STATE OF VIRGINIA
BEFORE THE STATE CORPORATION COMMISSION

Application of Virginia Electric and Power Company for approval, certification and rate adjustment under Section 56-585.1, Section 56-580.D, and Section 56-46.1 of the Code of Virginia with regard to a carbon capture compatible, clean-coal powered electric generation facility	)	**Case No. PUE-2007-00066**

DIRECT TESTIMONY OF DAVID A. SCHLISSEL
ON BEHALF OF
THE SOUTHERN ENVIRONMENTAL LAW CENTER
THE SIERRA CLUB
THE CHESAPEAKE CLIMATE ACTION NETWORK

PUBLIC VERSION
PROTECTED MATERIALS REDACTED

NOVEMBER 2, 2007

PUBLIC VERSION

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1. Introduction

Q. What is your name, position and business address?

A. My name is David A. Schlissel. I am a Senior Consultant at Synapse Energy Economics, Inc, 22 Pearl Street, Cambridge, MA 02139.

Q. Please describe Synapse Energy Economics.

A. Synapse Energy Economics ("Synapse") is a research and consulting firm specializing in energy and environmental issues, including electric generation, transmission and distribution system reliability, market power, electricity market prices, stranded costs, efficiency, renewable energy, environmental quality, and nuclear power.

Synapse's clients include state consumer advocates, public utilities commission staff, attorneys general, environmental organizations, federal government and utilities. A complete description of Synapse is available at our website, www.synapse-energy.com.

Q. Please summarize your educational background and recent work experience.

A. I graduated from the Massachusetts Institute of Technology in 1968 with a Bachelor of Science Degree in Engineering. In 1969, I received a Master of Science Degree in Engineering from Stanford University. In 1973, I received a Law Degree from Stanford University. In addition, I studied nuclear engineering at the Massachusetts Institute of Technology during the years 1983-1986.

Since 1983 I have been retained by governmental bodies, publicly-owned utilities, and private organizations in 28 states to prepare expert testimony and analyses on engineering and economic issues related to electric utilities. My recent clients have included the New Mexico Public Regulation Commission, the General Staff of the Arkansas Public Service Commission, the Staff of the Arizona Corporation Commission, the U.S. Department of Justice, the Commonwealth of Massachusetts, the Attorneys General of the States of Massachusetts, Michigan,

New York, and Rhode Island, the General Electric Company, cities and towns in Connecticut, New York and Virginia, state consumer advocates, and national and local environmental organizations.

I have testified before state regulatory commissions in Arizona, New Jersey, Connecticut, Kansas, Texas, New Mexico, New York, Vermont, North Carolina, South Carolina, Maine, Illinois, Indiana, Ohio, Massachusetts, Missouri, Rhode Island, Wisconsin, Iowa, South Dakota, Georgia, Minnesota, Michigan, Florida and North Dakota and before an Atomic Safety & Licensing Board of the U.S. Nuclear Regulatory Commission.

A copy of my current resume is attached as Exhibit DAS-1.

Q. On whose behalf are you testifying in this case?

A. I am testifying on behalf of the Southern Environmental Law Center, the Sierra Club and the Chesapeake Climate Action Network.

Q. Have you testified previously before this Commission?

A. Yes. I testified in Case No. PUE-2005-00018.

Q. What is the purpose of your testimony?

A. Synapse was retained by the Southern Environmental Law Center, the Sierra Club and the Chesapeake Climate Action Network to assist in its evaluation of the Application of Virginia Electric and Power Company ("Dominion Virginia Power" or "the Company") for authority to construct and operate a new coal-fired circulating fluid bed ("CFB") power plant in Wise County, Virginia. ("the Wise County Plant")

This testimony presents the results of our analyses.

Q. Were there other members of the Synapse staff who also assisted in the analyses undertaken by Synapse as part of its evaluation of Dominion Virginia Power's proposed Wise County Plant?

A. Yes. Dr. David White and Michael Drunsic also were members of our project team. Copies of their resumes are available at www.synapse-energy.com.

Q. Please summarize your conclusions.

A. My conclusions are as follows:

1. Dominion Virginia Power has not adequately considered the risks associated with building a new coal-fired power plant in analyses of the Wise County Plant.

2. The most significant uncertainties and risks associated with the proposed Wise County Plant are the potential for future federal restrictions on CO_2 emissions and further increases in the project's capital cost.

3. In particular, it is important for Dominion Virginia Power to justify the Wise County Plant in light of coming federal regulation of greenhouse gas emissions. It would be imprudent for the Company to continue its participation in the Project without considering of CO_2 prices in its economic analyses. Instead, to reflect the uncertainties and risks, the Company should use a range of possible CO_2 prices such as the forecasts presented by Synapse in this Case.

4. The Company's economic analyses do not show that the proposed Wise County Plant would provide power at a reasonable price as compared to other alternatives.

5. The Wise County Plant would not enable Dominion Virginia Power to diversify its fuel mix.

6. For these reasons, the State Corporation Commission should reject Dominion Virginia Power application for a certificate of public

convenience and necessity to construct and operate the proposed Wise County Plant.

7. Even if it approves the Company's application to construct and operate the Wise County Plant, the Commission should not grant Dominion Virginia Power's request for an additional 200 basis points in its return on equity.

Q. Please explain how you conducted your investigations in this proceeding.

A. We have reviewed the application, testimony and exhibits filed by Dominion Virginia Power in this case. In addition, we have participated in discovery. As part of that work, we have reviewed the information and documents provided by the Company in response to data requests submitted by our clients and by the Attorney General. We also have reviewed public information related to the issues addressed in Dominion Virginia Power application, testimony and exhibits and in our testimony and exhibits.

2. Dominion Virginia Power Has Not Adequately Considered The Risks Associated With Building A New Coal-Fired Generating Unit

Q. Why is it important that Dominion Virginia Power consider risk when evaluating the economics of building the proposed Wise County Plant?

A. Risk and uncertainty are inherent in all enterprises. But the risks associated with any options or plans need to be balanced against the expected benefits from each such option or plan.

In particular, parties seeking to build new generating facilities and the associated transmission face of a host of major uncertainties, including, for example, the expected cost of the facility, future restrictions on emissions of carbon dioxide, and future fuel prices. The risks and uncertainties associated with each of these factors needs to be considered as part of the economic evaluation of whether to pursue the proposed facility or other alternatives.

Q. Have you seen any evidence that Dominion Virginia Power has adequately considered risks and uncertainties in its evaluations of the proposed Wise County Plant?

A. No. The Company's testimony contains a number of general statements about the risks associated with increased reliance on oil and natural-gas but we have not found any evidence that Dominion Virginia Power has considered the risks associated with building a new baseload coal-fired generating unit. For example, there is no evidence that the Company has considered any greenhouse gas regulation costs in any economic analysis of the proposed Wise County Plant. As I will discuss below, this is an extremely unrealistic and imprudent assumption.

In addition, Dominion Virginia Power's economic analyses that we have examined do not include any assessment of the uncertainty or risks associated with higher capital costs.

Q. Is it reasonable to expect that Dominion Virginia Power could reflect uncertainty and risk in its economic analyses of whether to pursue The Wise County Plant or alternatives?

A. Yes. There are a number of ways that Dominion Virginia Power could have considered uncertainty and risk. The most simple way would have been to perform sensitivity analyses reflecting engineering type bounding in which the key variables would be expected to vary by X% above or below their projected values. In my experience, utilities regularly consider risk in this way.

Q. Have other companies provided such analyses in their Integrated Resource Plans or in the modeling analyses presented in support of requests to build and operate new generating facilities?

A. Yes. We have seen such sensitivity analyses in many of the power plant cases in which we have been involved in recent years. This case is unique in that Dominion Virginia Power has presented such a weak economic analysis in

support of its application and has not even prepared modeling analyses that examine whether the proposed Wise County Plant is part of a least or lowest cost plan for ratepayers.

Q. What are the most significant fossil plant-specific uncertainties and risks associated with building new coal-fired generating plants like The Wise County Plant?

A. The most significant uncertainties and risks associated with new coal-fired generating plants like the proposed the Wise County Plant are the potential for future restrictions on CO_2 emissions and the potential for further increases in the project's capital cost. Other potential uncertainties and risks for new coal plants include the potential for fuel supply disruptions that could affect plant operating performance and fuel prices and the potential for increasing stringency of regulations of current criteria pollutants.

Q. Have any proposed coal-fired generating projects been cancelled as a result of concern over increasing construction costs or the potential for federal regulation of greenhouse gas emissions?

A. Yes. A number of coal-fired power plant projects have been cancelled within the past year, in part, because of concern over rising construction costs and climate change. For example:

- Tenaska Energy cancelled plans to build a coal-fired power plant in Nebraska because of rising steel and construction prices. According to the company's general manager of business development:

  .. coal prices have gone up "dramatically" since Tenaska started planning the project more than a year ago.

  And coal plants are largely built with steel, so there's the cost of the unit that we would build has gone up a lot… At one point in our development, we had some of the steel and equipment at some very attractive prices and that equipment all of a sudden was not available.

  We went immediately trying to buy additional equipment and the pricing was so high, we looked at the price of the power that would

be produced because of those higher prices and equipment and it just wouldn't be a prudent business decision to build it.[1]

- TXU cancelled 8 of 11 proposed coal-fired power plants, in large part because of concern over global warming and the potential for federal legislation restricting greenhouse gas emissions.[2]
- Westar Energy announced in December 2006 that it was deferring site selection for a new 600 MW coal-fired power plant due to significant increases in the facility's estimated capital cost.
- Tampa Electric just cancelled a proposed integrated gasification combined cycle plant ("IGCC") due to uncertainty related to CO2 regulations, particularly capture and sequestration issues, and the potential for related project cost increases. According to a press release, "Because of the economic risk of these factors to customers and investors, the company believes it should not proceed with an IGCC project at this time," although it remains steadfast in its support of IGCC as a critical component of future fuel diversity in Florida and the nation.
- Four public power agencies suspended permitting activities for the coal-fired Taylor Energy Center because of growing concerns about greenhouse gas emissions.[3]

Q. Have you seen any instance where a participant in a jointly-owned coal-fired power plant project has withdrawn because of concern over increasing construction costs or potential CO_2 emissions costs?

A. Yes. Great River Energy ("GRE") just withdrew from the proposed Big Stone II coal-fired power plant project in South Dakota. According to GRE, four factors contributed most prominently to the decision to withdraw, including uncertainty about changes in environmental requirements and new technology and that fact that "The cost of Big Stone II has increased due to inflation and project delays."[4]

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1 Available at www.swtimes.com/articles/2007/07/09/news/news02.prt.
2 See www.marketwatch.com/news/story/txu-reversal-coal-plant-emissions.
3 See www.taylorenergycenter.org/s_16asp?n=40.
4 See ww.greatriverenergy.com/press/news/091707_big_stone_ii.html.

Q. Have any proposed coal-fired generating projects been rejected by state regulatory commissions due to concerns over increasing construction costs or the potential for federal regulation of greenhouse gas emissions?

A. Yes. Just since last December, proposed coal-fired power plant projects have been rejected by the Oregon Public Utility Commission, , the Florida Public Service Commission, and the Oklahoma Corporation Commission. The North Carolina Utilities Commission rejected one of the two coal-fired plants proposed by Duke Energy Carolinas for is Cliffside Project.

The decision of the Florida Public Service Commission in denying approval for the 1,960 MW Glades Power Project was based on concern over the uncertainties over plant costs, coal and natural gas prices, and future environmental costs, including carbon allowance costs.[5] In addition, the Oklahoma Corporation Commission has just voted to reject Public Service of Oklahoma's application to build a new coal-fired power plant.

Q. Is the Company aware that coal-fired power plant projects have been cancelled or rejected as a result of risks and uncertainties associated with carbon regulation and increasing construction costs?

A. [REDACTED]

[REDACTED]

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[5] Order No. PSC-07-0557-FOF-EI, Docket No. 070098-EI, July 2, 2007.

[6] Dominion Virginia Power Confidential Response to Interrogatory SELC 1-11(b), at the second unnumbered page.

Q. Is it important to evaluate the uncertainties and risks associated with alternatives to the Wise County Plant Project as well?

A. Yes. The risks associated with building natural gas-fired alternatives include potential CO_2 emissions costs, possible capital cost escalation and fuel price uncertainty and volatility.

Renewable alternatives and energy efficiency also have some uncertainties and risks. These include potential capital cost escalation, contract uncertainty and customer participation uncertainty.

3. Dominion Virginia Power Has Not Adequately Considered The Risks Associated With Future Federally Mandated Greenhouse Gas Reductions

Q. Is it prudent to expect that a policy to address climate change will be implemented in the U.S. in a way that should be of concern to coal-dependent utilities in the Midwest?

A. Yes. The prospect of global warming and the resultant widespread climate changes has spurred international efforts to work towards a sustainable level of greenhouse gas emissions. These international efforts are embodied in the United Nations Framework Convention on Climate Change ("UNFCCC"), a treaty that the U.S. ratified in 1992, along with almost every other country in the world. The Kyoto Protocol, a supplement to the UNFCCC, establishes legally binding limits on the greenhouse gas emissions of industrialized nations and economies in transition.

Despite being the single largest contributor to global emissions of greenhouse gases, the United States remains one of a very few industrialized nations that have not signed the Kyoto Protocol.[8] Nevertheless, individual states, regional groups

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[7] Id, at the third unnumbered page.

[8] As I use the terms "carbon dioxide regulation" and "greenhouse gas regulation" throughout our testimony, there is no difference. While I believe that the future regulation we discuss here will

of states, shareholders and corporations are making serious efforts and taking significant steps towards reducing greenhouse gas emissions in the United States. Efforts to pass federal legislation addressing carbon, though not yet successful, have gained ground in recent years. These developments, combined with the growing scientific understanding of, and evidence of, climate change as outlined in Dr. Hausman's testimony, mean that establishing federal policy requiring greenhouse gas emission reductions is just a matter of time. The question is not whether the United States will develop a national policy addressing climate change, but when and how. The electric sector will be a key component of any regulatory or legislative approach to reducing greenhouse gas emissions both because of this sector's contribution to national emissions and the comparative ease of regulating large point sources.

There are, of course, important uncertainties with regard to the timing, the emission limits, and many other details of what a carbon policy in the United States will look like.

Q. If there are uncertainties with regard to such important details as timing, emission limits and other details, why should a utility engage in the exercise of forecasting greenhouse gas prices?

A. First of all, utilities are implicitly assuming a value for carbon allowance prices whether they go to the effort of collecting all the relevant information and create a price forecast, or whether they simply ignore future carbon regulation. In other words, a utility that ignores future carbon regulations is implicitly assuming that the allowance value will be zero. The question is whether it's appropriate to assume zero or some other number. There is uncertainty in any type of utility

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govern emissions of all types of greenhouse gases, not just carbon dioxide ("CO_2"), for the purposes of our discussion we are chiefly concerned with emissions of carbon dioxide. Therefore, we use the terms "carbon dioxide regulation" and "greenhouse gas regulation" interchangeably. Similarly, the terms "carbon dioxide price," "greenhouse gas price" and "carbon price" are interchangeable.

forecasting and to write off the need to forecast carbon allowance prices because of the uncertainties is not prudent.

For example, there are myriad uncertainties that utility planners have learned to address in planning. These include randomly occurring generating unit outages, load forecast error and demand fluctuations, and fuel price volatility and uncertainty. These various uncertainties can be addressed through techniques such as sensitivity and scenario analyses.

Q. If the Wise County Plant were to be built, is carbon regulation an issue that definitely could be addressed in the future, and at a reasonable cost, once the timing and stringency of the regulation is known?

A. No. Unlike for other power plant air emissions like sulfur dioxide and oxides of nitrogen, there currently is no commercial or economical method for post-combustion removal of carbon dioxide from supercritical pulverized coal plants. Dominion Virginia Power agrees on this point, noting that

> carbon capture technology is not commercially viable or available at the present time. Furthermore, the successful integration of all of the technologies needed for a commercial-scale carbon capture and sequestration system has yet even to be demonstrated. As a result, it is not currently feasible to construct a power plant with technology that can capture and store carbon emissions.[9]

This conclusion is consistent with the general view in the electric industry.

Even if such technology were available, retrofitting an existing coal plant with the technology for carbon capture and sequestration is expected to be very expensive, increasing the cost of generating power at the plant by perhaps as much as 68 to 80 percent or higher.

[9] Direct Testimony of James K. Martin, at page 7, line 11.

Q. Do other utilities have opinions about whether and when greenhouse gas regulation will come?

A. Yes. A number of utility executives have argued that mandatory federal regulation of the emissions of greenhouse gases is inevitable.

For example, in April 2006, the Chairman of Duke Energy, Paul Anderson, stated:

> From a business perspective, the need for mandatory federal policy in the United States to manage greenhouse gases is both urgent and real. In my view, voluntary actions will not get us where we need to be. Until business leaders know what the rules will be – which actions will be penalized and which will be rewarded – we will be unable to take the significant actions the issue requires.[10]

Similarly, James Rogers, who was the CEO of Cinergy and is currently CEO of Duke Energy, has publicly said "[I]n private, 80-85% of my peers think carbon regulation is coming within ten years, but most sure don't want it now."[11] Mr. Rogers also was quoted in a December 2005 *Business Week* article, as saying to his utility colleagues, "If we stonewall this thing [carbon dioxide regulation] to five years out, all of a sudden the cost to us and ultimately to our consumers can be gigantic."[12]

Not wanting carbon regulation from a utility perspective is understandable because carbon price forecasting is not simple and easy, it makes resource planning more difficult and is likely to change "business as usual." For many utilities, including the Big Stone II Co-owners, that means that it is much more difficult to justify building a pulverized coal plant. Regardless, it is imprudent to ignore the risk.

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[10] Paul Anderson, Chairman, Duke Energy, "Being (and Staying in Business): Sustainability from a Corporate Leadership Perspective," April 6, 2006 speech to CERES Annual Conference, at: http://www.duke-energy.com/news/mediainfo/viewpoint/PAnderson_CERES.pdf

[11] "The Greening of General Electric: A Lean, Clean Electric Machine," *The Economist*, December 10, 2005, at page 79.

[12] "The Race Against Climate Change," *Business Week*, December 12, 2005, online at http://businessweek.com/magazine/content/05_50/b3963401.htm.

Duke Energy is not alone in believing that carbon regulation is inevitable and, indeed, some utilities are advocating for mandatory greenhouse gas reductions. In a May 6, 2005, statement to the Climate Leaders Partners (a voluntary EPA-industry partnership), John Rowe, Chair and CEO of Exelon stated, "At Exelon, we accept that the science of global warming is overwhelming. We accept that limitations on greenhouse gases emissions [sic] will prove necessary. Until those limitations are adopted, we believe that business should take voluntary action to begin the transition to a lower carbon future."

In fact, several electric utilities and electric generation companies have incorporated assumptions about carbon regulation and costs into their long term planning, and have set specific agendas to mitigate shareholder risks associated with future U.S. carbon regulation policy. These utilities cite a variety of reasons for incorporating risk of future carbon regulation as a risk factor in their resource planning and evaluation, including scientific evidence of human-induced climate change, the U.S. electric sector's contribution to emissions, and the magnitude of the financial risk of future greenhouse gas regulation.

Duke Energy and FPL Group are participating in the high profile U.S. Climate Action Partnership ("USCAP") which advocates for federal, mandatory legislation of greenhouse gases. The six principles of this group are:

- Account for the global dimensions of climate change;
- Create incentives for technology innovation;
- Be environmentally effective;
- Create economic opportunity and advantage;
- Be fair to sectors disproportionately impacted; and

- Reward early action.[13]

Most significantly, USCAP has argued that CO_2 emissions should be reduced by 60% to 80% by 2050. As I will discuss later, this is relatively the same goal as many of the climate change bills that have been introduced in the current U.S. Congress.[14]

Some of the companies believe that there is a high likelihood of federal regulation of greenhouse gas emissions within their planning period. For example, Pacificorp states a 50% probability of a CO_2 limit starting in 2010 and a 75% probability starting in 2011. The Northwest Power and Conservation Council models a 67% probability of federal regulation in the twenty-year planning period ending 2025 in its resource plan. Northwest Energy states that CO_2 taxes "are no longer a remote possibility."[15]

Even those in the electric industry who oppose mandatory limits on greenhouse gas regulation believe that regulation is inevitable. David Ratcliffe, CEO of Southern Company, a predominantly coal-fired utility that opposes mandatory limits, said at a March 29, 2006, press briefing that "There certainly is enough public pressure and enough Congressional discussion that it is likely we will see some form of regulation, some sort of legislation around carbon."[16]

Q. Why would electric utilities, in particular, be concerned about future carbon regulation?

A. Electricity generation is very carbon-intensive. Electric utilities are likely to be one of the first, if not the first, industries subject to carbon regulation because of the relative ease in regulating stationary sources as opposed to mobile sources (automobiles) and because electricity generation represents a significant portion

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[13] www.us-cap.org.
[14] *A Call for Action*, at page 7, available at www.us-cap.org.
[15] Northwest Energy 2005 Electric Default Supply Resource Procurement Plan, December 20, 2005; Volume 1, p. 4.

of total U.S. greenhouse gas emissions. A new generating facility may have a book life of twenty to forty years, but in practice, the utility may expect that that asset will have an operating life of 50 years or more. By adding new plants, especially new coal plants, a utility is essentially locking-in a large quantity of carbon dioxide emissions for decades to come. In general, electric utilities are increasingly aware that the fact that we do not currently have federal greenhouse gas regulation is irrelevant to the issue of whether we will in the future, and that new plant investment decisions are extremely sensitive to the expected cost of greenhouse gas regulation throughout the life of the facility.

Q. How does Dominion Virginia Power view the prospects for carbon regulation?

A. [REDACTED]

[REDACTED]

[17]

An April 2007 presentation to the Company's senior management subsequently reported that:

[REDACTED]

[18]

[16] Quoted in "U.S. Utilities Urge Congress to Establish CO2 Limits," Bloomberg.com, http://www.bloomberg.com/apps/news?pid=10000103&sid=a75A1ADJv8cs&refer=us

[17] Dominion Virginia Power Confidential Response to Question SELC 1-2(c), at page 1.

[18] Dominion Virginia Power Confidential Response to Question SELC 1-5(b), at page 3.

[REDACTED]

[19]

Q. Do you agree with Dominion Virginia Power assessment of the potential for federal regulation of greenhouse gas emissions?

A. We at Synapse believe that it is not a question of "if" with regards to federal regulation of greenhouse gas emissions but rather a question of "when." However, we also agree that there are uncertainties as to the design, timing and details of the CO_2 regulations that ultimately will be adopted and implemented.

Q. What mandatory greenhouse gas emissions reductions programs have begun to be examined in the U.S. federal government?

A. To date, the U.S. government has not required greenhouse gas emission reductions. However, a number of legislative initiatives for mandatory emissions reduction proposals have been introduced in Congress. These proposals establish carbon dioxide emission trajectories below the projected business-as-usual emission trajectories, and they generally rely on market-based mechanisms (such as cap and trade programs) for achieving the targets. The proposals also include various provisions to spur technology innovation, as well as details pertaining to offsets, allowance allocation, restrictions on allowance prices and other issues. Some of the federal proposals that would require greenhouse gas emission reductions that had been submitted in Congress are summarized in Table 1 below.[20]

[19] Id, at page 17.
[20] Table 1 is an updated version of Table ES-1 on page 5 of Exhibit DAS-3.

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Table 1. Summary of Mandatory Emissions Targets in Proposals Discussed in Congress[21]

Proposed National Policy	Title or Description	Year Proposed	Emission Targets	Sectors Covered
McCain Lieberman S.139	Climate Stewardship Act	2003	Cap at 2000 levels 2010-2015. Cap at 1990 levels beyond 2015.	Economy-wide, large emitting sources
McCain Lieberman SA 2028	Climate Stewardship Act	2003	Cap at 2000 levels	Economy-wide, large emitting sources
McCain Lieberman S 1151	Climate Stewardship and Innovation Act	2005	Cap at 2000 levels	Economy-wide, large emitting sources
National Commission on Energy Policy (basis for Bingaman-Domenici legislative work)	Greenhouse Gas Intensity Reduction Goals	2005	Reduce GHG intensity by 2.4%/yr 2010-2019 and by 2.8%/yr 2020-2025. Safety-valve on allowance price	Economy-wide, large emitting sources
Jeffords S. 150	Multi-pollutant legislation	2005	2.050 billion tons beginning 2010	Existing and new fossil-fuel fired electric generating plants > 15 MW
Carper S. 843	Clean Air Planning Act	2005	2006 levels (2.655 billion tons CO_2) starting in 2009, 2001 levels (2.454 billion tons CO_2) starting in 2013.	Existing and new fossil-fuel fired, nuclear, and renewable electric generating plants > 25 MW
Feinstein	Strong Economy and Climate Protection Act	2006	Stabilize emissions through 2010; 0.5% cut per year from 2011-15; 1% cut per year from 2016-2020. Total goal would be 7.25% below current levels.	Economy-wide, large emitting sources
Rep. Udall - Rep. Petri	Keep America Competitive Global Warming Policy Act	2006	Establishes prospective baseline for greenhouse gas emissions, with safety valve.	Energy and energy-intensive industries
Carper S.2724	Clean Air Planning Act	2006	2006 levels by 2010, 2001 levels by 2015	Existing and new fossil-fuel fired, nuclear, and renewable electric generating plants > 25 MW
Kerry and Snowe S.4039	Global Warming Reduction Act	2006	No later than 2010, begin to reduce U.S. emissions to 65% below 2000 levels by 2050	Not specified

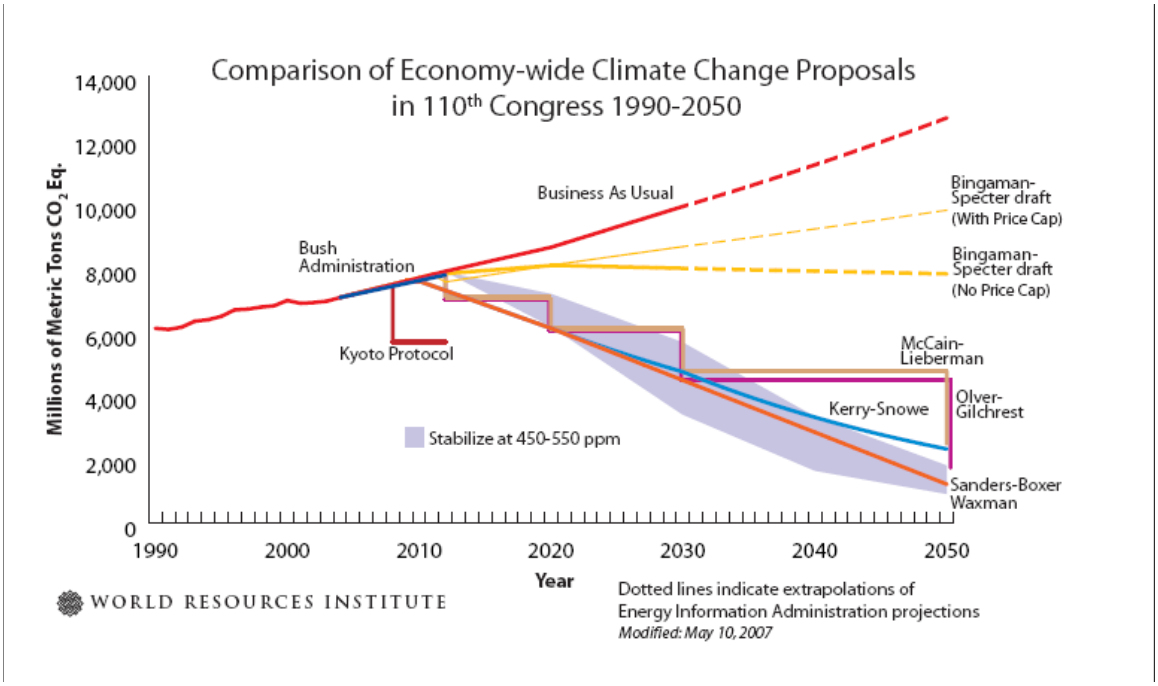
[21] More detailed summaries of the bills that have been introduced in the U.S. Senate in the 110th Congress are presented in Exhibit DAS-2.

Waxman H.R. 5642	Safe Climate Act	2006	2010 – not to exceed 2009 level, annual reduction of 2% per year until 2020, annual reduction of 5% thereafter	Not specified
Jeffords S. 3698	Global Warming Pollution Reduction Act	2006	1990 levels by 2020, 80% below 1990 levels by 2050	Economy-wide
Feinstein- Carper S.317	Electric Utility Cap & Trade Act	2007	2006 level by 2011, 2001 level by 2015, 1%/year reduction from 2016-2019, 1.5%/year reduction starting in 2020	Electricity sector
Kerry-Snowe	Global Warming Reduction Act	2007	2010 level from 2010-2019, 1990 level from 2020-2029, 2.5%/year reductions from 2020-2029, 3.5%/year reduction from 2030-2050, 65% below 2000 level in 2050	Economy-wide
McCain-Lieberman S.280	Climate Stewardship and Innovation Act	2007	2004 level in 2012, 1990 level in 2020, 20% below 1990 level in 2030, 60% below 1990 level in 2050	Economy-wide
Sanders-Boxer S.309	Global Warming Pollution Reduction Act	2007	2%/year reduction from 2010 to 2020, 1990 level in 2020, 27% below 1990 level in 2030, 53% below 1990 level in 2040, 80% below 1990 level in 2050	Economy-wide
Olver, et al HR 620	Climate Stewardship Act	2007	Cap at 2006 level by 2012, 1%/year reduction from 2013-2020, 3%/year reduction from 2021-2030, 5%/year reduction from 2031-2050, equivalent to 70% below 1990 level by 2050	US national
Bingaman–Specter S.1766	Low Carbon Economy Act	2007	2012 levels in 2012, 2006 levels in 2020, 1990 levels by 2030. President may set further goals ≥60% below 2006 levels by 2050 contingent upon international effort	Economy-wide

In addition, Senators Lieberman and Warner have issued a set of discussion princDominion Virginia Poweres for proposed greenhouse gas legislation. This legislation would mandate 2005 emission levels in 2012, 10% below 2005 levels by 2020, 30% below 2005 levels by 2030, 50% below 2005 levels by 2040, and 70% below 2005 levels by 2050.

The emissions levels that would be mandated by the bills that have been introduced in the current Congress are shown in Figure 1 below:

Figure 1: Emissions Reductions Required under Climate Change Bills in Current US Congress



The shaded area in Figure 1 above represents the 60% to 80% range of emission reductions from current levels that many now believe will be necessary to stabilize atmospheric CO_2 concentrations by the middle of this century.

Q. Is it reasonable to believe that the prospects for passage of federal legislation for the regulation of greenhouse gas emissions have improved as a result of last November's federal elections?

A. Yes. As shown by the number of proposals being introduced in Congress and public statements of support for taking action, there certainly are an increasing numbers of legislators who are inclined to support passage of legislation to regulate the emissions of greenhouse gases.

Nevertheless, my conclusion that significant greenhouse gas regulation in the U.S. is inevitable is not based on the results of any single election or on the fate of any single bill introduced in Congress.

Q. Are individual states also taking actions to reduce greenhouse gas emissions?

A. Yes. A number of states are taking significant actions to reduce greenhouse gas emissions.

For example, Table 2 below lists the emission reduction goals that have been adopted by states in the U.S. Regional action also has been taken in the Northeast and Western regions of the nation.

Public - Protected Materials Redacted

Table 2: Announced State and Regional Greenhouse Gas Emission Reduction Goals

State	GHG Reduction Goal	Western Climate Initiative member (15% below 2005 levels by 2020)	Regional Greenhouse Gas Initiative member (Cap at current levels 2009-2015, reduce this by 10% by 2019)
Arizona	2000 levels by 2020; 50% below 2000 levels by 2040	yes	
California	2000 levels by 2010; 1990 levels by 2020; 80% below 1990 levels by 2050	yes	
Connecticut	1990 levels by 2010; 10% below 1990 levels by 2020; 75-85% below 2001 levels in the long term		yes
Delaware			yes
Florida	2000 levels by 2017, 1990 levels by 2025, and 80 percent below 1990 levels by 2050		
Hawaii	1990 levels by 2020		
Illinois	1990 levels by 2020; 60% below 1990 levels by 2050		
Maine	1990 levels by 2010; 10% below 1990 levels by 2020; 75-80% below 2003 levels in the long term		yes
Maryland			yes
Massachusetts	1990 levels by 2010; 10% below 1990 levels by 2020; 75-85% below 1990 levels in the long term		yes
Minnesota	15% by 2015, 30% by 2025, 80% by 2050		
New Hampshire	1990 levels by 2010; 10% below 1990 levels by 2020; 75-85% below 2001 levels in the long term		yes
New Jersey	1990 levels by 2020; 80% below 2006 levels by 2050		yes
New Mexico	2000 levels by 2012; 10% below 2000 levels by 2020; 75% below 2000 levels by 2050	yes	
New York	5% below 1990 levels by 2010; 10% below 1990 levels by 2020		yes
Oregon	Stabilize by 2010; 10% below 1990 levels by 2020; 75% below 1990 levels by 2050	yes	
Rhode Island	1990 levels by 2010; 10% below 1990 levels by 2020; 75-80% below 2001 levels in the long term		yes
Utah		yes	
Vermont	1990 levels by 2010; 10% below 1990 levels by 2020; 75-85% below 2001 levels in the long term		yes
Washington	1990 levels by 2020; 25% below 1990 levels by 2035; 50% below 1990 levels by 2050	yes	

Q. Have recent polls indicated that the American people are increasingly in favor of government action to address global warming concerns?

A. Yes. A summer 2006 poll by Zogby International showed that an overwhelming majority of Americans are more convinced that global warming is happening than they were even two years ago. In addition, Americans also are connecting intense weather events like Hurricane Katrina and heat waves to global warming.[22] Indeed, the poll found that 74% of all respondents, including 87% of Democrats, 56% of Republicans and 82% of Independents, believe that we are experiencing the effects of global warming.

The poll also indicated that there is strong support for measures to require major industries to reduce their greenhouse gas emissions to improve the environment without harming the economy – 72% of likely voters agreed such measures should be taken.[23]

Other recent polls reported similar results. For example, a recent Stanford University/Associated Press poll found that 84 percent of Americans believe that global warming is occurring, with 52 percent expecting the world's natural environment to be in worse shape in ten years than it is now.[24] Eighty-four percent of Americans want a great deal or a lot to be done to help the environment during the next year by President Bush, the Congress, American businesses and/or the American public. This represents ninety-two percent of Democrats and seventy-seven percent of Republicans.

At the same time, according to a recent public opinion survey for the Massachusetts Institute of Technology, Americans now rank climate change as the country's most pressing environmental problem—a dramatic shift from three

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22 "Americans Link Hurricane Katrina and Heat Wave to Global Warming," Zogby International, August 21, 2006, available at www.zogby.com/news.

23 Id.

24 *The Second Annual "America's Report Card on the Environment" Survey by the Woods Institute for the Environment at Stanford University in collaboration with The Associated Press,* September 25, 2007.

years ago, when they ranked climate change sixth out of 10 environmental concerns.[25] Almost three-quarters of the respondents felt the government should do more to deal with global warming, and individuals were willing to spend their own money to help.

Q. What CO_2 prices has Dominion Virginia Power used in its analyses of the proposed Wise County Plant?

A. Dominion Virginia Power did not assume any annual carbon or CO_2 emissions cost in the economic analysis discussed by Company witness Martin.

Q. Is it prudent and reasonable to assume no CO_2 emissions allowance prices in analyses justifying the addition of new fossil-fuel fired power plants?

A. No. It is not prudent to project that there will be no regulation of greenhouse gas emissions at any point over the next thirty or more years. As I have discussed above, federal regulation of greenhouse gas emissions is highly likely in the near future. States also have started to take actions to reduce greenhouse gas emissions both on their own and as part of regional initiatives.

Q. Does Dominion Virginia Power discuss in its Application what its total greenhouse gas emissions will be if its adds the Wise County Plant to its generation mix, as its proposes?

A. No.

[25] *MIT Carbon Sequestration Initiative, 2006 Survey*, http://sequestration.mit.edu/research/survey2006.html

Q. Have you seen any projections of what Dominion Virginia Power forecasts will be its total annual CO_2 emissions after the Wise County Plant begins commercial operations?

A. Yes. The Company projects that its CO2 emissions will [REDACTED] [26]

Q. How does the trend in future Dominion Virginia Power emissions levels compare to the emissions target levels in the bills that have been introduced in the current U.S. Congress?

A. The numbers in the previous answer suggest that the Company is projecting that its CO_2 emissions [REDACTED] while the climate change proposals currently being considered in the U.S. Congress would mandate substantial reductions in emissions by that year.

Q. By how much would Dominion Virginia Power have to reduce its CO_2 emissions to reach 1990 levels by 2020 ?

A. [REDACTED] [27]

Q. Has Dominion Virginia Power developed any projection of future CO_2 emissions allowance prices?

A. Yes. The Company has developed a [REDACTED] [28]

[26] Dominion Virginia Power Confidential Response to Question SELC 1-5(b), at page 22.
[27] Id.
[28] Dominion Virginia Power Confidential Response to Question SELC 1-2(a), at page 2.

Q. Is this a reasonable forecast to use for resource planning?

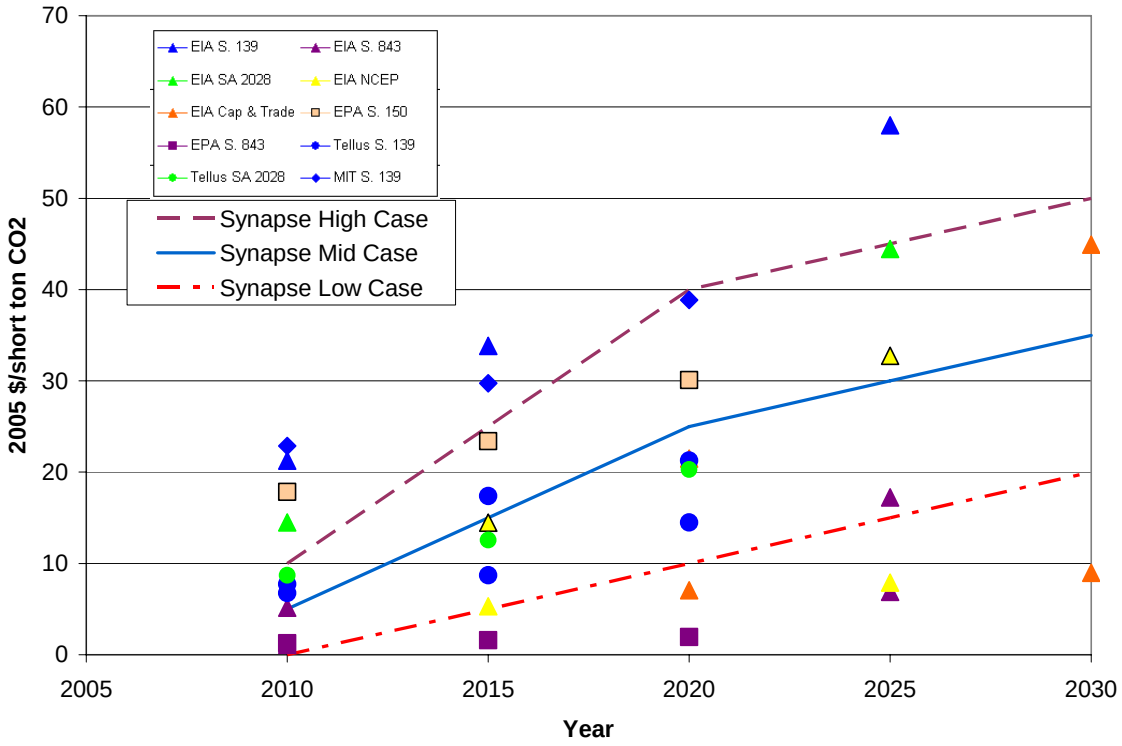
A. No. First, it is too low considering the proposals that are currently under review in Congress. Second, given all of the uncertainties it would be prudent to review a wide range of forecasts, not just a single price trajectory.

Q. Has Synapse developed a carbon price forecast that would assist the Commission in evaluating the proposed the Wise County Plant?

A. Yes. Synapse's forecast of future carbon dioxide emissions prices are presented in Figure 2 below.

Public - Protected Materials Redacted

Figure 2. Synapse Carbon Dioxide Prices



Q. What is Synapse's carbon price forecast on a levelized basis?

A. Synapse's forecast, levelized[29] over 20 years, 2011 – 2030, is provided in Table 3 below.

Table 3: Synapse's Levelized Carbon Price Forecast (2005$/ton of CO_2)

Low Case	Mid Case	High Case
$8.23	$19.83	$31.43

Q. When were the Synapse CO_2 emission allowance price forecasts shown in Figure 2 developed?

A. The Synapse CO_2 emission allowance price forecasts were developed in the Spring of 2006.

Q. How were these CO_2 price forecasts developed?

A. The basis for the Synapse CO_2 price forecasts is described in detail in Exhibit DAS-3, starting on page 41 of 63.

In general, the price forecasts were based, in part, on the results of economic analyses of individual bills that had been submitted in the 108th and 109th Congresses. We also considered the likely impacts of state, regional and international actions, the potential for offsets and credits, and the likely future trajectories of both emissions constraints and technological program.

Q. Are the Synapse CO_2 price forecasts shown in Figure 2 based on any independent modeling?

A. Yes. Although Synapse did not perform any new modeling to develop our CO_2 price forecasts, our CO_2 price forecasts were based on the results of independent modeling prepared at the Massachusetts Institute of Technology ("MIT"), the Energy Information Administration of the Department of Energy ("EIA"), Tellus, and the U.S. Environmental Protection Agency ("EPA").[30]

Q. Do the triangles, squares, circles and diamond shapes in Figure 2 above reflect the results of all of the scenarios examined in the MIT, EIA, EPA and Tellus analyses upon which Synapse relied?

A. As a general rule, Synapse focused our attention either on the modeler's primary scenario or on the presented high and low scenarios to bracket the range of results.

For example, the blue triangles in Figure 2 represent the results from EIA's modeling of the 2003 McCain Lieberman bill, S.139. Synapse used the results from EIA's primary case which reflected the bill's provisions that allowed: (a) allowance banking; (b) use of up to 15 percent offsets in Phase 1 (2010-2015) and

[29] A value that is "levelized" is the present value of the total cost converted to equal annual payments. Costs are levelized in real dollars (i.e., adjusted to remove the impact of inflation).

up to 10 percent offsets in Phase II (2016 and later years). The S.139 case also assumed commercial availability of advanced nuclear plants and of geological carbon sequestration technologies in the electric power industry.

Similarly, the blue diamonds in Figure 2 represent the results from MIT's modeling of the same 2003 McCain Lieberman bill, S.139. MIT examined 14 scenarios which considered the impact of factors such as the tightening of the cap in Phase II, allowance banking, availability of outside credits, and assumptions about GDP and emissions growth. Synapse included the results from Scenario 7 which included allowance banking and zero-cost credits, which effectively relaxed the cap by 15% and 10% in Phase I and Phase II, respectively. Synapse selected this scenario as the closest to the S.139 legislative proposal since it assumed that the cap was tightened in a second phase, as in Senate Bill 139.

At the same time, some of the studies only included a single scenario representing the specific features of the legislative proposal being analyzed. For example, SA 2028, the Amended McCain Lieberman bill set the emissions cap at constant 2000 levels and allowed for 15 percent of the carbon emission reductions to be met through offsets from non-covered sectors, carbon sequestration and qualified international sources. EIA presented one scenario in its table for this policy. The results from this scenario are presented in the green triangles in Figure 2.

Q. Do you believe that technological improvements and policy designs will reduce the cost of CO_2 emissions?

A. Yes. Exhibit DAS-3 identifies a number of factors that will affect projected allowance prices. These factors include: the base case emissions forecast; whether there are complimentary policies such as aggressive investments in energy efficiency and renewable energy independent of the emissions allowance market; the policy implementation timeline; the reduction targets in a proposal; program flexibility involving the inclusion of offsets (perhaps international) and

[30] See Table 6.2 on page 42 of 63 of Exhibit DAS-3.

allowance banking; technological progress; and emissions co-benefits.[31] In particular, Synapse anticipates that technological innovation will temper allowance prices in the out years of our forecast.

Q. Could carbon capture and sequestration be a technological innovation that might temper or even put a ceiling on CO_2 emissions allowance prices?

A. Yes.

Q. Does Dominion Virginia Power see carbon capture technology as a currently commercially viable way to mitigate CO_2 emissions from pulverized coal plants like the Wise County Plant?

A. No. As I noted earlier, Dominion Virginia Power has concluded that "carbon capture technology is not commercially viable or available at the present time."[32]

Q. Do you agree with this assessment?

A. Yes. I agree with this view of the current status of carbon capture and sequestration technology although I would note that there is some experience with the piping of CO_2 gas for enhanced oil recovery and industrial use in certain geographical areas.

Q. Is there any consensus when carbon capture and sequestration technology will become commercially viable for plants like the Wise County Plant?

A. No. I have seen estimates that carbon capture and sequestration technology may be proven and commercially viable from as early as 2015 to 2030 or later. For example, the February 2007 *Future of Coal* study from the Massachusetts Institute of Technology:

> Many years of development and demonstration will be required to prepare for its successful, large scale adoption in the U.S. and elsewhere. A rushed attempt at CCS [carbon capture and

[31] Exhibit DAS-3, at pages 46 to 49 of 63.
[32] Direct Testimony of James K. Martin, at page 7, line 11.

sequestration] implementation in the face of urgent climate concerns could lead to excess cost and heightened local environmental concerns, potentially lead to long delays in implementation of this important option.[33]

Q. What are the currently estimated costs for carbon capture and sequestration at pulverized coal facilities?

A. Hope has been expressed concerning potential technological improvements and learning curve effects that might reduce the estimated cost of carbon capture and sequestration. However, I have seen recent studies by objective sources that estimate that the cost of carbon capture and sequestration could increase the cost of producing electricity at coal-fired power plants by 60-80 percent, on a $/MWh basis. For example, a very recent study by the National Energy Technology Laboratory ("NETL") projects that the cost of carbon capture and sequestration would be $75/tonne[34] of CO_2 avoided, in 2007 dollars, for pulverized coal plants.[35] This translates in to $65/ton of CO_2 avoided, in 2005 dollars.

The March 2007 "Future of Coal Study" from the Massachusetts Institute of Technology estimated that the cost of carbon capture and sequestration would be about $28/ton although it also acknowledged that there was uncertainty in that figure.[36] The tables in that study also indicated significantly higher costs for carbon capture for pulverized coal facilities, in the range of about $40/ton and higher.[37]

However, even when the technology for CO_2 capture matures, there will always be significant regional variations in the cost of storage due to the proximity and quality of storage sites.

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33 *The Future of Coal, Options for a Carbon-Constrained World, an InterdiscDominion Virginia Powerinary MIT Study*, February 2007, at page 15.

34 A tonne or metric ton is a measurement of mass equal to 1,000 kilograms or 1.1 tons.

35 *Cost and Performance Baseline for Fossil Energy Plants*, National Energy Technology Laboratory, Revised August 2007, at page 27.

36 *The Future of Coal, Options for a Carbon-Constrained World*, Massachusetts Institute of Technology, March 2007, at page xi.

37 Id, at page 19.

Q. Have you seen any Company estimates of what it would cost to add carbon capture and sequestration technologies to the proposed the Wise County Plant?

A.

[REDACTED]

[38]

Q. Does Dominion Virginia Power reflect any costs associated with employing carbon capture and sequestration technologies in any of its economic analyses of The Wise County Plant?

A. No.

Q. Has Dominion Virginia Power included any carbon capture and sequestration equipment or features in the current design or cost estimate for The Wise County Plant?

A. No.

Q. Has Dominion Virginia Power reflected in its economic analyses any of the performance penalties that can be expected to be experienced as a result of the addition and use of carbon capture and sequestration technologies at The Wise County Plant?

A. No. Recent studies, such as the 2007 study by the National Energy Technology Laboratory, project that the output of a coal plant could be reduced by between 10 percent and 29 percent as a result of the addition of carbon capture and sequestration technologies. However, Dominion Virginia Power has not included any such performance penalties in the economic analyses we have reviewed.

[38] Dominion Virginia Power Confidential Response to Question SELC 1-5(b), at page 46.

Q. Do the Synapse CO_2 price forecasts reflect the potential for the inclusion of domestic offsets and, perhaps, international offsets in U.S. carbon regulation policy?

A. Yes. Even the Synapse high CO_2 price forecast is consistent with, and in some cases lower than, the results of studies that assume the use of some levels of offsets to meet mandated emission limits. For example, as shown in Figure 6 the highest price scenarios in the years 2015, 2020 and 2025 were taken from the EIA and MIT modeling of the original and the amended McCain-Lieberman proposals. Each of the prices for these scenarios shown in Figure 2 reflects the allowed use of offsets.

Q. How do the Synapse CO_2 price forecasts compare to the Company's CO_2 price forecast?

A. The Synapse CO_2 price forecasts and the long-term Dominion Virginia Power CO_2 price forecast provided in response to Question SELC 1-2(a) are shown in Figure 3 below:

Figure 3: Synapse and Dominion Virginia Power CO_2 Price Forecasts [39][CONFIDENTIAL]

[REDACTED]

Q. Have you seen any recent independent forecasts of future CO_2 emissions prices that are similar to the Synapse forecast?

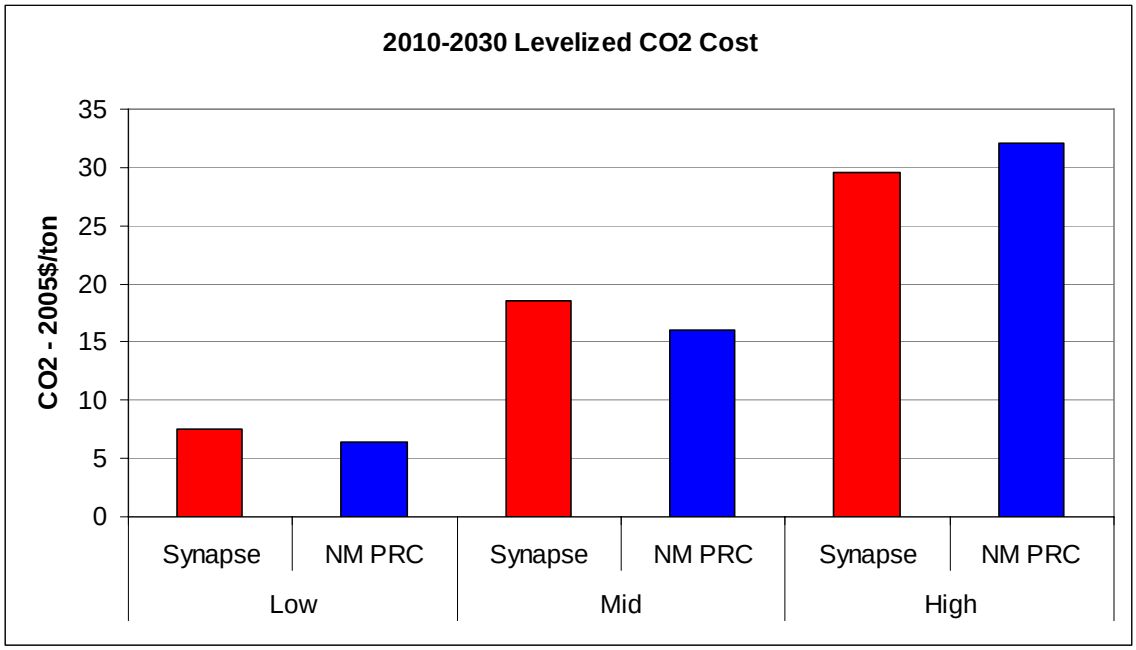
A. Yes. The Synapse CO_2 emissions allowance price forecasts compare favorably to recent forecasts of future CO2 prices used in resource planning analyses.

For example, last June the New Mexico Public Regulation Commission ordered that utilities should consider a range of CO_2 prices in their resource planning.[40] This range runs from $8 to $40 per metric ton, beginning in 2010 and increasing at the overall 2.5 percent rate of inflation. Figure 4 below shows that the New Mexico Commission's CO_2 prices are extremely close to the Synapse price forecasts on a levelized basis.

[39] Source Data provided in Dominion Virginia Power's Confidential Response to SELC 1-2(a).
[40] A copy of this Order is included as Exhibit DAS-4.

Public - Protected Materials Redacted

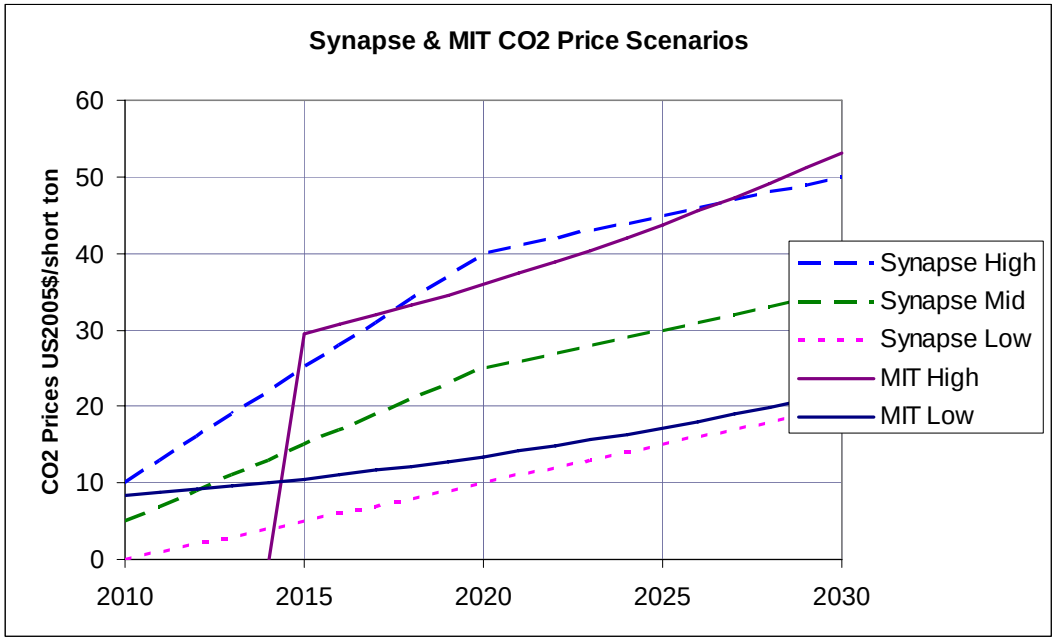
Figure 4: CO_2 Price Scenarios – Synapse & 2007 NM Public Regulation Commission



Similarly, the recent MIT study on *The Future of Coal* contained a set of assumptions about high and low future CO_2 emission allowance price. Figure 5 below shows that the CO_2 price trajectories in the MIT study are very close to the high and low Synapse forecasts.

Public - Protected Materials Redacted

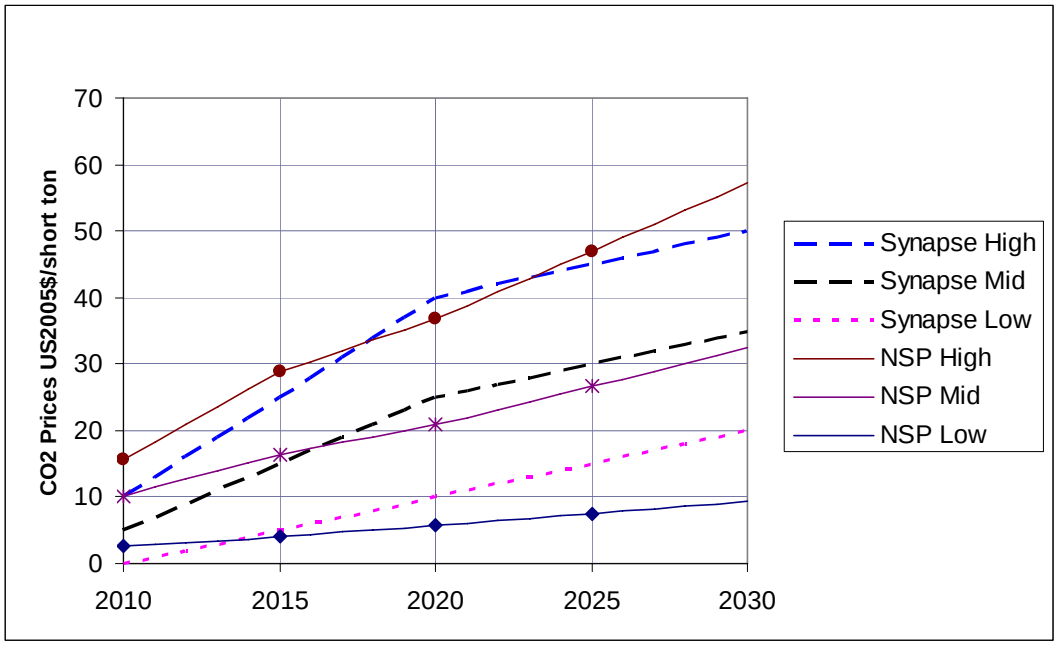
Figure 5: CO_2 Price Scenarios – Synapse & MIT March 2007 Future of Coal Study



At the same time, in its recently completed Integrated Resource Planning process, Nova Scotia Power used CO_2 prices that were developed by Natsource. Figure 6 below shows that the CO2 prices used by Nova Scotia Power are very similar to the Synapse price forecasts.

Public - Protected Materials Redacted

Figure 6: CO_2 Price Scenarios – Synapse & Nova Scotia Power IRP



Q. Do you believe that the Synapse CO_2 price forecasts remain valid despite being based, in part, on analyses from 2003-2005 which examined legislation that was proposed in past Congresses?

A. Yes. Synapse believes it is important for the Commission to rely on the most current information available about future CO_2 emission allowance prices, as long as that information is objective and credible. The analyses upon which Synapse relied when we developed our CO_2 price forecasts were the most recent analyses and technical information available when Synapse developed its CO_2 price forecasts in the Spring of 2006. However, new information shows that our CO_2 prices remain valid even though the original bills that comprised part of the basis for the forecasts expired at the end of the Congress in which they were introduced.

Most importantly, many of the new greenhouse gas regulation bills that have been introduced in Congress are significantly more stringent than the bills that were being considered prior to the spring of 2006. As I will discuss below, the increased stringency of current bills can be expected to lead to higher CO_2

emission allowance prices. The higher forecast natural gas prices that are being forecast today, as compared to the natural gas price forecasts from 2003 or 2004, also can be expected to lead to higher CO_2 emissions allowance prices.

Q. Do the Synapse carbon price forecasts presented in Figures 2 through 6 reflect the emission reduction targets in the bills that have been introduced in the current Congress?

A. No. Synapse developed our price forecasts late last spring and relied upon bills that had been introduced in Congress through that time. The bills that have been introduced in the current US Congress generally would mandate much more substantial reductions in greenhouse gas emissions than the bills that we considered when we developed our carbon price forecasts. Consequently, we believe that our forecasts are conservative but consistent with the climate change legislation that has been introduced in the current Congress.

Q. Have you seen any analyses of the CO_2 prices that would be required to achieve the much deeper reductions in CO_2 emissions that would be mandated under the bills currently under consideration in Congress?

A. Yes. An *Assessment of U.S. Cap-and-Trade Proposals* was recently issued by the MIT Joint Program on the Science and Policy of Global Change. This *Assessment* evaluated the impact of the greenhouse gas regulation bills that are being considered in the current Congress.

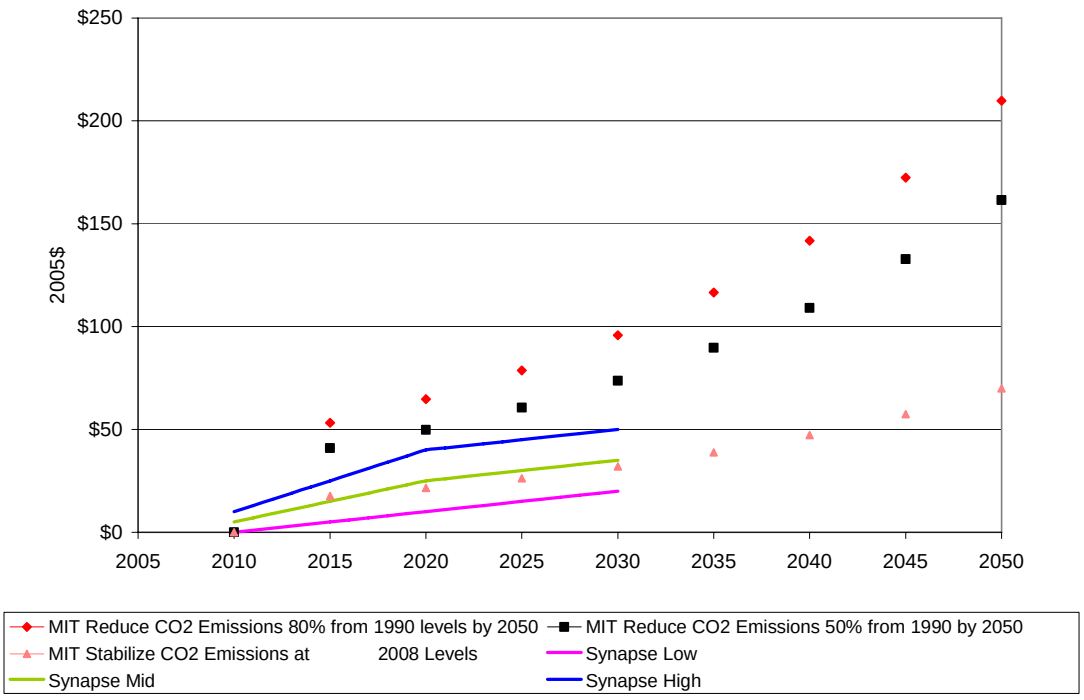
Twenty nine scenarios were modeled in the *Assessment*. These scenarios reflected differences in such factors as emission reduction targets (that is, reduce CO_2 emissions 80% from 1990 levels by 2050, reduce CO_2 emissions 50% from 1990 levels by 2050, or stabilize CO_2 emissions at 2008 levels), whether banking of allowances would be allowed, whether international trading of allowances would be allowed, whether only developed countries or the U.S. would pursue

greenhouse gas reductions, whether there would be safety valve prices adopted as part of greenhouse gas regulations, and other factors.[41]

In general, the ranges of the projected CO_2 prices in these scenarios were higher than the range of CO_2 prices in the Synapse forecast. For example, twelve of the 29 scenarios modeled by MIT projected higher CO_2 prices in 2020 than the high Synapse forecast. Fourteen of the 29 scenarios (almost half) projected higher CO_2 prices in 2030 than the high Synapse forecast.

Figure 7 below compares the three Core Scenarios in the MIT *Assessment* with the Synapse CO_2 price forecasts.

Figure 7: CO_2 Price Scenarios – Synapse and Core Scenarios in April 2007 MIT *Assessment of U.S. Cap-and-Trade Proposals*

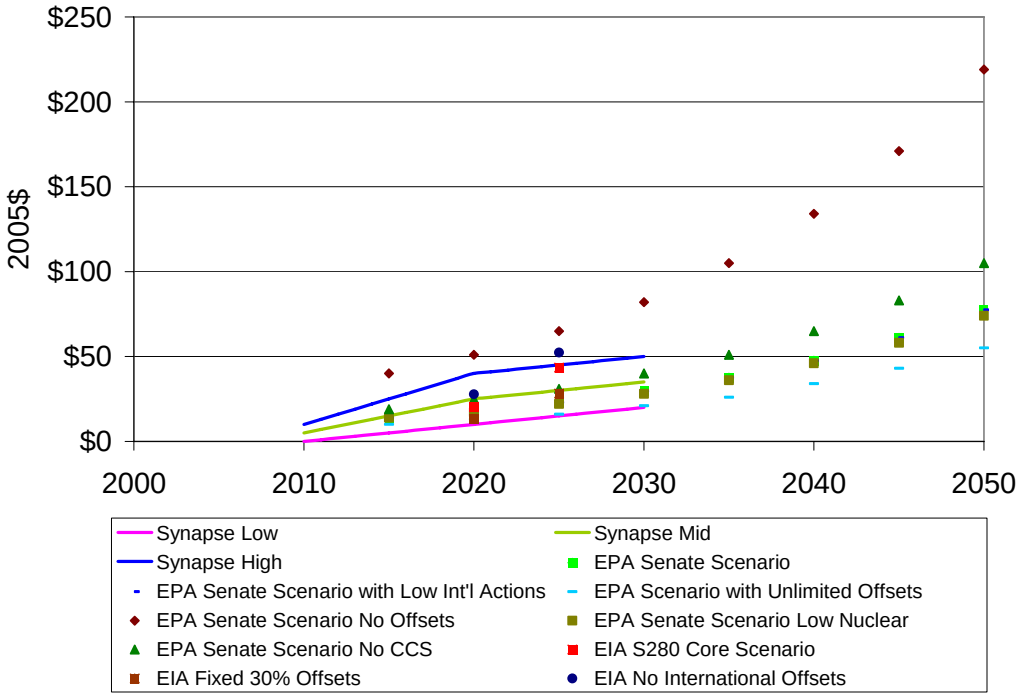


[41] The scenarios examined in the MIT *Assessment of U.S. Cap-and-Trade Proposals* are listed in Exhibit DAS-5.

Q. Have you compared the Synapse CO_2 emissions allowance price forecasts to any other assessments of current bills in Congress?

A. Yes. Both EPA and the Energy Information Agency (EIA) of the Department of Energy have analyzed the impact of the current version of the McCain-Lieberman legislation (Senate Bill 280).[42] Figure 8 below shows that the Synapse CO_2 price forecasts are consistent with the range of scenarios examined in the EPA and EIA assessments:

Figure 8: Synapse CO_2 Price Forecasts and Results of EPA and EIA Assessment of Current McCain Lieberman Legislation

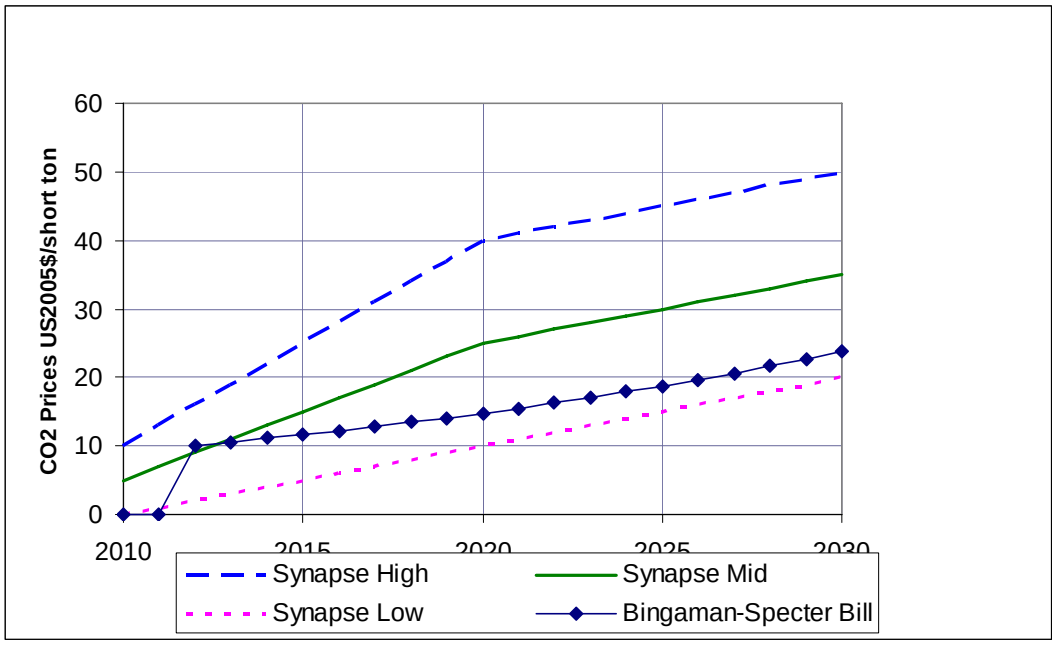


[42] *Energy Market and Economic Impacts of S. 280, the Climate Stewardship and Innovation Act of 2007*, Energy Information Administration, July 2007 and *EPA Analysis of the Climate Stewardship and Innovation Act of 2007, S. 280 in 110th Congress*, July 16, 2007.

Q. How do the Synapse CO_2 forecasts compare to the safety valve prices in the bill introduced by Senators Bingaman and Specter?

A. As shown in Figure 9 below, the safety valve prices in the legislation introduced by Senators Bingaman and Specter fall between the Synapse mid and low forecasts.

Figure 9: Synapse CO_2 Price Forecasts and Safety Valve Prices in Bingaman-Specter Legislation in 110th Congress



Q. Would it be reasonable to assume that a new supercritical coal-fired plant like the Wise County Plant will be grandfathered under federal climate change legislation or will be favored with the provision of extra CO_2 emission allowance allocations that could mitigate or offset the impact of CO_2 regulations?

A. No. It is unclear what provisions for grandfathering existing coal plants, if any, will be adopted as part of future greenhouse gas legislation. At the same time, it is unrealistic to expect that many or all of the new coal-fired plants currently being proposed will be grandfathered because of the substantial reductions in CO_2

emissions from current levels that have to be made by 2050 just to stabilize atmospheric concentrations of CO_2 at 450 ppm to 550 ppm.

Meeting these goals will require either a reduction in dependence on coal for electricity generation or a very large investment in conversion of the current coal generating fleet in the U.S. The only realistic way either of these is going to happen is with a large marginal cost on greenhouse gas emissions such as a CO_2 tax or higher emissions allowance prices. It is not reasonable to expect that a new supercritical coal plant, like the Wise County Plant, which will substantially increase the emissions of CO_2 into the atmosphere, will receive significant emission allowances under any U.S. carbon regulation plan.

For example, the National Commission on Energy Policy has recently recommended that "new coal plants built without [carbon capture and sequestration] not be "grandfathered" (i.e., awarded free allowances) in any future regulatory program to limit greenhouse gas emissions."[43] A report of an interdisciplinary study at the Massachusetts Institute of Technology on *The Future of Coal* similarly noted that:

> There is the possibility of a perverse incentive for increased early investment in coal-fired power plants without capture, whether SCPC or IGCC, in the expectation that the emissions from these plants would potentially be "grandfathered" by the grant of free CO2 allowances as part of future carbon emissions regulations and that (in unregulated markets) they would also benefit from the increase in electricity prices that will accompany a carbon control regime. Congress should act to close this "grandfathering" loophole before it becomes a problem.[44]

Additionally, it has been proposed in Congress that new coal-fired plants would be required to actually have carbon capture and sequestration technology. For example, a bill by Massachusetts Senator Kerry's bill limit CO_2 emissions from

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[43] *Energy Policy Recommendations to the President and the 110th Congress*, National Commission on Energy Policy, April 2007, at page 21.

[44] *The Future of Coal, Options for a Carbon-Constrained World, an Interdisciplinary MIT Study*, March 2007, at page (xiv).

new coal-fired facilities to 285 lbs/MWh. New coal-fired facilities would be defined as those that begin construction on or after April 26, 2007 and would certainly include the proposed Hempstead Project.

Q. What is Dominion Virginia Power's position regarding the likelihood that the emissions from the Wise County Plant will be grandfathered under federal greenhouse gas legislation?

A. The Company has refused to say what it believes concerning the likelihood that the emissions from the Wise County Plant would be grandfathered.[45]

Q. Is it possible that natural gas demand could be higher due to CO_2 emission regulations and, as a result, natural gas prices can be expected to be higher than otherwise would be the case?

A. Yes. However, the effect is very complicated and will depend on a number of factors such as how much new natural gas capacity is built as a result of the higher coal-plant operating costs due to the CO_2 emission allowance prices, how much additional DSM and renewable alternatives become economic and are added to the U.S. system, the levels and prices of any incremental natural gas imports, and changes in the dispatching of the electric system. There it is very difficult to determine, at this time, the amount by which natural gas prices might be raised due to CO_2 emission regulations.

In general, though, I agree

[REDACTED]

[46]

[45] Dominion Virginia Power Response to Question SELC 1-22.
[46] Dominion Virginia Power Confidential Response to Question SELC 1-5(b), at page 26.

Q. What are you recommendations concerning the CO_2 prices that the Commission should use in evaluating Dominion Virginia Power proposed Wise County Plant?

A. Given the uncertainty associated with the legislation that eventually will be passed by Congress, we believe that the Commission should use the wide range of forecasts of CO_2 prices shown in Figure 4 above to evaluate the relative economics of the proposed Repowering Project.

Q. How much additional CO_2 would the Wise County Plant emit into the atmosphere?

A. The Company has projected that the Wise County Plant will emit 5,368,678 tons of CO_2 annually.[47]

Q. What would be the annual costs of greenhouse gas regulations to the Company and its ratepayers under the Synapse CO_2 price forecasts if the Company proceeds with its proposed the Wise County Plant?

A. The range of the incremental annual, levelized cost to the Company and its ratepayers from greenhouse gas regulations would be:

Synapse Low CO_2 Case: 5.37 million tons of CO_2 · \$8.23/ton = \$44 million

Synapse Mid CO_2 Case: 5.37 million tons of CO_2 · \$19.83/ton = \$106 million

Synapse High CO_2 Case: 5.37 million tons of CO_2 · \$31.43/ton = \$169 million

4. Dominion Virginia Power Has Not Adequately Considered The Risk Of Further Increases In The Estimated Cost Of The Wise County Plant Project

Q. What is the currently estimated cost for The Wise County Plant?

A. The currently estimated cost of The Wise County Plant, without AFUCD or any other financing costs, is \$1.62 billion.[48]

Q. Is it reasonable to expect that the actual cost of the project will be higher than Dominion Virginia Power now estimates?

A. Yes. The costs of building power plants have soared in recent years as a result of the worldwide demand for power plant design and construction resources and commodities. There is no reason to expect that plant costs will not continue to rise during the years when the detailed engineering, procurement and construction of the Wise County Plant will be underway. This is especially true given the very early stage of the engineering and procurement for the project.

For example, Duke Energy Carolinas' originally estimated cost for the two unit coal-fired Cliffside Project was approximately $2 billion. In the fall of 2006, Duke announced that the cost of the project had increased by approximately 47 percent ($1 billion). After the project had been downsized because the North Carolina Utilities Commission refused to granted a permit for two units, Duke announced that the cost of that single unit would be about $1.53 billion, not including financing costs. In late May 2007, Duke announced that the cost of building that single unit had increased by about another 20 percent. As a result, the estimated cost of the one unit that Duke is building at Cliffside is now $1.8 billion exclusive of financing costs. Thus, the single Cliffside unit is now expected to cost almost as much as Duke originally estimated for a two unit plant.

Q. Did Duke explain to the North Carolina Utilities Commission the reasons for the skyrocketing cost of the Cliffside Project?

A. Yes. In testimony filed at the North Carolina Utilities Commission on November 29, 2006, Duke Energy Carolinas emphasized that the competition for resources had had a significant impact on the costs of building new power plants. This testimony was presented to explain the approximate 47 percent ($1 billion)

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[47] Dominion Virginia Power Response to Question SELC 1-21.
[48] Supplemental Direct Testimony of James K. Martin, at page 2, lines 5 and 6.

increase in the estimated cost of Duke Energy Carolinas' proposed coal-fired Cliffside Project that the Company announced in October 2006.

For example, Duke Energy Carolinas explained that:

> The costs of new power plants have escalated very rapidly. This effect appears to be broad based affecting many types of power plants to some degree. One key steel price index has doubled over the last twelve months alone. This reflects global trends as steel is traded internationally and there is international competition among power plant suppliers. Higher steel and other input prices broadly affects power plant capital costs. A key driving force is a very large boom in U.S. demand for coal power plants which in turn has resulted from unexpectedly strong U.S. electricity demand growth and high natural gas prices. Most integrated U.S. utilities have decided to pursue coal power plants as a key component of their capacity expansion plan. In addition, many foreign companies are also expected to add large amounts of new coal power plant capacity. This global boom is straining supply. Since coal power plant equipment suppliers and bidders also supply other types of plants, there is a spill over effect to other types of electric generating plants such as combined cycle plants.[49]

Duke further noted that the actual coal power plant capital costs as reported by plants already under construction exceed government estimates of capital costs by "a wide margin (i.e., 35 to 40 percent). Additionally, current announced power plants appear to face another increase in costs (i.e., approximately 40 percent addition."[50] Thus, according to Duke, new coal-fired power plant capital costs had increased approximately 90 to 100 percent since 2002.

Q. Have other coal-fired plant projects experienced similar cost increases?

A. Yes. A large number of projects have announced significant construction cost increases over the past few years. For example, the cost of Westar's proposed coal-fired plant in Kansas, originally estimated at $1 billion, increased by 20

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[49] Direct Testimony of Judah Rose for Duke Energy Carolinas, North Carolina Utilities Commission Docket No. E-7, SUB 790, at page 4, lines 2-14. Mr. Rose's testimony is available on the North Carolina Utilities Commission website.

[50] Ibid, at page 6, lines 5-9, and page 12, lines 11-16.

percent to 40 percent, over just 18 months. This prompted Westar's Chief Executive to warn: "When equipment and construction cost estimates grow by $200 million to $400 million in 18 months, it's necessary to proceed with caution."[51] As a result, the company has suspended site selection for the coal-plant and is considering other options, including building a natural gas plant, to meet growing electricity demand.

The estimated cost of the now-cancelled Taylor Energy Center in Florida increased by 25 percent, $400 million, in just 17 months between November 2005 and March 2007. The estimated cost of the Big Stone II coal-fired power plant project in South Dakota has increased by about 60 percent since the project was first announced. Finally, the estimated cost of the Little Gypsy Repowering Project (gas to coal) increased by 55 percent between announcement of the project in April 2007 and the filing of a request for a license to build in July 2007.

Q. What are the sources of the worldwide competition for power plant design and construction resources, commodities and equipment?

A. The worldwide competition is driven mainly by huge demands for power plants in China and India and by a rapidly increasing demand for power plants and power plant pollution control modifications in the United States required to meet SO_2 and NO_x emissions standards. The demand for labor and resource to rebuild the Gulf Coast area after Hurricanes Katrina and Rita hit in 2005 also has contributed to rising costs for construction labor and materials.

[51] Available at http://www.westarenergy.com/corp_com/corpcomm.nsf/F6BE1277A768F0E4862572690055581C/$file/122806%20coal%20plant%20final2.pdf.

Q. Is it commonly accepted that domestic United States and worldwide competition for power plant design and construction resources, commodities and manufacturing have led to these significant increases in power plant construction costs in recent years?

A. Yes. A wide range of energy, construction and financial industry studies have identified the worldwide competition for power plant resources as the driving force for the skyrocketing construction costs.

For example, a June 2007 report by Standard & Poor's, *Increasing Construction Costs Could Hamper U.S. Utilities' Plan to Build New Power Generation*, has noted that:

> As a result of declining reserve margins in some U.S. regions … brought about by a sustained growth of the economy, the domestic power industry is in the midst of an expansion. Standing in the way are capital costs of new generation that have risen substantially over the past three years. Cost pressures have been caused by demands of global infrastructure expansion. In the domestic power industry, cost pressures have arisen from higher demand for pollution control equipment, expansion of the transmission grid, and new generation. While the industry has experienced buildout cycles in the past, what makes the current environment different is the supply-side resource challenges faced by the construction industry. A confluence of resource limitations have contributed, which Standard & Poors' Rating Services broadly classifies under the following categories
>
> - Global demand for commodities
> - Material and equipment supply
> - Relative inexperience of new labor force, and
> - Contractor availability
>
> The power industry has seen capital costs for new generation climb by more than 50% in the past three years, with more than 70% of this increase resulting from engineering, procurement and construction (EPC) costs. Continuing demand, both domestic and international, for EPC services will likely keep costs at elevated levels. As a result, it is possible that with declining reserve margins, utilities could end up building generation at a time when

> labor and materials shortages cause capital costs to rise, well north of $2,500 per kW for supercritical coal plants and approaching $1,000 per kW for combined-cycle gas turbines (CCGT). In a separate yet key point, as capital costs rise, energy efficiency and demand side management already important from a climate change perspective, become even more crucial as any reduction in demand will mean lower requirements for new capacity.[52]

More recently, the president of the Siemens Power Generation Group told the New York Times that "There's real sticker shock out there."[53] He also estimated that in the last 18 months, the price of a coal-fired power plant has risen 25 to 30 percent.

A September 2007 report on *Rising Utility Construction Costs* prepared by the Brattle Group for the EDISON Foundation similarly concluded that:

> Construction costs for electric utility investments have risen sharply over the past several years, due to factors beyond the industry's control. Increased prices for material and manufactured components, rising wages, and a tighter market for construction project management services have contributed to an across-the-board increase in the costs of investing in utility infrastructure. These higher costs show no immediate signs of abating.[54]

The report further found that:

- Dramatically increased raw materials prices (e.g., steel, cement) have increased construction cost directly and indirectly through the higher cost of manufactured components common in utility infrastructure projects. These cost increases have primarily been due to high global demand for commodities and manufactured goods, higher production and transportation costs (in part owing to high fuel prices), and a weakening U.S. dollar.
- Increased labor costs are a smaller contributor to increased utility construction costs, although that contribution may rise in the future as

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[52] *Increasing Construction Costs Could Hamper U.S. Utilities' Plans to Build New Power Generation*, Standard & Poor's Rating Services, June 12, 2007, at page 1. A copy of this report is included in Exhibit DAS-6.

[53] "Costs Surge for Building Power Plants, *New York Times*, July 10, 2007.

[54] *Rising Utility Construction Costs: Sources and Impacts*, prepared by The Brattle Group for the EDISON Foundation, September 2007, at page 31. A copy of this report is attached as Exhibit DAS-7.

large construction projects across the country raise the demand for specialized and skilled labor over current or project supply. There also is a growing backlog of project contracts at large engineering, procurement and construction (EPC) firms, and construction management bids have begun to rise as a result. Although it is not possible to quantify the impact on future project bids by EPC, it is reasonable to assume that bids will become less cost-competitive as new construction projects are added to the queue.

- The price increases experienced over the past several years have affected all electric sector investment costs. In the generation sector, all technologies have experienced substantial cost increases in the past three years, from coal plants to windpower projects…. As a result of these cost increases, the levelized capital cost component of baseload coal and nuclear plants has risen by $20/MWh or more – substantially narrowing coal's overall cost advantages over natural gas-fired combined-cycle plants – and thus limiting some of the cost-reduction benefits expected from expanding the solid-fuel fleet.

- The rapid increases experienced in utility construction costs have raised the price of recently completed infrastructure projects, but the impact has been mitigated somewhat to the extent that construction or materials acquisition preceded the most recent price increases. The impact of rising costs has a more dramatic impact on the estimated cost of proposed utility infrastructure projects, which fully incorporates recent price trends. This has raised significant concerns that the next wave of utility investments may be imperiled by the high cost environment. These rising construction costs have also motivated utilities and regulators to more actively pursue energy efficiency and demand response initiatives to reduce the future rate impacts on consumers.[55]

Q. Is it reasonable to expect that these same factors will lead to construction delays as well as rising costs?

A. Yes.

Q. Doe the current Wise County Plant cost estimate include a contingency to reflect possible future cost increases?

A. Yes. According to Company witness Martin's Attachment JKM-5, the current plant cost estimate includes an [REDACTED] contingency. As I have

[55] Id, at pages 1-3.

discussed above, this is [REDACTED] than the cost increases that have been incurred in recent years at other coal-fired power plant projects.

Q. What is the current status of contracting and procurement for the Wise County Plant?

A. It appears from Mr. Martin's Supplemental Direct Testimony that none of the major contracts for the Wise County Plant have been let. Thus, the extremely early status of contracting and procurement render the project very susceptible to cost increases and construction delays.

Q. Has Dominion Virginia Power reflected the potential for a schedule delay as a result of the increased competition for power plant design and construction resources, commodities and manufacturing capacity?

A. No.

Q. Is it your testimony that Dominion Virginia Power should change its current cost estimate for the Wise County Plant?

A. Not necessarily. However, in order to evaluate the risks of continuing with the proposed project, Dominion Virginia Power should have prepared sensitivity studies that examined the relative economics of the Wise County Plant against alternatives assuming that the capital cost of the project is substantially higher than the Company now estimates. For example, in its economic analyses, Dominion Virginia Power should have prepared sensitivity analyses that reflected capital costs 20 percent and 40 percent higher than its current estimated cost for the Wise County Plant. It is not unreasonable to expect such additional cost increases at the Wise County Plant in light of the industry-wide experience and the expectation that worldwide demand will continue to be a driving force for rising prices.

Q. Is it reasonable to expect that these same current market conditions also will lead to increases in the estimated costs of other supply-side alternatives such as natural gas-fired or wind facilities?

A. Yes.

Q. What impact would higher coal-plant capital costs have on the relative economics of energy efficiency as compared to the Wise County Plant?

A. I have seen no evidence that the same worldwide demand for power plant resources has led to significant increase in the costs of energy efficiency measures. Therefore, it is reasonable to expect that higher coal-plant capital costs increase the relative economics and attractiveness of energy efficiency.

5. The Company's Economic Analyses Do Not Show That The Proposed Wise County Plant Would Provide Power At A Reasonable Price

Q. In your experience, what evidence do electric utility companies typically submit in cases where they are seeking to justify the addition of new baseload generating facilities?

A. Electric utility companies typically provide economic and system modeling analyses that compare resource plans that include a range of supply side options and, with increasing frequently, companies are now including demand side options, as well, in their resource planning. These studies project the costs and benefits of the various supply and demand side alternatives for decades into the future. They are used to examine whether the proposed generation facility is a component of a least cost expansion plan. A standard approach is to calculate and compare the net and cumulative present values of the various alternatives.

In addition to base case studies, prudent utility economic and system modeling analyses also present a wide range of sensitivity analyses that examine the impact of changes in key input assumptions, such as capital costs and fuel costs, on the relative costs and benefits of alternative resource plans and options. As I

discussed earlier, prudent and reasonable planning also requires that future CO_2 prices be reflected in resource planning.

Q. Has Dominion Virginia Power provided these types of economic and system modeling analyses in support of its proposed Wise County Plant?

A. No. The Company has only provided general statements in its testimony and limited economic comparisons between the proposed plant and buying capacity and energy from the market for the next sixty years.

Q. Has the Company provided any evidence that the proposed Wise County Plant is part of or is compatible with a least cost generation expansion plan?

A. No. The Staff directly asked Dominion Virginia Power "Has the Company conducted any analysis (system optimization, production costing simulation, etc.) of whether the proposed unit is compatible with a least cost generation expansion plan? If so, provide a summary of the results of all such studies."[56] (Emphasis in original)

Instead of providing the requested analyses, the Company referenced and repeated general statements in its testimony about the need for additional capacity, the search for alternative sites, etc., and referenced a number of other data request responses that had provided the results of its comparison of the cost of generating power at the Wise County Plant with the cost of buying power from the market.[57] However, Dominion Virginia Power did not cite to any studies that showed that the Wise County Plant was part of or compatible with a least cost generation expansion plan. This suggests that the Company could not cite to any such analyses because it has not prepared as part of its resource planning the system optimization or production costing simulation studies that would identify such a least cost expansion plan. It certainly has not provided the results of any such studies in any of the data request responses that we have reviewed.

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[56] Question Staff 1-7.
[57] Dominion Virginia Power Response to Question Staff 1-7.

Q. Has Dominion Virginia Power compared the cost of generating power at the proposed Wise County Plant, using its preferred CFB technology, with the cost of generating power at a new natural gas-fired facility?

A. No.[58] The only economic analyses provided by the Company either compared the cost of generating power at a CFB at the Wise County site with other coal-fired options or with buying power from the market. The Company did not examine the relative economic costs and benefits of building a new gas-fired combustion turbine or combined-cycle facility instead of the Wise County Plant.

Q. Do you have any comments regarding Company witness Hilton's answer to the question in his Supplemental Direct Testimony "Wouldn't gas facilities be cheaper to building than the coal plant?"[59]

A. Yes. The point is not merely whether it would be cheaper to build a natural gas-fired facility. The analysis that Dominion Virginia Power should have conducted would have been to compare the life cycle costs of coal-fired and natural gas-fired facilities within the context of system modeling analyses. However, the Company has not presented the results of any long-term economic comparisons or modeling analyses of generation expansion plans that contain natural gas or coal-fired power plants. Such analyses also could examine the significance of any projected volatility in gas or coal prices and the impact of federal regulation of greenhouse gas emissions.

Q. Has the Company compared the cost of generating power at the proposed Wise County Plant, using CFB technology, with the cost of implementing energy efficiency or demand-side management measures?

A. No.

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[58] Dominion Virginia Power Response to Question SELC 1-37.d.
[59] Supplemental Direct Testimony of E. Paul Hilton, at page 4, line 8.

Q. What explanation has Dominion Virginia Power provided for not comparing the cost of generating power at the proposed Wise County Plant, using CFB technology, with the cost of implementing energy efficiency or demand-side management measures?

A. The Company has claimed that "Demand side management and energy efficiency address and mitigate peaking demand, and the current project is needed to provide base load supply."[60]

Q. Is this a credible explanation?

A. No. Reducing overall energy usage through efficiency measures and programs can offset or eliminate the need for and the economics of proposed baseload generating facilities. Perhaps Dominion Virginia Power misstated its position on energy efficiency. It is hard to believe that in 2007 a utility believes energy efficiency measures only address reduction of peak demands.

Even if demand side management or energy efficiencies cannot, on their own, replace a new baseload generating facility in the short term, they can be expected to affect the relative economics, need for and timing of the addition of new baseload plants, especially where they are considered as part of a portfolio of alternatives that also would include renewable resources and, if necessary, some gas-fired capacity.

Q. Did Dominion Virginia Power compare the cost of generating power at the proposed Wise County Plant, using CFB technology, with the cost of generating power at renewable resources?

A. No.[61]

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[60] Dominion Virginia Power Response to Question SELC 1-37.e.
[61] Dominion Virginia Power Response to Question SELC 1-37.d.

Q. Does the discussion in Company witness Martin's Direct Testimony show that the proposed Wise County provides baseload power at a reasonable price or provides any economic benefits for the customers of Dominion Virginia Power?[62]

A. No. The discussion in Mr. Martin's testimony is critically flawed and biased in favor of the Wise County Plant in a number of ways.

First, Mr. Martin does not show that buying capacity and energy from the market would be a lower cost option for ratepayers than other available alternatives such as building a new gas-fired unit, building or buying power from renewable resources, implementing demand side management or energy efficiency measures, or some combination of these options. In other words, there may be more economic options for the Company than either building the Wise County Plant or buying power from the market for the next 60 years.

Second, Mr. Martin only discusses the comparison between the Wise County Plant and buying power from the market in nominal dollars. He does not compare the life cycle costs of the two options in present value dollars. This ignores the potential impact of the timing of the costs and benefits of each option.

This is a significant flaw because internal Company reports reveal that Dominion Virginia Power expects to

[REDACTED]

[63] These costs would be incurred before the Company would have to buy power from the market in place of any power that would be generated at the Wise County Plant. Thus, these costs would have a significant impact in a present value analysis because they would be discounted less than power supply costs incurred in subsequent years after the plant enters commercial service.

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62 Direct Testimony of James K. Martin, at page 11, line 1, through page 12, line 6.

63 Dominion Virginia Power Southwest Virginia Project: Investment Review Committee, April 13, 2007, at page 11, provided in Response to Question SELC 1-5.

Third, Mr. Martin's analysis does not include any CO_2 costs that reflect the impact of federal regulation of greenhouse gas emissions. Nor, in the alternative, do the all-in costs for the Wise County Plant in the Company's study reflect any costs of adding or operating carbon capture or sequestration equipment.[64] It also appears that Mr. Martin did not include the costs of buying any NO_x or SO_2 allowances in the his projected costs of power from the Plant.

Thus, the Company's economic analysis understates the cost of the Wise County Plant because it does not consider all of the costs of generating power. It also understates the cost of the Wise County Plant because its does not discount the costs of both options to present year dollars.

Q. Do you have any comment on the claim by Mr. Martin that if market prices escalate at only 3 percent per year, the market cost for energy and capacity would exceed the all-in cost of the Project around its 6th year of operation?[65]

A. Yes. This comment may be technically correct but also is misleading because it does not reflect the [REDACTED] that the Company's customers would pay prior to the project's in-service date. When the cumulative net present value of the two options (that is Wise County versus buying power from the market) are compared, the analysis shows that the Wise County Plant would be

[REDACTED]

. However, as shown in Figure 10, the analysis also reveals that the Wise County Plant would be the more expensive option, on a cumulative net present value basis, for the first 40 years, that is, through the year 2048. In other words, the year 2048 is the break-even year between the two options.

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64 Dominion Virginia Power Responses to Questions AG 1-13 and AG 1-14.

65 Direct Testimony of James K. Martin, at page 12, lines 1-4.

Figure 10: Cumulative Present Value Difference Between the Cost of Generating Power and Buying Capacity and Energy from the Market – Based on Example in Company Witness Martin's Testimony [CONFIDENTIAL]

This figure shows that the cost of generating power at the proposed Wise County Plant would be more expensive through the year 2048, on a cumulative present value basis, than buying capacity and energy from the market, using the cost figures from Company witness Martin's Direct Testimony. In fact, the Company's customers would pay an [REDACTED] at which time the annual cost of generating power at the Plant would become less expensive than the annual cost of buying power from the market. Consequently, in this example, Dominion Virginia Power's customers would pay significantly higher rates in the near future in the hope that

the Plant will produce some cumulative present value economic benefit in the distant future, after the year 2048.[66]

Q. But doesn't this example show that building the Wise County Plant will be the less expensive option overall?

A. No. These figures reflect the Company's all-in costs of the Wise County Plant which do not include any CO_2 costs or any costs of purchasing NO_x or SO_2 emissions allowances. Including these costs would substantially reduce, or even eliminate altogether, the cumulative cost advantage shown for the Wise County Plant in Figure 10.

Q. Just to be clear, are you recommending that the Company not build the proposed Wise County Plant and instead rely on buying capacity and energy from the market for the next 60 years?

A. No. I think that it would not be prudent to attempt to rely on the market for the next 60 years in place of implementing supply or demand side alternatives. This is just an illustration of the weaknesses in Company's claim that generating power at the Wise County Plant would be less expensive than buying power from the market. Instead, I believe that the Company should be required to analyze, on a net and cumulative present value basis, the relative costs of system plans that include generating power at the Wise County Plant versus alternative plans that include renewable resources, energy efficiency and some natural gas-fired capacity.

Q. Does the Company's 2005 site development review and comparative technology analysis show that the Wise County Plant is compatible with a least cost generation expansion plan?

A. No. That 2005 analysis only examined the levelized costs of a number of alternative coal-fired power plants.

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[66] This calculations for this illustration are presented in Confidential Exhibit DAS-8.

6. Adding The Wise County Plant Would Not Increase the Diversity in Dominion Virginia Power's Generation Supply

Q. Is supply diversity an issue that the Commission should consider as it evaluates Dominion Virginia Power proposed Wise County Plant?

A. Yes. I think supply diversity is a very important consideration. Reducing the Company's current heavy dependence on fossil-fired generation, especially coal-fired power, and moving towards greater use of renewable resources and energy efficiency, should be a major goal given the threat posed by global climate change and the inevitability of federal regulation of greenhouse gas emissions in the near future. Building the Wise County Plant would be a step in the wrong direction.

Q. How dependent is the Company on fossil-fired generation at this time?

A. In 2006, Dominion Virginia Power generated 51 percent of its own generation at coal-fired power plants.[67] Another six percent was generated at natural gas-fired facilities. One percent was produced at oil-fired plants.

Q. Will the addition of the Wise County Plant enable Dominion Virginia Power to further diversify its fuel mix, as Company witness Hilton has claimed?

A.

[REDACTED]

[67] Dominion Virginia Power Response to Interrogatory Question No. SELC 1-6.

Q. Is considering a the amount of gas-fired capacity in the Company's generation mix the appropriate way to evaluate its fuel diversity?

A. No. It is necessary to look at the MWh of power generated using each fuel because the issue of fuel diversity is a matter of the amount of each type of fuel that the company burns, and the cost consequences of burning that fuel. Simply looking at its capacity mix does not offer any information about the utilization of that capacity.

Q. Do you have any comment on Dominion Virginia Power witness Hilton's claim that the Company already has considerable amount of gas generation in its fleet?[68]

A. Yes. As noted about, in 2006, only six percent of the generation at the Company's own facilities was produced by natural gas-fired facilities. This is not a significant dependence on natural gas. The Company generates only one percent of its power at its oil-fired facilities. This also is not a significant dependence on oil.

Q. Do you agree with Mr. Hilton that the prices of natural gas supplies are volatile?[69]

A. Yes. However, the risk that the prices of gas supplies will be volatile must be balanced against the potential risks of federal greenhouse gas regulations and coal-fired power plant construction cost increases. There are risks associated with all options. That is why those risks are considered and evaluated during prudent a resource planning process. Unfortunately, as I will explain later, there is no evidence that Dominion Virginia Power has performed such prudent resource planning with regard to the Wise County Plant.

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[68] Supplemental Direct Testimony of E. Paul Hilton, at page 4, line 12.
[69] Id, at page 4, lines 14-17.

Q. Is fuel diversity a broader issue than merely deciding whether to build a coal- or gas-fired generating unit?

A. Yes, it should be. Implementing demand side management programs and building or buying power from low carbon-emitting renewable resource facilities also would increase a company's supply diversity. Investments in demand side management and renewable resources would provide real benefits in terms of supply diversity by reducing Dominion Virginia Power's dependency on coal, gas and oil.

Q. Do you have any comment on Mr. Hilton's testimony concerning the desirability of having a balanced and flexible portfolio of resources to meet customer needs?[70]

A. Yes. The Company already produces 51 percent of the generation at its own facilities at coal-fired power plants. Adding more coal-fired generation does not make this supply mix more balanced and flexible, especially considering the risks and potential costs associated with federal regulation of greenhouse gas emissions.

On the other hand, adding renewable resources and reducing system demands and energy usage through demand side management and energy efficiency measures would increase Dominion Virginia Power's supply diversity. Indeed, adding more gas-fired capacity instead of new coal-fired generation might make economic sense especially if it is included as part of a least cost plan adding more renewable resources, demand side management and energy efficiency. Unfortunately, Dominion Virginia Power has not examined the relative economics of any of these alternatives to the Wise County Plant.

[70] Supplemental Direct Testimony of E. Paul Hilton, at page 4, lines 10 through 12.

7. The Commission Should Not Grant Dominion Virginia Power An Additional 200 Basis Points On Its Return On Equity On The Basis Of The Claim That Wise County Would Be A Carbon Capture Compatible Power Plant.

Q. Should the Commission grant Dominion Virginia Power an additional 100 or 200 basis points on its return on equity because it has proposed to build a clean coal, carbon capture compatible plant in Southwest Virginia?

A. No. The Company is proposing to build a state-of-the-art plant with what appear to be BACT controls for the current criteria pollutants. That is to be expected. However, Dominion Virginia Power has not taken any significant steps in the design of the proposed Wise County Plant with regard to carbon capture and sequestration other than to reserve space for the possible future addition of currently unknown equipment. Moreover, the Company has not expressed a willingness or intention to bear any risks associated with the decision to pursue building a CFB facility in Wise County. Therefore, there is no basis for granting the Company a higher return on equity on its investment.

Q. What actions has Dominion Virginia Power taken with regard to making the proposed Wise County Plant carbon capture compatible?

A. We asked the Company a number of questions regarding its claim that the Wise County Plant will be carbon capture compatible:

- SELC 1-14: Please provide copies of any assessments of the potential to sequester, either at the site of the proposed Wise County plant or any other location(s), the CO_2 that will be produced at the proposed plant.
- SELC 1-15: Please describe and provide the documentation associated with any plan by Dominion Virginia Power to capture and sequester the CO_2 that will be produced at the proposed Wise County plant.
- SELC 1-16: Please state whether any equipment for carbon capture and sequestration has been included in the design for the proposed Wise County plan. If the answer is yes, please identify the equipment and its cost.
- SELC 1-17: Please state whether the design for the proposed Wise County plant otherwise allows for the installation and operation of

equipment for carbon capture and sequestration. If the answer is yes, please identify each way in which the design allows for the installation and operation of equipment for carbon capture and sequestration.

- SELC 1-18: Please provide copies of any assessments or estimates, prepared by or for Dominion Virginia Power or any affiliated company, of the potential costs of retrofitting the proposed Wise County plant for carbon capture and sequestration equipment, if and when that technology becomes commercially viable for CFB.

- SELC 1-19: Please provide copies of any assessments or estimates, prepared by or for Dominion Virginia Power or any affiliated company, which have addressed or examined the operating costs and/or the performance penalties that can be expected to be experienced as a result of the addition and use of carbon capture and sequestration equipment.

- SELC 1-23: Reference paragraph 7 of the Application. Identify each way in which the site for the Wise County plant has been designed to accommodate future installation of carbon capture technology and provide the documents associated with those design features.

- SELC 1-36.a: Specify all of the steps that the Company has made to make [the Wise County plant] compatible with anticipated, future carbon capture technology.

In response to Question SELC 1-14 the Company provide the following narrative paragraph and a single presentation that offered no information on the specific design of the Wise County Plant. The responses to all of the other Questions merely referred to the response to Question SELC 1-14:

> As stated in my Direct Testimony of July 13, 2007, carbon capture technology is not commercially viable or available at the present time. The Company has taken steps to make the Plant highly efficient and compatible with anticipated, future carbon capture technology. The Virginia City Site has adequate space for the future deployment of such technology. The Plant design has a designated area of sufficient size based on conceptual carbon capture equipment to allow the flue gases to be processed for carbon capture. In addition, the Plant is located in a region which is being studied by others as a viable location for future carbon sequestration. The Company is part of a consortium testing the viability of carbon storage at locations in Southwest Virginia…. The Department of Energy is considering an application from the consortium for a Southwest Virginia test site. Additionally, the Company is continuing to follow the evolution of technology that

will allow carbon capture technology to become commercially viable in the future.[71]

Thus, the Company:

- Has proposed to build a state-of-the art coal-fired power plant
- Has set aside space for currently uncertain carbon capture and sequestration technology
- Has sited the plant in Southwest Virginia
- Is part of a consortium testing the viability of carbon storage at locations in Southwest Virginia
- Is following the evolution of carbon capture and sequestration technology

While these are commendable actions, they hardly seem to justify the receipt of an additional 100 or 200 basis points on return on equity.

Q. Other than estimating the cost of building the Plant as $1.62 billion, has the Company estimated what the cost of any of the steps to make the Wise County Plant carbon capture compatible?

A. No.

Q. Has the Company offered to pay of the costs of any of these steps to make the Wise County Plant carbon capture compatible?

A. Not that I have seen. Presumably, the Company's customers will be asked to pay the costs associated with each of these steps to make the Wise County Plant carbon capture compatible.

[71] Dominion Virginia Power Response to Question SELC 1-14.

Q. Did the Company's Attachment to its response to Question SELC 1-14 provide any other significant information about design features that are being included to make the Wise County Plant carbon capture compatible?

A. The Attachment provided background information about efforts to study carbon sequestration, research efforts and the opportunities for a partnership among Dominion, the Virginia Center for Coal and Energy Research and Virginia Tech.

Q. Has the Company identified any features of associated with a circulating fluid bed design that make the Wise County Plant more carbon capture compatible than other power plant designs?

A. No.[72]

Q. Has Dominion Virginia Power expressed a willingness to bear any risks associated with the success or failure of the development of commercially viable carbon capture and sequestration technology for the Wise County Plant?

A. I am not aware of any risks associated with the success of failure of the development of carbon capture and sequestration technology that Dominion Virginia Power has offered to bear. Unless the Company offers to bear the risks associated with building the Wise County Plant or the Commission requires that it do so, ratepayers will be asked to bear all of the following costs:

- Dominion Virginia Power's share of costs of studying and developing future carbon capture and sequestration technology.
- The costs of buying any allowances for the CO_2 emissions from the Wise County Plant that would be required until carbon capture and sequestration technology becomes commercially viable.
- The costs of installing and operating carbon capture and sequestration technology at the Wise County Plant.

[72] Dominion Virginia Power Response to Question Staff 1-2.

- The costs of buying allowances for the CO_2 emissions from the Wise County Plant if carbon capture and sequestration does not prove to be technically or commercially viable at the plant.

It is not equitable that ratepayers also be required to pay the Company an additional 100 or 200 basis points on return on equity in addition to being asked to bear all of the risk and, potentially, all of these costs. Thus, the Commission should deny Dominion Virginia Power's request for any additional return on equity.

Q. Does this conclude your testimony?

A. Yes.