

PUBLIC TESTIMONY – REDACTED VERSION

**COMMONWEALTH OF VIRGINIA
STATE CORPORATION COMMISSION**

**APPLICATION OF VIRGINIA ELECTRIC AND POWER)
COMPANY FOR A CERTIFICATE OF PUBLIC CONVENIENCE)
AND NECESSITY TO CONSTRUCT AND OPERATE AN)
ELECTRIC GENERATION FACILITY IN WISE COUNTY,)
VIRGINIA, AND FOR APPROVAL OF A RATE ADJUSTMENT)
CLAUSE UNDER §§ 56-585.1, 56-580D, AND 56-46.1 OF THE CODE)
OF VIRGINIA)
)**

CASE NO. PUE-2007-00066

Direct Testimony of

Philip Mosenthal

On Behalf of

Southern Environmental Law Center

Appalachian Voices

Chesapeake Climate Action Network

Sierra Club

Southern Appalachian Mountain Stewards

November 2, 2007

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1 I. IDENTIFICATION AND QUALIFICATIONS

2 **Q. State your name and business address.**

3 A. Philip Mosenthal, 14 School Street, Bristol, VT 05443.

4 **Q. On whose behalf are you testifying?**

5 A. I am testifying on behalf of the Southern Environmental Law Center,
6 Appalachian Voices, Chesapeake Climate Action Network, Sierra Club, and
7 Southern Appalachian Mountain Stewards.

8 **Q. Mr. Mosenthal, by whom are you employed and in what capacity?**

9 A. I am the founding partner in Optimal Energy, Inc., a consultancy
10 specializing in energy efficiency and utility planning. Prior to founding Optimal
11 Energy, Inc. in 1996 I was the Chief Consultant for Mid-Atlantic region for
12 XENERGY, Inc. (now KEMA).

13 **Q. Summarize your qualifications.**

14 A. I have 24 years of experience in all aspects of energy efficiency, including
15 facility energy management, policy development and research, integrated resource
16 planning, cost-benefit analysis, and efficiency and renewable program design,
17 implementation and evaluation. I have developed numerous utility efficiency plans,
18 and designed and evaluated utility and non-utility residential, commercial and
19 industrial energy efficiency programs throughout North America, in Europe and
20 China.

21 I have also completed or directed numerous studies of efficiency potential
22 and economics, including ones in China, Colorado, Kansas, Maine, Massachusetts,
23 Michigan, New England, New Jersey, New York, Quebec, Texas, and Vermont.
24 These have ranged from high level assessments to extremely detailed, bottom-up

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1 assessments evaluating thousands of measures among numerous market segments.
2 Recent examples of the latter are analyses of electric and natural gas efficiency and
3 renewable potential and development of suggested programs for New York State,
4 on behalf of the New York State Energy Research and Development Authority
5 (NYSERDA).

6 Beginning in 1998 I led development of commercial and industrial
7 programs for the Long Island Power Authority. I continue to advise LIPA on
8 program design, planning and implementation issues, and have recently been
9 involved in assessment of the achievable electric potential from a portfolio of
10 ramped up electric and gas efficiency programs on Long Island.

11 I was the chief architect of the nation’s first “energy efficiency utility” in
12 Vermont in the late 1990’s, and led the development of the EEU, including all
13 planning, program design and analysis, and testimony. I am currently a lead
14 advisor for business energy services at Efficiency Vermont, which operates as the
15 EEU. I also currently advise non-utility parties in the Massachusetts Collaborative
16 on commercial and industrial efficiency planning, program design and evaluation
17 issues, working closely with the utility program administrators in that state.

18 Prior to co-founding Optimal Energy in 1996, I was the Chief Consultant
19 for the Mid-Atlantic Region for XENERGY, INC. (now KEMA). I have a *B.A.* in
20 Architecture and an *M.S.* in Energy Management and Policy, both from the
21 University of Pennsylvania. My resume is provided as Exhibit SELC-PHM-1.

22 **Q. Have you previously testified before the Virginia State Corporation**
23 **Commission (“the Commission” or “SCC”)?**

24 **A. No.**

1 II. INTRODUCTION AND SUMMARY

2 **Q. What is the purpose of your testimony in this proceeding?**

3 A. My testimony addresses two issues: (1) the failure of Dominion Virginia
4 Power to engage in appropriate resource planning to effectively consider all
5 resource alternatives to meet future electric demand to ensure least cost solutions
6 are identified and pursued; and (2) the large and cost-effective electric efficiency
7 resource potential in Dominion Virginia Power’s territory and its ability to defer or
8 replace investment in a new coal-fired power plant to serve Dominion Virginia
9 Power's customers.

10 **Q. Summarize your testimony.**

11 A. First, Dominion Virginia Power has failed to engage in an appropriate
12 resource planning process that considers all the resource alternatives to meeting
13 future electric load. By ignoring energy efficiency, demand response and combined
14 heat and power opportunities (collectively referred to as demand-side management
15 or DSM), Dominion Virginia Power is only considering one set of solutions to
16 meet future electric load growth. Without engaging in an integrated resource
17 planning process (IRP), Dominion Virginia Power and the SCC can not determine
18 if construction of a new coal fired power plant is the best solution to meet new load
19 growth and protect ratepayers from unnecessarily high electricity costs and
20 environmental and financial risks. The SCC should direct Dominion Virginia
21 Power to engage in IRP going forward that assesses, on an equal footing, all
22 electric resources available to meet forecast electric needs.

23 Second, the cost-effective achievable electric efficiency potential in
24 Dominion Virginia Power's territory is large and sufficient to *meet all electric*

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1 *energy load growth and maintain electricity demand at 2012 levels* (the start date
2 of the proposed coal plant) *at least* thru 2022. Pursuit of this efficiency resource
3 would result in dramatically lower energy costs for ratepayers and avoid the need to
4 build a new coal plant in the near future. Further, efficiency resources can be
5 captured at a fraction of the cost of new coal-fired power supply, providing
6 substantial economic benefits to Virginians and boosting the local economy and
7 jobs. The SCC should direct Dominion Virginia Power to pursue all cost-effective
8 efficiency opportunities through a portfolio of cost-effective programs, available to
9 all electric customers.

10 **Q. Can you summarize your key findings?**

11 A. Yes. My analysis shows that:

- 12 • Dominion Virginia Power has failed to adequately consider alternatives
13 to the proposed coal plant or determine that it is a good choice for
14 ratepayers.
- 15 • Energy efficiency resources are large and cheap, and can significantly
16 defer or completely replace the need for a new power plant at a fraction
17 of the cost of the proposed coal plant.
- 18 • Not only has Dominion Virginia Power failed to analyze demand-side
19 alternatives (DSM), it appears to completely misunderstand the nature
20 of DSM and assumes it can only reduce peak loads and not address
21 annual energy usage for which the coal power plant is designed.

- 22 • [REDACTED] coal-
23 fired power plants have been postponed or cancelled nationally [REDACTED]
24 [REDACTED]
25 [REDACTED]
26 [REDACTED]
27 [REDACTED]

1 ██████████ Yet Dominion Virginia Power seems to ready to ignore these
2 clear warning signs and expose its ratepayers to substantial risk.

- 3 • Pursuit of efficiency resources now can pay large dividends. Deferral of
4 the coal plant for just 10 years would result in savings of \$647 million
5 just due to the time value of money. In addition, the efficiency resources
6 can provide between 1 and 4 billion dollars in *net* benefits (depending
7 on the scenario pursued) to the Virginia economy, lowering ratepayers’
8 electricity costs, improving the environment, and minimizing risk.

9
10 III. THE COMMISSION SHOULD ADOPT INTEGRATED RESOURCE
11 PLANNING AS AN ON-GOING REQUIREMENT FOR DOMINION VIRGINIA
12 POWER.

13 **Q. What is Integrated Resource Planning?**

14 A. Integrated resource planning (IRP) — also termed *least cost planning* — is
15 a process of assessing all alternative supply and demand resources and their
16 associated economics to arrive at the optimal, least cost solution (from the
17 ratepayer’s perspective) to meeting future energy needs. Done properly, it should
18 treat supply and demand resources on an equal footing. DSM resources could
19 include energy efficiency, demand response programs, combined heat and power,
20 and other customer-sited distributed generation. On the supply side, utility-scale
21 renewable generation should be considered along with traditional power plant
22 options. In some jurisdictions, additional economic value can be assigned to reflect
23 benefits from reduced environmental damage or reduced risk.

24 **Q. Has Dominion Virginia Power conducted an IRP process?**

25 A. No. Dominion Virginia Power indicates that it has conducted no studies,
26 nor does it know of any studies that cover its service territory, of efficiency

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1 opportunities (SELC 2-8). When asked to describe its IRP process and provide the
2 latest plans (SELC 2-1), Dominion Virginia Power describes only generation and
3 supply capacity procurement, and refers to and provides only “resource plans” it is
4 required to file in North Carolina. A review of these plans clearly show that DSM,
5 while mentioned, is not well integrated into its resource procurement decisions. In
6 essence, Dominion Virginia Power has simply accepted its current forecast and
7 only considered traditional supply options to meet it. This means the Commission
8 has only half the picture, and can not determine what resource portfolio will best
9 meet forecast loads at least cost to ratepayers.

10 **Q. Do other regulatory jurisdictions require a more comprehensive “least cost”**
11 **approach to resource planning?**

12 A. Yes. Other states require the full acquisition of all cost effective efficiency
13 resources before new central station generation can be approved. This is true in
14 Vermont law and the California Loading Order. The New England Independent
15 System Operator has moved to adoption of this approach in its acquisition of
16 system peak capacity resources (through the Forward Capacity Market) as well.
17 The Northwest Power Planning Council conducts an excellent comprehensive
18 planning process that estimates on an equal footing all available resource options
19 including efficiency and combined heat and power.

20 **Q. Has Dominion Virginia Power made the argument that there is not the energy**
21 **efficiency potential available to justify higher levels of DSM investment?**

22 A. No. It has not even addressed the issue in its planning and analysis for the
23 Wise County plant. As I show below, the opportunities for cost-effective energy

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1 efficiency resources are large and cheap, and need to be considered as an
2 alternative to new coal-fired generation.

3

4 IV. THE COMMISSION SHOULD DIRECT DOMINION VIRGINIA POWER TO
5 ENGAGE IN AGGRESSIVE EFFORTS TO CAPTURE ALL EFFICIENCY
6 RESOURCES THAT ARE LOWER COST THAN AVAILABLE SUPPLY
7 RESOURCES.

8 **Q. Why is it important that the Commission direct Dominion Virginia Power to**
9 **implement significant efficiency programs?**

10 A. There are many important economic, consumer and environmental reasons
11 for the Commission to direct Dominion Virginia Power to capture all cost-effective
12 efficiency resources in these proceedings.

13 **Q. Please describe the economic and consumer benefits from adoption of**
14 **efficiency programs for Dominion Virginia Power ratepayers.**

15 Cost-effective electric efficiency programs help consumers and the
16 economy because the costs of investing in efficiency are lower than the costs of
17 generating and delivering the electricity for an equivalent level of service. This
18 means that cost-effective efficiency programs produce a number of economic and
19 consumer benefits including the following.

20 First, efficiency investments will lower total costs and electric bills for
21 consumers in Dominion Virginia Power's service territory. While efficiency
22 programs may increase electric *rates* in the short term because fixed costs and
23 program costs must be recovered over a smaller sales volume, the total electric *bills*
24 go down. This is an important point. Customers do not really care what their rate is,

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1 they care about how much electricity costs them. By reducing total energy bills
2 companies increase profitability and consumers are left with more disposable
3 income (the “income effect”). This results in additional spending being funneled
4 back into the local economy for other goods and services and in increased
5 competitiveness among businesses.

6 Second, investments in efficiency measures will directly boost the state and
7 local economy. Efficiency programs will direct infrastructure investment into local
8 buildings, creating new jobs for equipment installers, builders, engineers, and
9 others. I discuss potential job benefits in more detail below.

10 Third, efficiency investments, by reducing electricity demand, will reduce
11 upward pressure on prices to cover significant new investments in generation,
12 transmission and distribution infrastructure. Because DSM often improves system
13 load factors by achieving greater proportionate reductions in peak demand than
14 overall electricity use, market clearing prices at peak times can be lowered,
15 benefiting all ratepayers.

16 **Q. Please describe the environmental benefits of adoption of efficiency programs**
17 **for Dominion Virginia Power.**

18 A. More efficient end-use electricity use will result in reduced air pollution,
19 particularly sulfur dioxide (the primary cause of acid rain), nitrogen oxides (a key
20 component of urban smog), and nitrous oxide and carbon dioxide (key greenhouse
21 gas pollutants). This not only improves environmental health, but has the result of
22 lowering risk to utility shareholders and ratepayers from future emissions
23 regulations, taxes or cap and trade schemes. In contrast, pursuing a coal supply

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1 strategy exposes ratepayers to substantial risks in these areas. Below I estimate the
2 CO₂ benefits from pursuit of cost-effective efficiency programs.

3 In addition to emissions reductions, efficiency as an alternate to the
4 proposed coal plant would result in substantial other environmental benefits from
5 reducing a variety of impacts associated with coal mining, transportation and
6 burning. These include impacts from mountain top removal and water pollution.

7 **Q. Why can't we just let the market take care of electric efficiency?**

8 **A.** Electricity customers face a number of classic market barriers which
9 prevent them from pursuing efficiency measures and investments, even when it
10 would be in their own economic interest to do so. The resulting market failure
11 leaves economically achievable efficiency savings unrealized, resulting in an over-
12 commitment to more expensive electric supply. Energy-efficiency market barriers
13 require intervention with proven program designs to overcome multiple, interacting
14 barriers. Among the most widely-recognized efficiency market barriers are limited
15 access to low-cost capital to cover the higher initial cost of efficiency (*e.g.*,
16 purchasing more efficient appliances); scarcity of reliable information on the costs
17 and performance of efficiency technologies; limited availability of high-efficiency
18 products, equipment, and/or services; and split incentives between those who pay
19 for energy-using equipment and those who pay energy bills (*e.g.*, landlords and
20 tenants).¹

¹ See, for example: Lawrence Berkeley Laboratories, *Market Barriers to Energy Efficiency: A Critical Reappraisal of the Rationale for Public Policies to Promote Energy Efficiency*, Berkeley, CA, 1996), pp. 20, 35–41, available on the DOE Information Bridge Web site at <www.osti.gov/bridge/home.html>.

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1 **Q. Do customers in Dominion Virginia Power’s service territory currently have**
2 **access to efficiency programs?**

3 A. Not really. The American Council for an Energy Efficient Economy
4 (ACEEE) recently released a report: *The State Energy Efficiency Scorecard for*
5 *2006*. This document looks at state spending on ratepayer funded efficiency
6 programs in 2004.² Virginia is tied for dead last (along with Kansas and Wyoming)
7 in this ranking with no spending at all.³

8 More recently, Dominion has proposed offering some extremely limited
9 DSM efforts, although primarily in North Carolina. To date, it has only used time
10 of use and other pricing mechanisms to encourage efficiency. In response to SELC
11 2-9 Dominion indicates it is planning to engage in a pilot compact fluorescent bulb
12 (CFL) promotion in the 4th quarter of 2007 with a goal of selling 150,000 CFLs. It
13 is not clear whether this is in Virginia, North Carolina or both. Given the 2 million
14 residential customers in Dominion Virginia Power alone, this is a tiny fraction of
15 the achievable potential, and represents only 0.075 CFLs per residential customer.
16 In contrast, Efficiency Vermont has sold more than 1.2 million CFLs, and serves
17 only about 265,000 residential customers, for an average of 4.8 bulbs per
18 household.⁴ This is 64 times as much. To be fair, Dominion does state that it plans
19 to ramp this effort up in 2008 and 2009 to a total of 1,250,000 bulbs, however this

² Eldridge, *et. al.*, *The State Energy Efficient Scorecard for 2006*, ACEEE, June 2007.

³ *Ibid.*, p. 9. Delaware is not included in this ranking because data was not available.

⁴ Since EVT formation in 2000 through May 10 2007 CFL sales have been 1.275 million. Personal communication with Michael Russom, Manager for Retail Products at Efficiency Vermont, October 26, 2007.

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1 is still less than one per customer. Dominion Virginia Power indicates it offers
2 education and rate designs to encourage efficiency as well.

3 **Q. Aren't education and rate designs important to encourage efficiency?**

4 A. Yes. However, they are generally ineffective by themselves. Without
5 overcoming the multiple barriers described above through integrated and
6 comprehensive strategies, just providing price incentives and education is
7 insufficient. In fact, Dominion Virginia Power does not even track energy impacts
8 from its limited DSM efforts. It states (SELC 2-5) "no yearly documentation of the
9 energy efficiency and demand side management programs is available."

10 **Q. Is there other evidence that Dominion Virginia Power is not currently**
11 **planning on pursuing aggressive efficiency?**

12 A. Yes. First, there is the *complete lack of analysis* of efficiency resources.
13 Second, and even more disturbing, Dominion Virginia Power shows a *complete*
14 *lack of understanding of DSM* as an energy resource. For example, in response to
15 SELC 1-5 (l,m) Dominion Virginia Power states

16 *"the Company further notes that demand side measures are*
17 *focused primarily on mitigating and reducing peak load,*
18 *rather than base load demand, and the proposed coal plant*
19 *is needed for base load supply."*

20 Clearly Dominion Virginia Power views DSM primarily in terms of
21 demand response strategies and not energy efficiency programs. This is quite
22 astonishing given the great amount of experience throughout the U.S. capturing
23 cost-effective energy efficiency through utility programs. For example, California
24 has maintained virtually no per capita growth in electricity usage for approximately
25 30 years, primarily through aggressive efficiency efforts. In contrast, during this

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1 same period U.S. growth was approximately 50%.⁵ California achieved this while
2 its state economic percentage growth actually exceeded the national rate. In fact,
3 the Bush Administration’s National Energy Plan of 2001 identified energy
4 efficiency as the largest new source of energy since 1975, accounting for at least
5 20% of total usage.⁶ It is also astonishing because of Dominion’s own pilot CFL
6 effort. While this pilot is very minimal, residential CFLs provide the vast majority
7 of impacts and benefits from annual energy reductions with very little impacts and
8 benefits during the system peak period.

9 Finally, in response to SELC 1-3 asking for any DSM or resource plans
10 Dominion Virginia Power provided only 2005 and 2006 “resource plans” for North
11 Carolina, saying they do not have any for Virginia. These plans give virtually no
12 credence to DSM as a significant energy resource. Rather, they simply describe the
13 minimal DSM efforts Dominion is pursuing, with no quantification of costs or
14 savings.

15 **Q. You mention that there is ample experience throughout the U.S. with energy**
16 **efficiency programs. Can you provide some background on this experience?**

17 A. Yes. Since the late 1980’s various states have pursued DSM. During the
18 early 1990’s efforts were ramped up, most notably on the west coast and in the
19 northeast, but other states as well. After a brief period of declining investment in
20 the late 1990’s driven by movement to deregulation, we again see substantial
21 increases in DSM investment in North America. ACEEE estimates 2004 ratepayer

⁵ Goldstein, D., *Saving Energy, Growing Jobs*, Bay Tree Publishing, Berkeley, CA, 2007, p.59.

⁶ *Ibid.*, p. 58.

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1 funded spending in efficiency programs was \$1.45 billion and climbing.⁷ It is
2 almost certainly higher today.

3 **Q. How does Virginia compare with other states on energy efficiency progress?**

4 A. Very poorly. As mentioned above, the 2007 ACEEE Scorecard report⁸
5 ranked the states on efficiency efforts, considering such things as: utility
6 investment in efficiency programs, building codes, regulatory or legislative policies
7 and standards, tax incentives, and other areas. Virginia overall ranked 38th out of 50
8 states. Virginia scored a zero in all categories except building codes and combined
9 heat and power. Without its building codes, Virginia’s score would drop to 46th. As
10 mentioned above, based only on ratepayer funded programs Virginia is tied for last
11 place.

12 **Q. Have you examined the potential for cost-effective efficiency in the Dominion**
13 **Virginia Power service territory?**

14 A. No. I have not performed a detailed potential analysis for Dominion
15 Virginia Power. Nor have I had the opportunity to review potential studies
16 conducted for Dominion Virginia Power or related territories because according to
17 Dominion Virginia Power they do not exist (SELC 2-8).

18 **Q. Then how do you arrive at your conclusion that efficiency resources are large**
19 **and could provide net economic benefits to Virginians and defer the need for**
20 **the Wise County Plant?**

⁷ Eldridge, *et. al.*, *The State Energy Efficient Scorecard for 2006*, ACEEE, June 2007, p. 5.

⁸ *Ibid.*, Table ES-1, p. *iv*.

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1 A. I base my conclusions on an analysis of the current and forecast electric
2 loads in Dominion Virginia Power's territory and the likely achievable efficiency
3 opportunities from the large body of experience and studies in the industry and my
4 own extensive experience having both completed numerous efficiency potential
5 studies and reviewing those done by others.

6 **Q. What analysis have you conducted?**

7 A. I analyzed a low, medium and high DSM scenario of capturing 1.0%, 1.5%
8 and 2.0% incremental electric load reduction per year from DSM for 10 years only.
9 I applied these to Dominion Virginia Power's current and forecast energy and peak
10 loads. I assume a ramp-up of 4 years to reach full levels, starting in 2009, with
11 programs only going until 2018. Of course, undoubtedly there would be continued
12 opportunities for efficiency beyond this point that could be captured. This would
13 allow for 2008 as a full planning year before program implementation. Exhibit
14 SELC-PHM-2 and Figures 1 and 2 show the results of this analysis.

15 **Q. Explain the forecast you used for your analysis.**

16 A. My starting point was the 2006 energy and peak demand loads for
17 Dominion Virginia Power provided in response to SELC 2-2. I then applied the
18 annual forecast growth rates of the electricity usage from a forecast of the “PJM
19 South” reliability zone provided by Dominion Virginia Power in response to SELC
20 2-4. Dominion Virginia Power indicates in this response that PJM South “closely
21 approximates Dominion Virginia Power's service area but is not identical.” For
22 peak demand, I adopted annual growth rates from a PJM reliability region forecast
23 of Dominion’s peak loads provided in response to SELC 2-4, referring to AG 1-31.
24 I believe these include Dominion’s North Carolina territory as well, but should

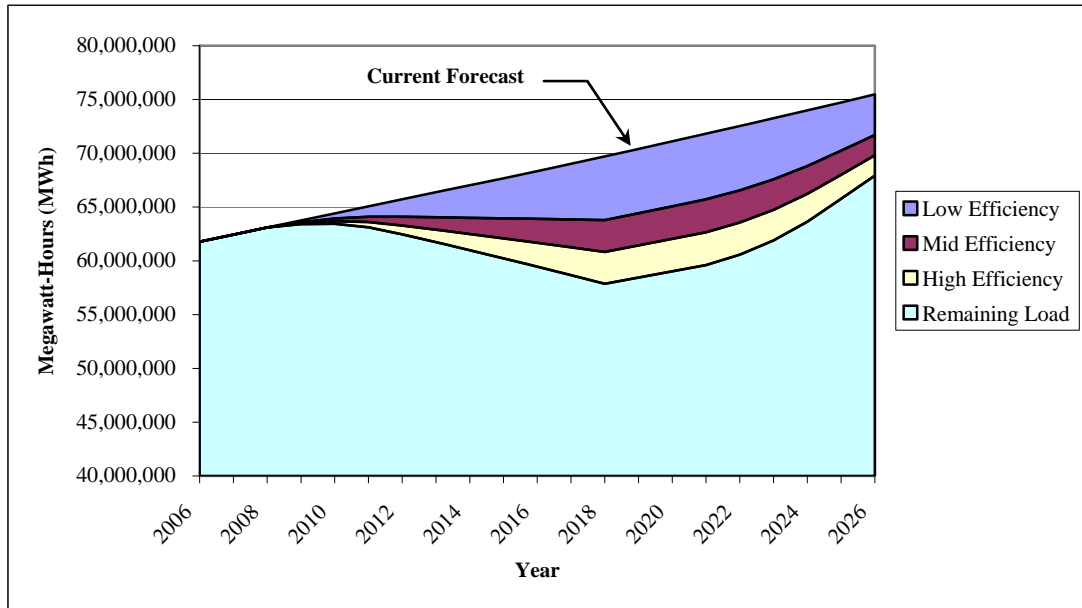
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1 closely approximate peak demand growth in its Virginia territory. I note that the
2 peak demand growth rates are significantly higher than the growth in annual
3 electricity usage (energy). The PJM South electricity forecast shows most growth
4 occurring in resale power and in the residential sector. Since residential loads are
5 typically not the major drivers of peak loads, and it is unlikely that residential load
6 factors are likely to change dramatically over time, I suspect that much of the
7 forecast peak load growth may be related to resale opportunities for Dominion,
8 rather than native load. It is not clear whether Dominion’s proposal for a new plant
9 is primarily to meet its own native load in Virginia, or as a business venture to sell
10 more power to other utilities.

11
12
13 **Q. What are the findings of your analysis?**

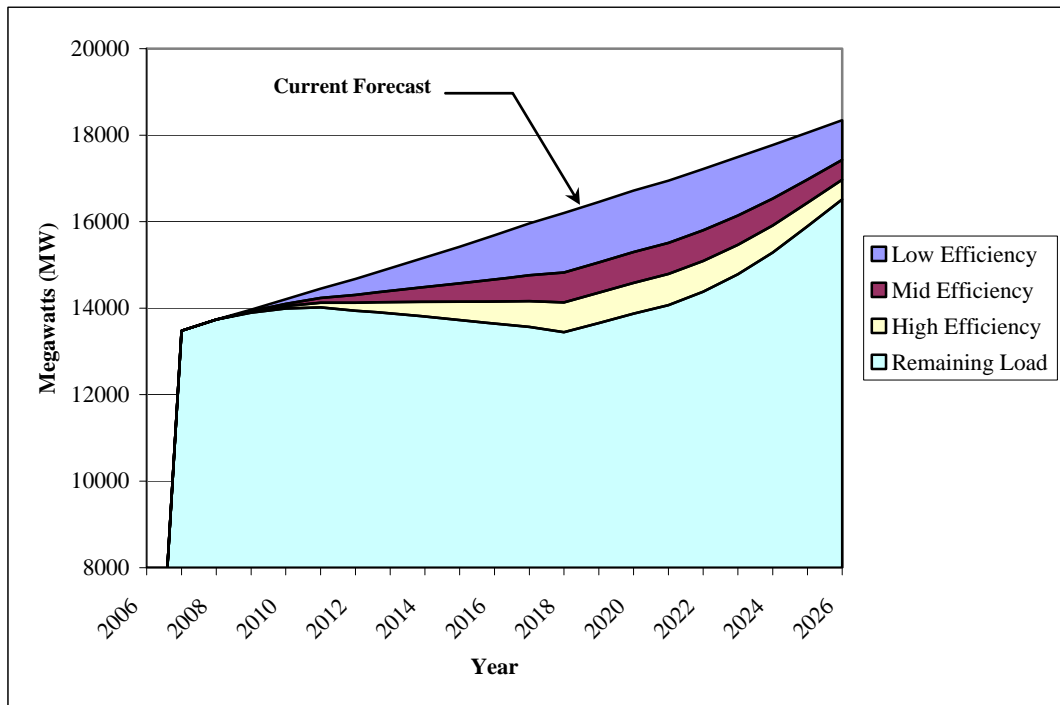
14 A. At the low (1.0%/yr.) scenario, electric energy consumption would continue
15 to climb slightly while programs are ramping up, but would then remain relatively
16 flat from 2011 through about 2018. Loads would not reach the forecast 2012 level
17 (the year Dominion Virginia Power anticipates the Wise County plant would go
18 into service) until 2022. This could potentially defer construction for a full 10
19 years. With the medium scenario, energy use would stay essentially flat through
20 2022, and not reach the forecast 2012 level until 2024. At the high scenario (2.0%)
21 energy consumption would remain below expected 2008 levels until 2024, and not
22 reach the 2012 forecast level until 2025. Figure 1 shows the current forecast and the
23 resulting annual electricity loads under each scenario.

1 **Figure 1: Current Forecast Annual Electricity Usage and Resulting Load From**
2 **Efficiency Scenarios**
3



4
5
6 Looking at peak demand, loads would continue to climb under the low and
7 medium scenarios, and decrease slightly for about 10 years under the high scenario.
8 However, the forecast 2012 peak load would not be reached until 2017, 2021 and
9 2023 for the low, medium and high scenarios, respectively. Figure 2 shows the
10 current peak demand forecast and the resulting peak loads under each scenario.

1 **Figure 2: Current Forecast Peak Electricity Demand and Resulting Load From Efficiency**
 2 **Scenarios**
 3



4
 5
 6 **Q. What do you conclude from this analysis?**

7 A. Even under the lowest scenario, efficiency can defer the need for the coal
 8 plant significantly. If Dominion Virginia Power were to aggressively pursue all
 9 cost-effective energy efficiency opportunities it is likely that the need for a new
 10 coal plant could be completely eliminated during the planning horizon. Note that
 11 my analysis only assumes 10 years of program delivery. As a result, by 2022
 12 savings from previously installed measures begin to disappear and are not assumed
 13 to be replaced. Continued efficiency investment could maintain and grow these
 14 savings indefinitely.

15 It is likely that with effective efficiency programs the coal plant would
 16 never be needed. However, it is important to realize that deferring the start date
 17 alone offers substantial benefits to ratepayers — both in real dollar savings as well

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1 as lower risk and more time to assess the best solution. Because of the time value of
2 money, just deferring the \$1.677 billion investment Dominion Virginia Power
3 estimates (Office of Attorney General 2-40) for 10 years would save ratepayers
4 \$647 million assuming a real discount rate of 5%. This is equal to 39% of today's
5 total cost of the plant. Below I further discuss the other very important benefits of
6 deferral.

7 **Q. Isn't it true that based on current forecasts peak load would continue to grow**
8 **under the low and medium scenarios?**

9 A. Yes. However, it would grow much less fast. Also, there are some
10 significant conservatisms in my analysis of peak load impacts. First, I assume that
11 peak load savings simply match (on a percentage basis) those for annual energy
12 use. Typically, most DSM portfolios tend to focus more heavily on those
13 applications that have relatively high coincidence with the power system peak. As a
14 result, any efficiency portfolio delivered in Dominion Virginia Power's territory
15 would likely save greater proportional amounts at peak than they do for energy.

16 Second, my analysis completely ignores the substantial peak load reduction
17 potential from demand response programs and combined heat and power. Programs
18 to promote these opportunities could easily add enough additional peak demand
19 reduction to substantially defer the coal plant. Demand response programs
20 nationally currently reduce peak demands by about 2.5%.⁹ However, many utilities
21 do not practice demand response, whild some regions have available demand
22 response resources well in excess of this level.

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1 Perhaps most significant, Dominion Virginia Power claims that the need for
2 the coal plant is not being driven by peak load, but rather by energy usage. In
3 response to SELC 1-5 (l,m) Dominion Virginia Power states “the Company further
4 notes that demand side measures are focused primarily on mitigating and reducing
5 peak load, rather than base load demand, and *the proposed coal plant is needed for*
6 *base load supply.*” (emphasis added). While this statement clearly misunderstands
7 the broad role of DSM, it makes clear that the coal plant is not needed because of
8 peak load increases.

9 As I mention above, it is also not clear why the forecast seems to imply a
10 significant worsening of load factor over time. Possibly some of this could come
11 from expected drops in industrial load, which tend to have the best load factors.
12 However, even removing industrial load does not appear to explain this completely.
13 As a result, it may be that the higher expected growth in peak demand is because of
14 projected resale of power to other utilities, rather than meeting the native capacity
15 needs of Dominion Virginia Power's customers. In any case, because DSM
16 generally offers benefits of improving system load factors, this is an additional
17 reason to aggressively pursue it.

18 **Q. What evidence do you have that the scenarios you analyze are achievable in**
19 **Virginia?**

20 A. I estimate the cost-effective achievable potential is likely greater than even
21 the highest scenario. However, there is no need to assume this, as even the low or
22 medium scenarios can push the need for the coal plant out significantly. These

⁹ 2006 Long-Term Reliability Assessment, North American Reliability Council, October 2006, p. 6.

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1 levels are already being achieved in some areas, and have been for some time. For
2 example, a number of states and utilities have been and are currently capturing
3 DSM impacts of approximately 1% or more per year incremental savings,
4 including CA, CT, MA and VT. Further, these jurisdictions have a long history of
5 efficiency programs and therefore likely already have a more efficient building
6 stock in place than Virginia.

7 In addition, plans are either in place or under consideration to significantly
8 surpass these historic levels of effort because of analyses that have shown the large
9 potential still untapped and that efficiency is by far the cheapest energy resource.

10 For example, Vermont’s new goals established by the Public Service Board call for
11 approximately 2% statewide incremental savings in 2008 (VT is currently at about
12 1.5%) and about 10% savings over 2 years in “geographically targeted”¹⁰ areas.¹¹
13 New York has set a goal to capture a 15% reduction in electric usage from
14 efficiency by 2015 (1.9% per year).¹² Pacific Gas and Electric (PG&E) has
15 previously acquired approximately 1% per year and is planning to increase this to
16 between 1.4 and 1.6% per year.¹³ Illinois has set a goal to ramp up to 2.0% per year

¹⁰ “Geographically targeted” areas refer to regions where load reductions can cost-effectively help defer or avoid significant capital expenditures on the transmission and distribution system.

¹¹ Efficiency Vermont Annual Plan 2007-2008, Prepared for the Vermont Public Service Board by Vermont Energy Investment Corporation, 1 June 2007.

¹² NY Public Service Commission, *Proceeding on Motion of the Commission Regarding an Energy Efficiency Portfolio Standard, Case 07-M-0548*, 16 May 2007.

¹³ *Direct testimony of John J. Plunkett, Docket No. 070098-EI*, before the Public Service Commission of Florida, 2007.

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1 incremental savings.¹⁴ MA and CT are both considering dramatic ramp-up of
2 existing efficiency efforts that would bring savings up to over 2% of load each
3 year.¹⁵ Massachusetts has articulated a goal of eliminating all load growth by
4 efficiency investment for the indefinite future.

5 **Q. Is there any evidence that Virginia can capture similar levels as those**
6 **described above?**

7 A. Yes. First of all, common sense tells us that these opportunities are
8 available. Virginia homes and businesses are not significantly different than those
9 in other areas and equipment markets are national or global. As I mention above,
10 those areas aggressively promoting efficiency are heavily dominated by those that
11 have a long history of efficiency programs. As a result, there is no reason to believe
12 there would not be *even more opportunity in places like Virginia* that have no
13 history of efficiency programs.

14 Second, Virginia has a much warmer summer and milder winter than
15 Northeastern states. This should lead to greater cost-effective cooling and
16 ventilation opportunities because of the significantly longer hours of equipment
17 operation. After lighting, these end uses typically offer the greatest opportunities
18 for commercial efficiency.

¹⁴ Illinois Power Agency Act (SB 1592), enacted August 2007.

¹⁵ Massachusetts Department of Telecommunications and Energy, *Petition of the Massachusetts Division of Energy Resources For An Investigation into Establishing an Electricity Performance Standard as a Component of the Supply of Basic Service Electricity*, Dec. 21, 2006, p.34 and *Conservation and Load Management Portfolio Plan, Docket 06-10-02, Scenario 2 Supplemental Filing*, January 24, 2007, submitted to the DPUC jointly by Connecticut Light and Power Company and United Illuminating Company.

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1 Finally, there is some region-specific evidence. Potomac Electric Power
2 Company implemented aggressive programs during the early and mid 1990’s that
3 were among some of the leading programs in the nation. An efficiency potential
4 study for the Mid-Atlantic States conducted by ACEEE in 1997 found cost-
5 effective electric efficiency opportunities could reduce the 2010 electric load by
6 33% (2.2% incremental savings per year).¹⁶ Because of the lack of good analysis in
7 Virginia, this is the closest study of which I am aware.

8 **Q. Please describe the economic benefits of adoption of aggressive efficiency**
9 **programs for Dominion Virginia Power.**

10 A. Electric energy efficiency programs are typically very cost-effective. While
11 the levelized cost per kWh has varied significantly among individual programs,
12 typical total costs have been in the 2-4 cents/kWh range.¹⁷ Many DSM efforts are
13 capturing savings for even less.¹⁸ The Western Governors’ Association found:

14 *“DSM programs typically save electricity at a total cost of \$0.02 – 0.03/per*
15 *kWh (utility plus participant costs), meaning that improving end-use*
16 *efficiency is the least expensive electricity resource...Also, many DSM*
17 *programs reduce peak power demand more than they reduce electricity*
18 *consumption in percentage terms, meaning the programs also improve the*
19 *load factor for the utility system and improve system reliability.”¹⁹*

¹⁶ ACEEE, *Energy Efficiency and Economic Development in New York, New Jersey and Pennsylvania*, 1997, Executive Summary found at <http://www.aceee.org/store/proddetail.cfm?CFID=944981&CFTOKEN=53188029&ItemID=98&CategoryID=7>

¹⁷ See for example: U.S. Department of Energy, *State and Regional Policies that Promote Energy Efficiency Programs Carried Out by Electric and Gas Utilities, A Report to the United States Congress Pursuant to Section 139 of the Energy Policy Act of 2005*, March 2007, p. 11 and Western States Governors’ Association, *Clean and Diversified Energy Initiative*, Energy Efficiency Task Force Report, January 2006, pp. 55-56.

¹⁸ For example, the Texas investor owned utilities exceeded the Texas Energy Efficiency Resource Standard requirements in 2005 by 27% at a cost of only 1.36 cents/kWh. A recent study, Optimal Energy Inc., *Power to Save: An Alternative Path to Meet Electric Needs in Texas*, prepared for Natural Resources Defense Council and Ceres, January 2007, estimates that Texas can reduce loads by an annual average of 1.4% at a cost of 1.8 cents/kWh.

¹⁹ WGA, *on. cit.*, pp. 55-56.

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Q. How does this compare to the costs of supply-side alternatives to meet future load growth?

A. Dominion Virginia Power estimates the “all in” cost for the Wise County plant at an average of 8.9 cents/kWh over its useful life (p. 11 of Dominion witness Martin’s direct testimony), or roughly 2 to 5 times the cost of efficiency resources. SELC Witness Schlissel addresses costs for the proposed plant in more detail.

In response to a request for avoided costs in SELC 2-11 (a), Dominion Virginia Power refers to PJM locational marginal prices as their avoided energy supply costs. These prices change hourly; the simple unweighted average (mean) of the price at the Dominion Hub over a recent twelve month period is approximately 5.8 cents/kWh. This does not include avoided capacity costs associated with purchasing capacity to meet peak loads. This is a conservative estimate of avoided costs for two reasons. First, actual avoided costs are higher because costs are highest during the highest use periods and lowest when consumption is low. Therefore, actual average annual costs are heavily weighted in favor of the higher cost hours (as opposed to the even weighting among all hours I have done). Without data on Dominion Virginia Power's system load shape, I am unable to calculate the appropriate weighted average, nor to properly include capacity costs. Even at this level, efficiency is significantly cheaper.

Second, these costs ignore the often substantial transmission and distribution costs that can be avoided from DSM.

Q. Have you estimated the economic benefit to Virginia from capture of significant energy efficiency resources?

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1 A. Yes. Using the low estimate of the LMP costs for the Dominion Hub, I
2 conservatively estimate that present value net benefits to the Virginia economy
3 would be 1.07, 1.31 and 1.35 billion from pursuit of the low, medium and high
4 scenarios, respectively. These would be captured with benefit-cost ratios of 1.9, 1.6
5 and 1.4 respectively. In other words, for every dollar invested by ratepayers, they
6 would recoup between \$1.40 and \$1.90.. I developed these estimates by assuming
7 DSM societal levelized costs of 3, 3.5 and 4.0 cents/kWh for the low, medium and
8 high scenarios. Table 1 provides the economic costs, benefits, net benefits and
9 benefit-cost ratios.

10 These economic benefit estimates are done using the low avoided cost
11 assumption of 5.8 cents/kWh. Actual benefits from a more detailed analysis would
12 be higher.

13 When considering that efficiency can defer or avoid the proposed coal plant,
14 it may be more appropriate to compare the benefit of efficiency against the average
15 avoided costs of the coal plant, namely the 8.9 cents/kWh Dominion Virginia
16 Power estimates. At this level, present value net benefits would grow to 2.36, 3.24
17 and 3.92 billion from pursuit of the low, medium and high scenarios, respectively.
18 Benefit-cost ratios would increase to 3.0, 2.5 and 2.2 respectively. In other words,
19 even under the lowest scenario, the *net* benefits to the Virginia economy would
20 significantly exceed the *full* investment of \$1.67 billion proposed for the coal plant.

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22

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Table 1: Efficiency Scenario Economics

Avoided cost and Efficiency Scenarios		Costs (PV \$ million)	Benefits (PV \$ million)	Net benefits (PV \$ million)	Benefit-Cost Ratio
PJM LMP Energy Costs					
Efficiency Scenario	Low	1,201	2,275	1,074	1.9
	Med	2,102	3,413	1,311	1.6
	High	3,203	4,550	1,347	1.4
Dominion Coal Plan Energy Costs					
Efficiency Scenario	Low	1,201	3,563	2,362	3.0
	Med	2,102	5,345	3,243	2.5
	High	3,203	7,126	3,923	2.2

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4 **Q. Have you estimated the reduction in carbon dioxide from capture of**
 5 **significant energy efficiency resources?**

6 A. Yes. I have calculated a low and high estimate. The former is based on the
 7 average overall CO2 emissions for all Virginia electricity consumption.²⁰ This
 8 clearly underestimates the impact, because any nuclear or hydro power is likely to
 9 be baseload and used regardless of efficiency impacts. The latter estimate is based
 10 on avoided emissions from a coal plant.²¹ This likely overestimates the true impact,
 11 since on the margin efficiency reductions may likely be offsetting oil or gas fired
 12 generation at times. However, it may more accurately reflect the impact if
 13 efficiency is pursued in lieu of the proposed coal plant.

²⁰ U.S. Energy Information Administration of the US DOE, average total emissions per MWh for Virginia from 2002 was 0.528 metric tons per MWh. From: <http://www.eia.doe.gov/oiaf/1605/ee-factors.html>

²¹ Based on coal content of Virginia coal, assuming average generation efficiency of 10,000 Btu/kWh, emissions are 0.936 metric tons per MWh. From: http://www.eia.doe.gov/cneaf/coal/quarterly/co2_article/co2.html

1 Table 2 shows the range of carbon emissions under the different scenarios
 2 assuming 10 years of program delivery. The total emissions reductions over the 23
 3 year analysis period are equivalent to taking from 8 to 28 million cars off the
 4 road.²²

5
 6 **Table 2: CO2 Emissions Reductions From Efficiency Scenarios 2009-2030**
 7 **(Million Metric Tons)**
 8

Emissions Factors	Efficiency Scenarios		
	Low	Medium	High
Average VA power mix	41.61	62.41	83.21
Coal Plant	73.72	110.58	147.44

9
 10 **Q. Have you estimated the impact on local jobs from capture of significant energy**
 11 **efficiency resources?**

12 A. No. However, there is ample evidence that DSM investments create
 13 dramatically more local jobs than do investments in traditional power supply.
 14 These jobs come from the substantial increase in discretionary income energy users
 15 enjoy from lower energy bills, as well as the significant job opportunities created
 16 for people to plan, design, analyze and install efficiency measures in buildings.
 17 Examples of these include, but are not limited to: architecture and engineering
 18 services, equipment installation and servicing contractors, utility planners, and
 19 energy auditors. ACEEE estimates job multipliers (jobs created per million dollars
 20 of investment) of 13.5 for energy efficiency investments as compared to only 2.4

²² Based on 5.23 tons of CO₂ emissions per car, from U.S. Environmental Protection Agency, *Clean Energy-Environment Guide to Action*, February, 2006, p. 2-10.

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1 for utility supply investments.²³ In other words, for every dollar of investment
2 Dominion Virginia Power shifts from coal plant construction to efficiency
3 programs, job creation would increase by more than five-fold.

4 **Q. What do you recommend in this case?**

5 A. I recommend that the SCC direct Dominion Virginia Power to do two
6 things:

- 7 1) Begin immediately to plan for and implement aggressive cost-
8 effective efficiency programs targeted to all customer classes. As a
9 starting point, Dominion Virginia Power should be able to ramp up
10 to at least 1.0% per year incremental savings in about 3 years.
- 11 2) Engage in an IRP process whereby Dominion Virginia Power
12 analyzes all resources on an equal footing to determine the least cost
13 solutions to meet future resource needs. This should include a
14 variety of traditional supply solutions, as well as renewables, energy
15 efficiency, demand response, and distributed generation.

16 **Q. Given Dominion Virginia Power believes they need the Wise County Plant in**
17 **service by 2012, isn't this is a risky approach that will take time and might still**
18 **conclude that the coal plant is the optimal solution?**

19 A. No. For reasons explained above, it is unlikely that the coal plant will turn
20 out to be the optimal solution. Regardless, this strategy will significantly lower risk,
21 save ratepayers money, and allow Dominion Virginia Power and the Commission

²³ Laitner, S., *et.al.*, *The Economic Benefits of an Energy efficiency and On-site Renewable Energy Strategy to Meet Growing Electricity Needs in Texas*, ACEEE, September 2007, Table 2, p.6.

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1 to make more informed choices. [REDACTED] large
2 numbers of planned coal power plants have been cancelled in the past few years
3 because of uncertainty about potential carbon regulation. [REDACTED]
4 [REDACTED]
5 [REDACTED]
6 [REDACTED]
7 [REDACTED]
8 [REDACTED]
9 [REDACTED]
10 [REDACTED]
11 [REDACTED]
12 [REDACTED] a fairly
13 common risk avoidance strategy being used by many in the electric industry right
14 now.

15 Perhaps more importantly, this strategy lowers risk and saves money
16 because it buys time. By pursuing energy efficiency and demand response, as my
17 analysis shows, even under the low scenario which is proven readily achievable
18 they can defer the need for the plant by about 10 years. In the meantime, they can
19 conduct an IRP that will allow the SCC to determine what alternatives are in the
20 public interest.

21 The real economic value of deferral (due to the time value of money) alone
22 is \$647 million. In addition, given the current high demand for steel and other
23 materials, it is likely that construction costs may come down in real terms over this
24 period. Perhaps more importantly, this delay will benefit from technology

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1 advancements that may make things like IGCC or carbon capture and sequestration
2 more cost-effective. In addition, it is likely that renewable technologies
3 (particularly wind and solar) will come down in price, and renewables and other
4 distributed generation plants will be brought on line in the intervening years.

5 Also, this gives time to see what kinds of carbon regulation may be
6 imposed. Building the coal plant now exposes ratepayers to significant risk if
7 carbon regulation imposes large additional costs on the power plant that are not
8 currently assumed. Given that the proposed coal plant is estimated to have a 50
9 year life,²⁴ committing now to this carbon-intensive strategy without a full analysis
10 makes no sense and is high risk, especially when there is no down-side to pursuing
11 the demand-side alternatives.

12 All this results in a more diversified portfolio and lower risk to ratepayers,
13 while still leaving the Wise County plant as a future option. Even if the plant is
14 ultimately built, Dominion Virginia Power ratepayers will benefit not only from the
15 large savings from deferring the investment, but from the energy efficiency efforts
16 with lower bills, improved load factor, a cleaner environment, and a healthier
17 economy. The SCC Energy Efficiency Task Force is currently considering many
18 of these issues, and delaying permitting any new coal plant until the Task Force
19 completes its work is prudent.

20 **Q. Does this conclude your testimony?**

21 A. Yes.

²⁴ Application of Dominion Virginia Power to the SCC, Case No. PUE-2007-00066, July 13, 2007, p. 6.