system/program/detail/2528>. Over 35 states (including Virginia) have some form of a renewable incentive program. The program in the Commonwealth of Virginia is a voluntary incentive program for the investor owned electric utility sector. Passed initially in 2007, it was updated in 2009 (HB 1994). Its initial goal was 15 percent renewables (on 2007 base year sales) by 2025. DSIRE shows the program also being updated in 2012, 2013 and 2014 by the Legislature in the Commonwealth.

It would have been presumptuous of the VCCER team to unilaterally attempt to anticipate what updates the Virginia legislature and Governor might make to the current voluntary renewable portfolio standard (RPS) program in light of the pending EPA CPP regulations. The VCCER report, in Scenarios 1 and 2, held the renewables and conservation levels at current or EPA Appendix 1 levels, with the agreement of all state agencies involved in developing the scenarios of the VCCER study. It should be noted that the 2012 base-line scenario was not included to demonstrate compliance with the draft regulations, but merely to illustrate the basis for comparisons of the compliance scenarios.

In the four compliance scenarios of the VCCER report, both the “economic dispatch” and “green dispatch” analyses showed substantially increasing renewable energy and conservation MWh's. See Table A below for comparison of the amounts used in each analysis.

Table A- Power generation for renewables and energy efficiency/demand side management (EE/DSM) from VCCER report

<b>Scenario 4 Economic - MWH's</b>			
	<b>2020</b>	<b>2025</b>	
VA. Existing and Incremental Renewables	2,358,443	5,054,758	
VA. EE/DSM Programs	331,215	1,162,194	
<b>Scenario 4 Green - MWH's</b>			
	<b>2020</b>	<b>2025</b>	
VA. Existing and Incremental Renewables	4,458,736	7,000,000	
VA. EE/DSM Programs	313,555	1,090,212	
<b>Scenario 5 Economic - MWH's</b>			
	<b>2020</b>	<b>2030</b>	
VA. Existing and Incremental Renewables	5,700,000	5,700,000	
VA. EE/DSM Programs	388,148	388,148	
<b>Scenario 5 Green - MWH's</b>			
	<b>2020</b>	<b>2030</b>	
VA. Existing and Incremental Renewables	5,700,000	9,500,000	
VA. EE/DSM Programs	388,713	2,396,756	
<b>Scenario 6 Economic - MWH's</b>			
	<b>2020</b>	<b>2030</b>	
VA. Existing and Incremental Renewables	2,500,000	5,700,000	
VA. EE/DSM Programs	313,797	388,428	
<b>Scenario 6 Green - MWH's</b>			
	<b>2020</b>	<b>2030</b>	
VA. Existing and Incremental Renewables	4,458,736	9,500,000	
VA. EE/DSM Programs	405,591	1,344,664	

Additionally, previous reports on Virginia’s potential for renewable generation have indicated that offshore wind has the highest potential for deployment. Dominion Energy has been involved with the state in investigating and beginning development of those resources. Based on Dominion’s Integrated Resource Plan (IRP), the earliest that offshore wind power would be available is 2025 and recently the small-scale demonstration precursor project of the full scale application was delayed for at least one year. Although

the VCCER recognizes the commitment of all parties involved to make offshore wind power a success, given all the uncertainties of this project, the VCCER did not feel that deployment of this renewable generation would be available in time to meet the 2030 compliance date, but included it in the generation shown in Table A as appropriate.

Many of the coal-fired generating assets of Dominion and other generators in the state have been in the rate base and have been paid for by Virginia ratepayers and thus are available for dispatch. New generation assets, whether renewable or fossil fuel based, would add to the costs for Virginia ratepayers. According to the DOE/EIA in their most recent report available at the time of the VCCER study (“Updated Capital Cost Estimates for Utility Scale Electricity Plants,” 2013), the following “overnight capital costs” to construct new generating capacity are:

Coal - Advanced PPC with CCS	\$5,300/ kilowatt (kW)
Coal – IGCC with CCS	\$5.559 / kW
Nat. Gas – Conventional CC	\$1,017 / kW
Nat. Gas – Adv. CC with CCS	\$2,141 / kW
Nuclear – dual unit	\$5 546 / kW
Wind – Offshore (400mw)	\$6,230 / kW
Solar – photovoltaic (150mw)	\$3,873 / kW
Biomass – CC (20mw)	\$8,180 / kW

[http://www.eia.gov/forecasts/capitalcost/pdf/updated\\_capcost.pdf](http://www.eia.gov/forecasts/capitalcost/pdf/updated_capcost.pdf)

Using these costs, the VCCER team chose to limit new renewable capacity in our attempt to balance achieving the CO<sub>2</sub> rate-based compliance targets and also fully utilizing current generating assets including new lower-emitting generating assets. In our analyses, this balance was one factor concurrently considered in our search for one possible least cost compliance solution.

**3. VCCER made calculation mistakes that cut the estimated benefits of emission reductions by more than 40 percent.**

Dr. Shobe criticizes the VCCER report for its evaluation of benefits, particularly as shown in Table 8-22 which is reproduced below. He indicates that our report failed to reconcile the EPA’s presentation of benefits in 2011 dollars and that we double discounted these benefits, making them much smaller than appropriate. As explained below, Dr. Shobe completely misunderstood our report.

Table 8-1:  
Summary of Estimated Emission Reductions and Benefits  
for Selected Scenarios versus 2012 Emissions

<b>Summary of Estimated Emission Reductions and Benefits for Selected Scenarios</b>					
<b>Scenario</b>	<b>Year</b>	<b>Estimated Reduction in CO<sub>2</sub> Emissions versus 2012</b>		<b>Estimated Benefits</b>	
		<b>Virginia</b>	<b>US</b>	<b>Virginia</b>	<b>US</b>
Scenario 4	2020	6.45 million	295 million	\$310 million	\$14 billion
	2025	9.07 million	376 million	\$458 million	\$19 billion
Scenario 5	2020	12.9 million	383 million	\$606 million	\$18 billion
	2030	12.9 million	555 million	\$721 million	\$31 billion
Scenario 6	2020	8.54 million	383 million	\$400 million	\$18 billion
	2030	11.9 million	555 million	\$660 million	\$31 billion

In order to analyze the impacts and benefits of the proposed rules on the public, including environmental and health costs and benefits, only the approaches used by the EPA in support of its June 18, 2014, proposal were utilized by the VCCER team; there was a lack of other easily-applicable methodology. The proportion of emissions reductions in Virginia, compared to the projected national reductions, was used to assign costs and benefits accruing in the Commonwealth based on the EPA’s published Regulatory Impact Analysis. VCCER did not perform any other analyses of health costs and benefits beyond pro-rating EPA’s published national figures for the proportion of reduction in carbon emissions in

Virginia. Additional data from the US Census Bureau was used to evaluate the possible impacts of changes in the electrical generation mix within Virginia, resulting from implementation of the EPA's proposed rules, on low-income and minority populations.

One of the significant concerns leading to the promulgation of regulations and the analysis in this report are the health and environmental impacts of CO<sub>2</sub> emissions and the benefits of limiting those emissions. The EPA prepared a detailed Regulatory Impact Analysis (RIA) that accompanied the release of the June 18, 2014, proposed rule. In the RIA, the EPA explained their means of identifying and monetizing the environmental and health impacts and benefits of CO<sub>2</sub> emissions and reductions possible under the proposed rule. The EPA noted that the climate benefits presented in its RIA are associated solely with CO<sub>2</sub> emissions.

In the RIA for the proposed rule, the EPA quantifies the impacts of CO<sub>2</sub> emissions using an economic valuation of the Social Cost of Carbon (SCC). SCC is a metric, developed by an interagency panel, which can be used to estimate, in monetary terms, the marginal changes in impacts of CO<sub>2</sub> emissions on an annual basis. According to the EPA, the SCC is based on consideration of anticipated global climate impacts, including agricultural, human health, property damage, and energy systems costs. Their rationale for using this metric and development of the number are given in another EPA publication from 2010, and its use is consistent throughout the Federal government. However, as we noted in our report, the Government Accountability Office and a number of other entities have criticized the EPA's methodology (although Dr. Shobe disagrees with our characterization of the cited GAO report.)

Since the EPA stated in the RIA that the SCC represented only a partial accounting of the total climate impacts, they developed another monetized metric of “estimated global climate benefits of CO<sub>2</sub> reductions” for the proposed rule. These values differ by year and also include the use of various discount rates to monetize the benefits. The EPA’s values were national, based on total tonnage reductions projected under the various options identified in the proposed rule. The EPA stated that the use of regional compliance strategies (e.g., that states would develop regional trading agreements) produced slightly smaller reductions in CO<sub>2</sub>, and as a result, smaller benefits. There was an acknowledgement in the RIA that the costs and benefits are not uniformly distributed. In order to provide some estimate of the magnitude of those benefits in Virginia, a proportional factor was assigned based on CO<sub>2</sub> emissions reductions in the Commonwealth versus nationally, using the scenarios examined in this report.

Given the time available to complete the report and the lack of publicly available data upon which to base any further analysis, a detailed health investigation was beyond the scope of this report. Instead, EPA’s estimates in the RIA for the proposed rule were used by the VCCER team without any discounting whatsoever. If, therefore, EPA presented the benefits in 2011 dollars, our calculations are directly based on those figures.

While the EPA’s RIA indicated that the SCC includes some estimate of health costs associated with CO<sub>2</sub> emissions, it also outlined several metrics for health benefits of the proposed rule based on “health co-benefits.” The EPA states that implementing the proposed rule guidelines will result in reductions of particulate matter (PM<sub>2.5</sub>), ozone and other atmospheric emissions that can have a negative impact on human health. It was also noted in our report that a number of organizations have criticized EPA’s approach, since those organizations believe the majority of the health benefits are realized not for CO<sub>2</sub>

reductions under this proposed rule, but rather for pollutants regulated under another section of the Clean Air Act.

In order to monetize the health impacts of the reductions in discharges of these and other air pollutants, the EPA considered both avoided premature deaths and avoided morbidity effects of numerous non-fatal endpoints. Based on analysis of those factors, the EPA published summaries of national and regional health benefits per ton of reduced emissions from electrical generation units. The EPA recognized differences on a regional basis, based in part on the differences in specific fuels used in different regions. The EPA warned, “Great care should be taken in applying these estimates to emissions reductions occurring in any specific location, as these are all based on broad emissions reductions scenarios...” As a result, EPA concluded that the health co-benefits may be either over- or under-estimated. It should be noted that this analysis does not include any health co-benefits that may accrue as a result of lowered exposures to hazardous air pollutants, ecosystem effects and visibility impairment.

In order to estimate the co-benefits in Virginia, we used the proportion of CO<sub>2</sub> reduction expected in the Commonwealth under the scenarios considered in our report, which averaged 2.2 percent of the national total, to be the proportional reduction in other emissions.

A 2014 EPA-funded study at MIT (“A Self-Consistent Method to Assess Air Quality Co-Benefits from US Climate Policies” by Rebecca Saari, Noelle E. Selin, Sebastian Rausch, and Tammy M. Thompson, MIT Joint Program on the Science and Policy of Global Change, Report No. 259, April 2014) examined the air quality co-benefits of carbon management policies. The study showed a wide variation in the value of co-benefits derived from air

quality improvements, ranging from 26 to 1,050 percent of the costs of policy implementation. The study also indicated that “cap-and-trade” policies were less costly than sector-specific programs, such as the CPP. The article also reinforced the uncertainties of both costs and benefits based on year-to-year meteorological variability, regional variability, and basic uncertainties in both health and economic models.

#### **4. VCCER overstated the estimates of the negative economic effects of the regulations by mischaracterizing Virginia coal markets.**

Dr. Shobe's report states that the VCCER report "implicitly assumes that most coal mined in Virginia is used for electricity generation and would have no market other than Virginia power plants. This is incorrect. As of 2011, only about a third of Virginia Coal was used in electricity generation in Virginia."

This criticism misses the reasons for our assumptions and the dynamic nature of the coal market in the United States. Because the draft regulations cover the entire U.S., global coal markets would inevitably be impacted. In recent years, less than half of Virginia coal output is used for power generation, and about 40 percent of coal output is used for export. Nationally, however, 90 percent of coal output is used for power generation, as shown in the referenced EIA publication. Based on its significant experience and expertise, the VCCER report team felt it was inappropriate to assume that Virginia coal companies operate in an environment isolated from the global and national markets, or that Virginia's coal companies could maintain production and keep existing market share even as national coal production and consumption and global coal prices were severely impacted.

Nationally, since over 90 percent of domestic coal production is used for electricity generation, the proposed EPA rule has already significantly impacted domestic coal demand and this trend is expected to accelerate in the foreseeable future. Subsequently, the domestic and global coal price will decline sharply. Additionally, lower cost coal producers in other states or countries might be able to deliver fuel for the remaining Virginia demand, displacing production within the Commonwealth. Data from the EIA shows that Virginia's cost of coal production is significantly higher than the national average. It is under a significant competitive disadvantage to coal produced in neighboring states. When market conditions change and coal price and demand both fall, it would be unrealistic to expect Virginia's coal industry to keep its market share and perhaps to afford to even operate. Recent events have shown the VCCER report's estimates of production impacts to be realistic. These include recent mine closures and the bankruptcy of major coal producers (most notably Virginia-based Alpha Natural Resources, the top coal producer in Appalachia), resulting from the depressed market (with exports now estimated to be 20 percent below last year's tonnages), low prices and high costs of production.

**5. VCCER used inappropriate and incomplete economic analysis in estimating total economic cost and associated job losses, inflating cost and job losses.**

Dr. Shobe's report states that "The economic analysis in the report implicitly assumes that people do not make sensible adjustments to changes in economic circumstances and assumes that there are no economic benefits elsewhere in the economy."

As Dr. Shobe knows, a typical criticism of an economic impact study is to claim that the model is static rather than dynamic. The VCCER team selected one of the most-widely employed and accepted economic models, which is used extensively by prominent and highly-respected economists. The assumptions in this model are based on the current economic structure of the state and the region. All economic estimates in the VCCER study are based on the assumptions of that particular model.

To the knowledge of the VCCER team, there are no other models that take into account all the behavioral factors (such as moving or changing careers) stated by Dr. Shobe. Should they exist, those models still would, of necessity, make assumptions about how people will change their behaviors 10 or 20 years from now. Those assumptions would be open to criticism as well. Thus, the model chosen in the VCCER study is standard prudent practice, and does not require speculation as to how human behavior might change 10 to 20 years into the future.

Dr. Shobe's critique cited the possibility that unemployed Virginia coal miners could find a job or move to another state, thus mitigating the impact of loss of coal jobs. That criticism also misses the point of the VCCER analysis, which looks at impact on the Commonwealth. First, Virginia coal mines, and the infrastructure that supports them, are mainly located in southwest Virginia, an area with a struggling economy and high unemployment rates and few other economic engines. For example, the June 2015, unemployment rates for Buchanan, Dickenson, Wise and Lee Counties were 11.1 percent, 10.2 percent, 9.2 percent and 7.9 percent, much higher than the state average of 5.0 percent. It is not easy for displaced coal miners to find jobs. This high rate of unemployment and the small size of the regional labor market also makes it likely that every job that is filled by a displaced miner is one fewer job available for those entering the workforce or with less experience, thus keeping overall employment levels high.

In addition, with more coal miners looking for jobs, regional wages will not increase; indeed most will probably decrease. As of the first quarter of 2015, annual average wage for the coal mining industry in Southwest Virginia was \$78,349 compared with an average wage of \$35,041 for all industries in the region. In an economic environment like southwest Virginia's coal region, opportunities are limited for displaced coal miners. As a result, even considering the possibility that displaced labor will move to other types of employment or to other regions, the end result will not be much different from what was estimated in the VCCER report—many jobs will be lost, displaced miners will have to settle, if they are lucky, for much lower wages, and the regional economy will be affected negatively. Again, the VCCER report's analysis represents a realistic scenario, based on deep understanding of the economy of the coal-producing region of the state.

**6. VCCER assumes unrealistically low capacity factors for Virginia’s new natural gas power plants in Warren and Brunswick counties.**

As stated previously, the scenarios evaluated in the study were collectively developed by DEQ, DMME, and VCCER, and were designed in part to determine the impact of certain aspects of the proposed clean power plan.

Scenario 2, which seems to be the sole focus of this comment was intended to isolate and evaluate only the singular impact of EPA Building Block #2 (preserved nuclear) upon the calculation of the Commonwealth’s CO<sub>2</sub> emission rate using 2012 capacity factors for all generating units. Scenario 2 represents a baseline and is not one of the compliance scenarios; therefore, the capacity factors for the new NGCC’s were held near zero to isolate the impact of the EPA CPP-suggested 6 percent preserved nuclear input.

In subsequent scenarios, where compliance was the primary focus, the new generating capacity from the new NGCC generation was unconstrained and thus dispatched at the following high capacity factor (CF) levels in accordance with the building blocks cited in EPA’s proposed rule:

Scenario 4 Economic -2020 - all 2,580 MW of the Warren and Brunswick capacity were dispatched at a 65 percent CF.

Scenario 4 Green – 2020 – all 2,580 MW of the Warren and Brunswick capacity were dispatched at a 65 percent CF.

Scenario 4 Economic and Green for 2025 - (following EPA CPP Appendix 2 guidance) all MW’s of this new NGCC capacity was again dispatched at a 65 percent CF.

Scenario 5 Economic -2020 - all 2,580 MW of the Warren and Brunswick capacity were dispatched at a 70 percent CF.

Scenario 5 Green – 2020 – all 2,580 MW of the Warren and Brunswick capacity were dispatched at a 70 percent CF.

Scenario 5 Economic and Green for 2030 - all MW’s of this new NGCC capacity was again dispatched at a 70 percent CF.

Scenario 6 Economic -2020 - all 2,580 MW of the Warren and Brunswick capacity were dispatched at a 60 percent CF.

Scenario 6 Green – 2020 – all 2,580 MW of the Warren and Brunswick capacity were dispatched at a 60 percent CF.

Scenario 6 Economic and Green for 2030 - all MW's of this new NGCC capacity were dispatched at a 68 percent CF in 2030 (economic case) and at a 60 percent CF in 2030 in the (green case) respectively.

As shown in these data from the VCCER report, the critique that low CFs were used in the VCCER calculations is completely inaccurate.

## **7. The VCCER report fails to provide a full analysis of the option of building a third reactor at the North Anna Nuclear Power Station.**

In addition to the nuclear generation taken into account in the state goals in EPA's proposed rule (6 percent preserved nuclear), any additional new nuclear generating units or uprating of existing nuclear units, relative to a baseline capacity as of the date of the proposal could be a component of a state plan. Reference - EPA Section 34923 (as published in the Federal Register on June 18, 2014). Part 8 – Potential Emission Reduction Measures Not used to Set Proposed Goals. The EPA also requested comments on alternative nuclear capacity treatment in this proposed draft rule.

As Dr. Shobe indicates in his critique, the VCCER team, at the request of the Virginia DEQ, analyzed a special case including the capacity from a North Anna Unit #3. The unit was assumed to come on line in 2022 and to generate 10.3 million CO<sub>2</sub>-free MWhs annually from 1,470 MWs of new nuclear capacity. This scenario lowered the CO<sub>2</sub>/MWh rate for the Commonwealth to 792 for 2020. For example purposes only, this special new nuclear capacity was inserted without the use of any renewables or conservation to highlight the enormous impact of the addition of this proposed new Dominion nuclear unit upon the state compliance plan.

At the time of our study, Dominion Virginia Power's most recent Integrated Resource Plan (filed with the Virginia State Corporation Commission and dated August 29, 2014) discussed the potential for a new nuclear unit at their North Anna site (see section 5.3 of their plan, page 71).

- The Company stated "it is in the process" of developing a new nuclear unit at its existing North Anna Power Station
- The process is contingent upon obtaining all the required permits and licenses (COL) and also Nuclear Regulatory Commission approval of the withdrawal of Old Dominion Electrical Cooperative from any Unit #3 participation.
- Dominion now determines that the "earliest" possible in-service date for a North Anna unit #3 would be September 2027 with this capacity being available to meet summer peak demand in 2028.

- “The company states it *has not committed* to build North Anna 3 and will not make a final decision until after the issuance of the COL” (by the NRC).  
[emphasis added by VCCER]

Due to these considerations regarding North Anna Unit #3, the VCCER team and the other state agencies preparing the Virginia Energy Plan concluded it was not prudent to include the addition of new nuclear capacity in the compliance analysis.

## **8. Overestimated the rate of growth in electricity demand.**

Several other assumptions directly impacted the analysis and interpretation of results included in the VCCER report. One critical assumption was the rate of growth in electricity demand. Virginia has not established an official growth rate, and estimates in the published literature varied from less than 1 percent to over 2 percent. In conducting this study, the projected rate of growth of 1.51 percent, used by Dominion Energy in their official 2014 submittals to the states of North Carolina and Virginia, was used to develop demand projections. The VCCER did not develop this growth rate, but chose to use a publicly available rate instead of making forecasts.

**9. The VCCER Report does not analyze any cases of cooperation between states, even though such cooperation is a known way to lower compliance costs.**

In the June 2014 Draft CPP Plan, the US EPA suggested an alternative compliance method through the use of a Mass Based Tonnage Compliance Program (Regional Trading) as opposed to its proposed rate based compliance program. At that time, EPA simply laid out what components they deemed necessary to convert each state's rate based requirements into equivalent mass based CO<sub>2</sub> tons. VCCER provided comments to the EPA CAMD Division stating that insufficient data and instructions were provided in the proposed rule to insure that each state would submit consistent calculations to the EPA if such a mass-based compliance alternative was chosen.

Probably as a result of comments received, the US EPA issued technical documentation and calculations of the mass based tons for all the affected states under the CPP in November 2014 (after the publication of the VCCER report). These can be found in:

*Rate to Mass Technical Support Document – November 2014*

*Technical Support Document: Translation of the Clean Power Plan Emission Rate-Based CO<sub>2</sub> Goals to Mass-Based Equivalents (PDF)*

<http://www2.epa.gov/cleanpowerplan/clean-power-plan-proposed-rule-technical-documents>

Given the short time frame (June 15 to September 1, 2014), the budget for the VCCER analysis, and the availability of only state-level comparative compliance cost data (EPA IPM Shadow Costs), it was decided that no recommendation could be made for or against the Commonwealth's participation in a regional trading program or mass based tonnage compliance; therefore, additional study on this issue was recommended in the VCCER report.

In the months since the issuance of the June 2014 CPP, other states near the Commonwealth have expressed an interest in exploring a regional program for carbon allowances which would discard many of the constraints and limitations found in the northeast's Regional Greenhouse Gas Initiative (RGGI) program. A new regional trading program has yet to be formally explored and it would require agreement upon conceptual

design, memoranda of understating by the many states and enabling legislation by each of the states involved.

Other state and regional trading programs (RGGI and California AB32) have been created to address CO<sub>2</sub> in those areas. These limited membership programs are characterized by strict auction rules, limits on allowance holdings, who can participate/own allowances and governing board prescribed price controls. In preparation of its report, the VCCER team contacted RGGI management to ascertain what steps would be required of the Commonwealth of Virginia to join the RGGI program. While RGGI has not yet formally adopted requirements for new members, we were informed that these might include:

- Participation in the quarterly auction
- Return of proceeds to consumer benefit – renewables or efficiency etc.
- Avoid dilution of the strength of the RGGI cap
- Transferability of allowances to others in RGGI

In addition, the state would need to sign the most recent RGGI MOU and pass enabling legislation documenting the distribution of the proceeds to the various sectors.

As of release of our report on October 1, 2014, the VCCER team decided that it would be premature to recommend that the Commonwealth join in any mass based trading program until a great deal of additional study had been conducted to identify the correct solution for the Commonwealth (rate- versus mass-based).

## **10. VCCER misinterpreted analysis provided by the EPA in the EPA's regulatory impact analysis of its proposed rule.**

Dr. Shobe's report states that the VCCER made a mistake by treating estimates in the regulatory impact analysis "as if they were EPA's estimate of compliance cost." This is not correct. The VCCER report never claimed this is the EPA's estimate of the compliance cost. The VCCER report assumed this is simply the price increase that will be borne by businesses and consumers who use electricity

Dr. Shobe's report also claims the VCCER report interpreted "these price increase estimates as full measures of compliance cost." Once again, Dr. Shobe's critique makes statements about conclusions supposedly found in the VCCER report that were never expressed in the report. The VCCER team understood perfectly that only one portion of compliance cost were passed through. That is why the VCCER report also presented a worst-case scenario—for illustrative purposes--for business and consumer costs where all compliance costs were passed through. Not surprisingly, worst-case scenario (Report Table 8-9) costs were much higher than a more realistic estimate of business and consumer costs (Report Table 8-5). But that is not "double counting." They are costs estimated under two different scenarios. Dr. Shobe's report shows a lack of understanding of the intent and content of the VCCER report.

Also on page 23 of his critique, Dr. Shobe states that the cost estimates included in the VCCER report "make a mistake by inflating the nominal electricity price before increasing them by the EPA estimated compliance cost factor of three percent. Then they present these estimates as being in 2012 dollars, which they are not, and make the mistake of adding 2030 dollars to 2012 dollars in the results." More specifically, he claims the VCCER study inflated the electricity price using the nominal rate. This statement by Dr. Shobe is incorrect. The VCCER report quoted the nominal price rate (3.5 percent), but used only the real rate of increase (1.4 percent, on top of general inflation) in estimating the consumer electricity cost. The cost estimates, therefore, are stated in 2012 dollars, not 2030 dollars as Dr. Shobe claims. There is no inflating of costs in the VCCER report.

Dr. Shobe implies that the VCCER report includes intentional cost inflation as an indicator of bias on the part of the VCCER team. We reject these accusations which are not supported by a careful reading of the VCCER report. Dollar values were properly adjusted

to account for time based discounting and all dollar figures are presented in 2012 dollars throughout the report. It is not clear how Dr. Shobe can arrive at this conclusion without verifying any underlying calculations behind the VCCER report.

**11. VCCER incorrectly characterizes the results of a US GAO report on EPA’s use of the “social cost of carbon” estimates.**

The VCCER team disagrees with Dr. Shobe’s interpretation of the GAO report and stands by its comments included in the report. We were moderate in our criticism of the “social cost of carbon” estimates and only identified the criticisms without taking a position on the value of the concept.

In addition to the comments made in the VCCER report, we offer the following supporting documentation of controversy surrounding the SCC issue, which we chose not to cite.

- February 26, 2014, Comments from the American Coalition for Clean Coal Electricity on Docket OMB-OMB 2013-007 - Technical Update of the Social Cost of Carbon for Regulatory Analysis Under Executive Order 128667 (Nov 2013)
- Comments on this same OMB Docket from the Institute for Energy Research regarding the calculation of the Social Cost of Carbon by the Obama Administration.
- A 2014 report from the US Chamber of Commerce titled “Charting Federal Costs and Benefits” highlighting a preponderance of federal regulations with no clear methodology of calculating cost and benefits.

## **Conclusion**

The VCCER and the report team stand behind their contribution to the Virginia Energy Plan. It was our responsibility to produce a report that all stakeholders could use to evaluate realistic options to achieve the required reductions in CO<sub>2</sub> emissions while ensuring energy security for the citizens of the Commonwealth. While we understand that there are many approaches that could have been used to evaluate the potential for Virginia's compliance with the EPA's proposed Clean Power Plan regulations, we feel our study was professional, unbiased, and based on publically-available information, primarily from government sources. In carrying out our responsibilities, we acted with professional integrity, diligence, pragmatism, and due care.

Since the preparation of our report, EPA and the President have released the final Clean Power Plan. The VCCER continues to update its analysis of these issues based on the final regulations in order to provide reliable, unbiased information and help ensure that the Commonwealth and the nation develop implementable approaches to address the environmental, economic and electrical power needs of this and future generations.