



Abt Associates Inc.

55 Wheeler Street
Cambridge, MA 02138

Assessing the Economic Impact of Dominion Virginia Power's Coal-Fired Power Plant in Wise County, Virginia

Prepared under contract for the Wise Energy for Virginia Coalition, c/o Appalachian Voices, 408E Market Street, Charlottesville, VA 22903

January 2009

Executive Summary

Dominion Virginia Power (DVP) recently began efforts to increase electric generating capacity in Virginia, citing rising electricity demand forecasts and a growing reliance on wholesale market purchases to meet this demand. The specific approach pursued by DVP, and approved in 2008 by the Virginia State Corporation Commission (SCC), is to construct and operate a 585 MW coal-fired power plant in Wise County, Virginia (hereinafter, the *Plant*). Although investing in new generating capacity is a traditional approach to meeting electricity supply needs, an alternative approach – based on reducing demand for electricity via investments in energy efficiency – may prove economically more beneficial to Virginia.

The Wise Energy for Virginia Coalition retained Abt Associates Inc. to assess the economic impact of the Plant and the alternative approach of relying on energy efficiency to offset the electricity needs that would otherwise be met by the Plant (the *Energy Efficiency Alternative*). This Executive Summary reviews the principal findings from these analyses and key elements of the analytic approach.

Specifically, we examined:

- The economic impact of the Plant on the Company's Virginia customers and the broader Virginia economy. These impacts include Gross State Product (GSP) and employment effects in Virginia from (1) DVP's outlays for construction and operation of the Plant and (2) changes in electricity rates to business and residential customers due to the Plant.
- The economic impact on Virginia of meeting the electricity needs that would otherwise be served by the Plant via investments in energy efficiency. These impacts again include GSP and employment effects from (1) installing and maintaining the energy efficiency investments and (2) the changes in electricity rates to business and residential customers. Our analyses of the Energy Efficiency Alternative are based on *low* and *medium* cost cases, which were developed from an analysis of cost-effective energy efficiency opportunities in Virginia undertaken by the *American Council for an Energy-Efficient Economy*.

Overall, our analyses find that the Energy Efficiency Alternative would be less costly than the Plant for ratepayers, and substantially more beneficial to the Virginia economy in terms of Gross State Product (GSP) and job effects. The beneficial effects of energy efficiency are even more pronounced when a likely federal carbon emissions regulatory program is taken into account.

Of particular importance, our analyses account for the costs of a federal carbon emissions regulation, which constitutes a significant cost not previously considered by DVP or SCC in their economic evaluations of the Plant. Because coal has the highest carbon-content of electric power sources, a carbon emissions regulation is likely to add considerably to the Plant's cost to Virginia ratepayers. We analyzed two carbon emissions regulation cases – a *low permit-cost case*, using an initial permit price of \$23 per ton of CO₂-equivalent emissions, and a *mid permit-cost case*, using an initial permit price of \$39 per ton –

for the analysis of the Plant and the Energy Efficiency Alternative. We also analyzed a *no carbon emissions regulation case*. However, given the strengthening consensus at the federal level to pursue a carbon emissions regulatory program, we view the carbon emissions regulation cases as providing the more realistic assessment of outcomes from Plant operation compared to the Energy Efficiency Alternative. The following summary emphasizes the findings from the carbon emissions regulation cases.

Below, we summarize key findings from our analysis of the Plant and the Energy Efficiency Alternative. We report results as annual values for three years we selected for our analysis: 2012, 2018, and 2025.

Impact on Electricity Rates

Our analyses indicate that the Plant will *increase* electricity rates for DVP's Virginia customers in all of the impact years, assuming the requirements of a carbon emissions regulation. By contrast, under the Energy Efficiency Alternative, the total burden to Virginia ratepayers *declines*.

Two factors account for the difference in rate impact for the Plant and Energy Efficiency Alternative:

1. The Energy Efficiency Alternative achieves electricity demand reductions at a substantially lower cost (average of approximately \$35-\$60/MWh over the analysis years) than the cost of power generated by the Plant (average of approximately \$100/MWh over the analysis years).
2. The Energy Efficiency Alternative will avoid the cost of a carbon emissions regulation, whereas these costs are likely to be substantial for the Plant.

In both cases, the rate effects reported below are reduced by the avoided cost of purchased power, which is presumed to be displaced either by the Plant's electricity generation or by the reduction in demand through energy efficiency. The additional costs of a carbon emissions regulation apply to the electricity production costs for the Plant *and* to the cost of purchased power. However, the burden of a carbon emissions regulation on purchased power is lower than on the Plant's generation because purchased power is derived from a blend of energy inputs, which overall has lower carbon emissions intensity than the coal-based generation from the Plant.

As shown in *Figure 1* and *Figure 2*, below, the Energy Efficiency Alternative cases yield a substantial rate *reduction* for both residential and business customers. These reductions total in the tens of millions of dollars in each year, and exceed \$100 million *annually* in future years under the carbon emissions regulation cases. In contrast, the Plant yields substantial rate *increases*, totaling in the tens of millions of dollars for all analysis years under the carbon emissions regulation cases. Under the no carbon emissions regulation case, the rate impact difference is less substantial; however, the Energy Efficiency Alternative remains substantially superior to the Plant in terms of overall rate impact.

For the average Virginia household, which consumes about 1,200 kWh of electricity per month, the rate effects for the *mid-permit* cost case are equivalent to an *additional cost* of \$40 - \$47 per year for the Plant, versus a *savings* of \$30 - \$50 per year for the *mid-permit* cost and *mid-efficiency* case under the Energy Efficiency Alternative.¹

Combining these separate effects into a total *net* difference – i.e., the difference between the increased rates under the Plant *and* the rate reductions under the Energy Efficiency Alternative – yields a more comprehensive assessment of the monthly household cost effect. For example, under the *mid-permit cost* and *mid-efficiency cost* case, the average Virginia household would achieve *net* savings under the Energy Efficiency Alternative of \$77 - \$90 per year (compared to the estimated rate impact for the Plant).

¹ *Figure 3* includes results for other analysis cases.

Figure 1: Total Rate Effect for DVP's Virginia Residential Customers (millions)

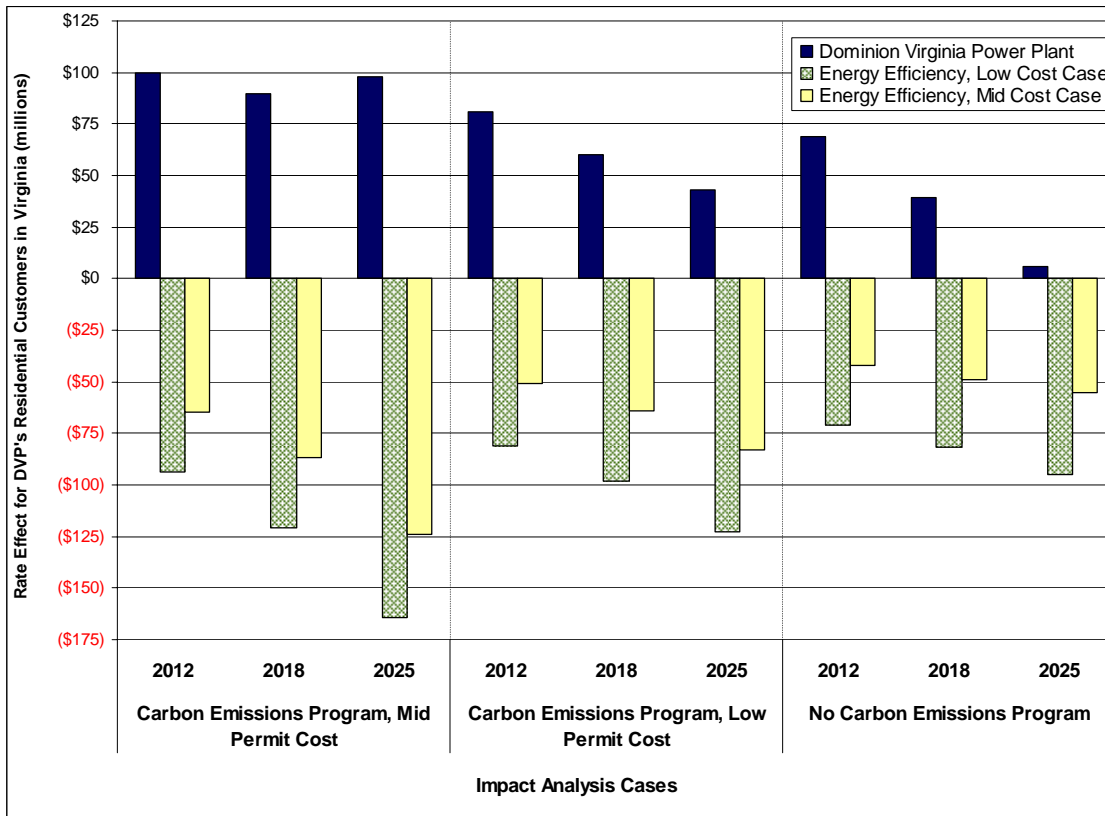


Figure 2: Total Rate Effect for DVP's Virginia Business Customers (millions)

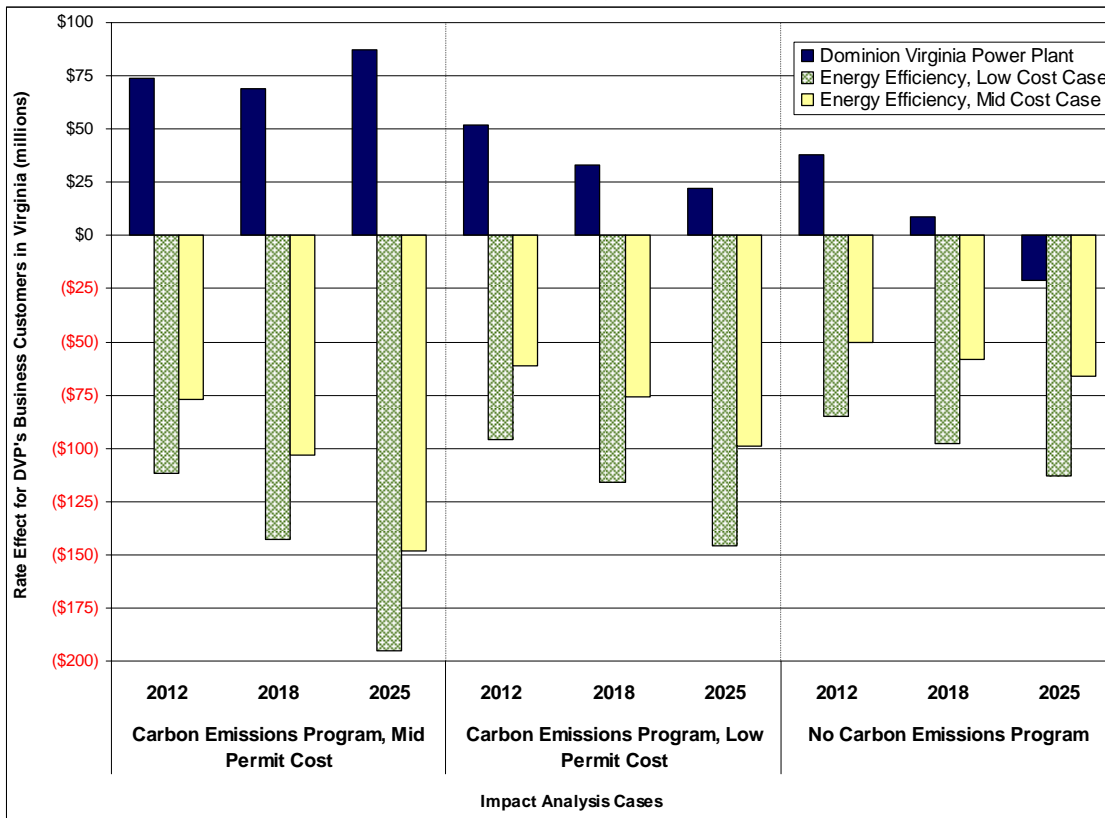
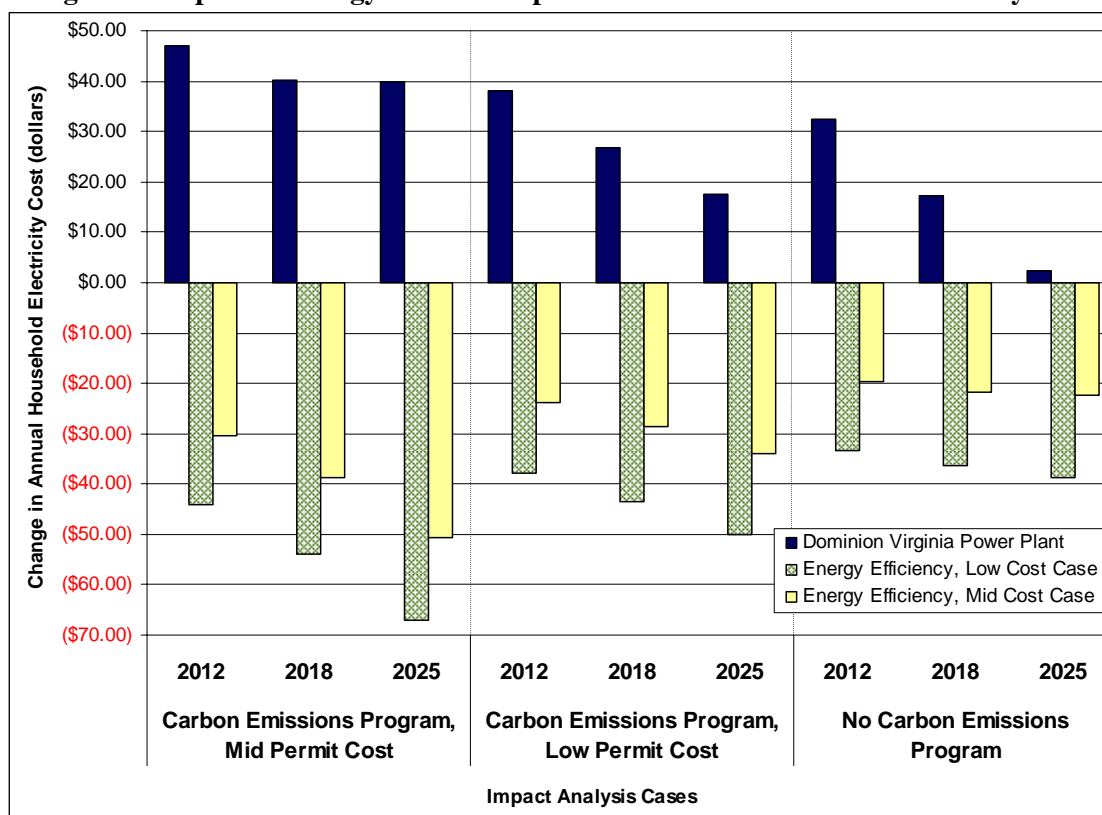


Figure 3: Impact of Energy Resource Options on Annual Household Electricity Cost



Gross State Product and Employment Impacts

Our analyses indicate that the Energy Efficiency Alternative will achieve substantially superior economic benefits for Virginia compared to the Plant.

The economic impacts of the Plant and the Energy Efficiency Alternative are summarized in *Figure 4* (change in Gross State Product – GSP), *Figure 5* (jobs), and *Figure 6* (employee earnings), below.

For the Plant, these figures capture the following economic effects in Virginia:

1. The economic effect of expenditures for operating the Plant, including in-state fuel purchases. *These effects are positive – i.e., increased GSP and jobs.*
2. The economic effect of the changes in electricity rates to DVP’s Virginia customers to recover the Plant’s costs. *These effects are generally negative, although less so in the no-carbon emissions regulation case.*

Similarly, for the Energy Efficiency Alternative, these figures capture the following economic effects:

1. The economic effect of the expenditures to implement energy efficiency policies and programs. *These effects are uniformly positive.*
2. The economic effect of the changes in electricity rates to DVP’s Virginia ratepayers to recover the cost of the energy efficiency policies and programs. *These effects are uniformly positive.*

For both the Plant and the Energy Efficiency Alternative, we calculated the total economic impact by summing the impacts from items (1) and (2), above.

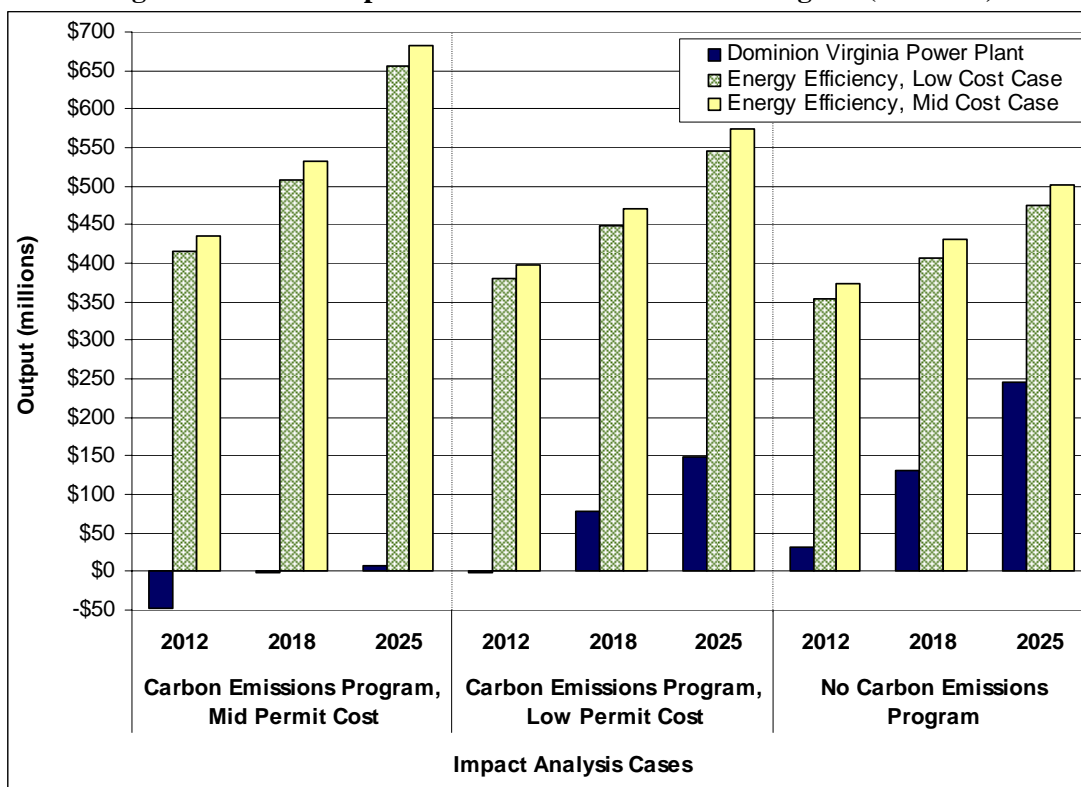
As shown below, the Energy Efficiency Alternative achieves substantial benefits to the Virginia economy in all analysis cases – by carbon emissions regulation case, Energy Efficiency Alternative cost case, and analysis year. These benefits increase over time and also as the cost of a carbon emissions regulation increases. In contrast, the Plant achieves substantially lower benefits, and these contributions diminish – *to essentially zero or negative* – as the cost of a carbon emissions regulation increases.

Under the *mid-permit cost* carbon emissions regulation case, the increase in Virginia GSP for the Energy Efficiency Alternative ranges from \$415 to \$435 million in 2012, and increases to a range of \$655 to \$680 million by 2025. The comparable values for the Plant are approximately *negative* \$50 million in 2012 to a positive \$10 million in 2012.

Under the *low-permit cost* carbon emissions regulation case, the increase in Virginia GSP for the Energy Efficiency Alternative ranges from \$380 to \$400 million in 2012, and increases to a range of \$355 to \$375 million by 2025. Comparable values for the Plant are essentially *zero* in 2012 to an increase of \$150 million in 2025.

In the absence of a carbon emissions regulation, the Plant uniformly contributes economic value to Virginia and this value increases with time; however, even here, the Plant’s contribution is substantially less than the Energy Efficiency Alternative’s contribution (see *Figure 4*, below).

Figure 4: Annual Impact on Gross State Product in Virginia (\$ million)



The Plant also contributes to Virginia’s economy during the construction period: our analyses indicate an annual average increase of \$180 million in gross state product, 1,422 jobs, and \$105 million in employee earnings over the four years of Plant construction. However, this benefit is short-lived and does not contribute to a sustained increase in economic activity in Virginia. In contrast, investment in energy efficiency can contribute to a sustained, long-term increase in GSP and jobs, and provides a skill and experience platform for extending the benefits of energy efficiency throughout the Virginia economy.

These GSP effects are accompanied by comparable impacts on jobs and employee income. Again, the Energy Efficiency Alternative achieves substantially more beneficial results than the Plant (see *Figure 5* and *Figure 6*, below).

Under the *mid-permit cost* case, the Energy Efficiency Alternative achieves employment gains of approximately 3,100 jobs in 2012, increasing to 5,000 jobs in 2025; employee income gains range from \$130 million in 2012 to \$210 million in 2025. Comparable values for the Plant are approximately 950 job losses in 2012, increasing to 1,000 job losses in 2025, and employee income losses of approximately \$23 million in 2012, declining to \$8 million in 2025.

Under the *low-permit cost* case, the Energy Efficiency Alternative achieves employment gains of approximately 2,850 jobs in 2012, increasing to 4,150 jobs in 2025; employee income gains range from \$120 million in 2012 to \$175 million in 2025. Comparable values for the Plant are approximately 570 job losses in 2012, reversing a gain of 130 jobs in 2025; employee income effects are \$10 million in losses in 2012, reversing to a gain of \$40 million in 2025.

As above, in the absence of a carbon emissions regulation, the Plant contributes gains in jobs and employee earnings, in particular during the later years of Plant operation. However, the Plant's contributions are considerably smaller than those estimated for the Energy Efficiency Alternative.

Figure 5: Annual Impact on Employment in Virginia

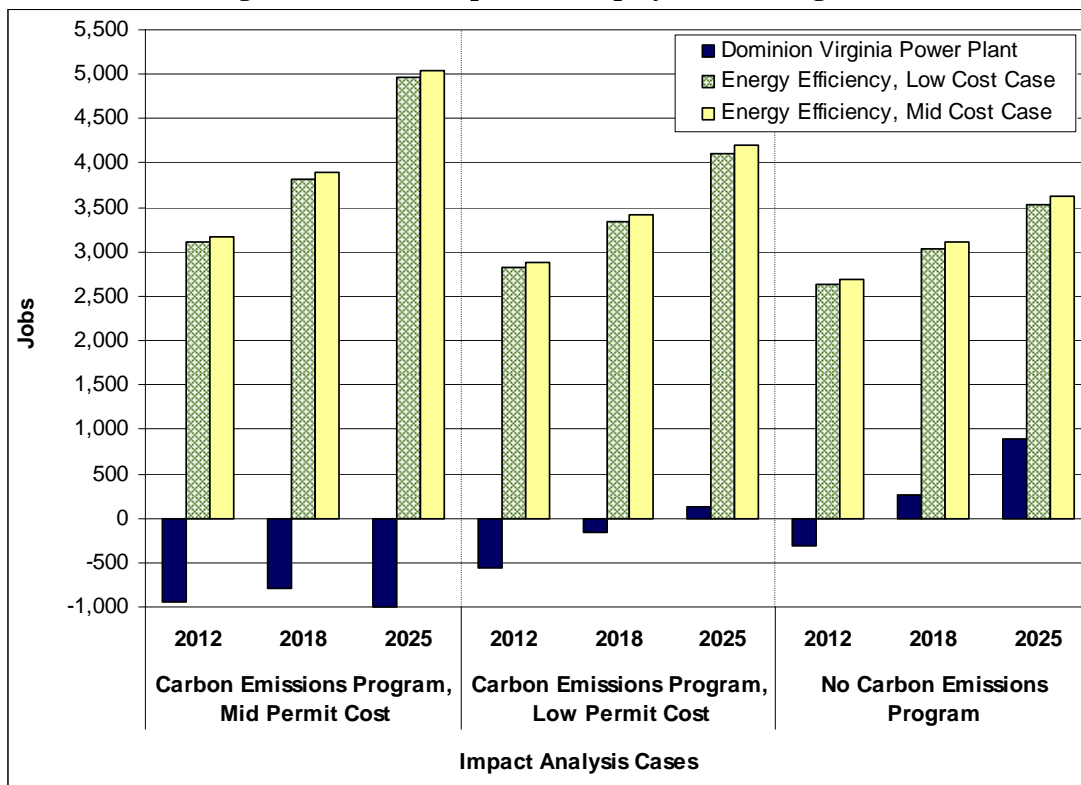
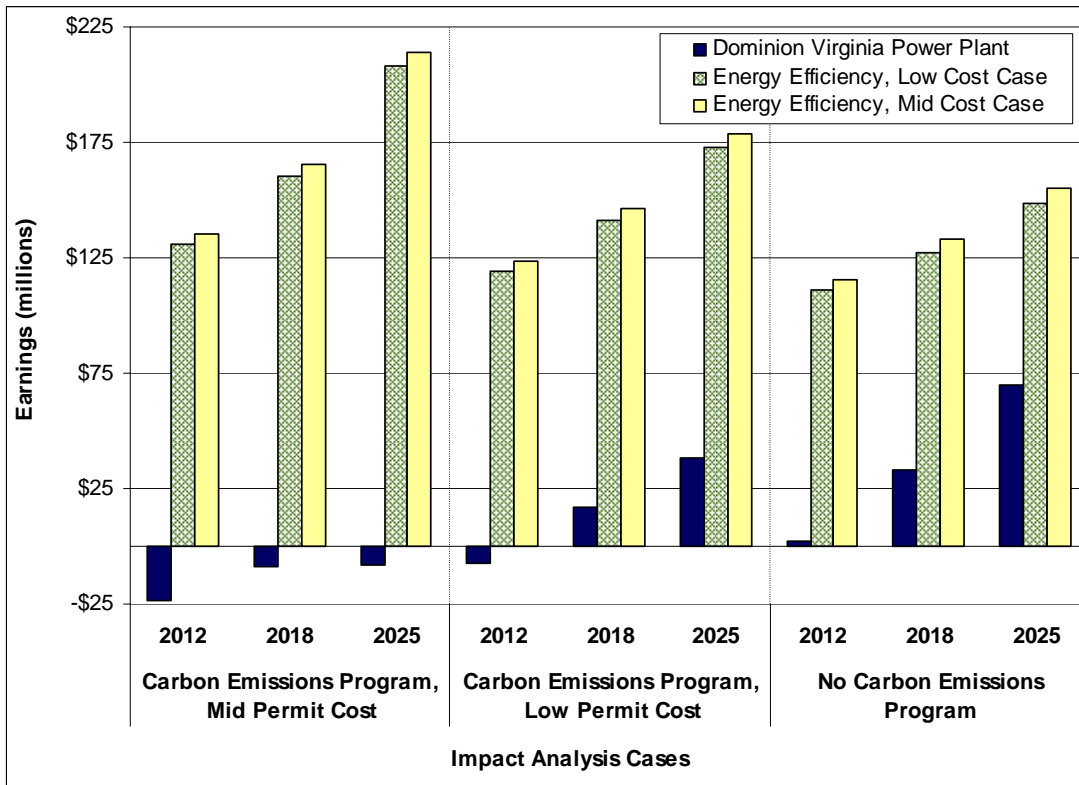


Figure 6: Annual Impact on Employee Earnings in Virginia (\$ million)



Conclusion

From the standpoint of economic contribution to Virginia, we find that the Energy Efficiency Alternative offers a better approach than the Plant for meeting Virginia’s electricity needs. The Energy Efficiency Alternative is substantially less costly for ratepayers, and substantially more beneficial to the economy in its effects on gross state product and employment. These superior benefits are even more pronounced when a carbon emissions regulation is taken into account.

We emphasize that our analysis does not evaluate or presume to know which *specific energy efficiency policies/programs* or combinations thereof are the best options for Virginia, nor does this analysis intend to suggest that the Commonwealth consider *only* energy efficiency for meeting future energy needs. In addition, we recognize that material institutional barriers exist to pursuing the Energy Efficiency Alternative. For instance, under typical regulatory structures, utilities often do not have an economic incentive to offer energy efficiency or other demand-side programs because reduced electricity sales reduce utility revenues and earnings (Kushler et al. 2006).² However, a number of states and power companies have successfully pursued programs to include energy efficiency as a component of total energy resource planning and thereby reduce the need for new electric generating capacity.

In summary, this analysis demonstrates that energy efficiency can contribute a substantial economic gain compared with traditional supply-side approaches for meeting growing electricity demand and should be considered a priority energy resource as part of any integrated resource planning process.

² Kushler, M., York, D., and Witte, P. 2006. *Aligning Utility Interests with Energy Efficiency Objectives: A Review of Recent Efforts at Decoupling and Performance Incentives*. American Council for an Energy-Efficiency Economy (ACEEE) Report Number U061, October 2006.

Key Aspects of Our Analysis Approach

- Our assessment of Plant costs and related effects builds from cost information in DVP's presentations before the SCC. The estimated electricity rate changes rely on conventional ratemaking principles in conjunction with electricity consumption, cost of capital, and other rate information in DVP's presentations. Our assessment of the *economic impact* of these rate changes is based, for residential customers, on the estimated effects on residential ratepayer spending in Virginia, and, for business customers, on the market response to efforts by these customers to pass on the rate changes in price increases, by affected economic sector, within the Virginia economy. Our analyses of the overall economic impact capture the effect of both rate changes and outlays associated with the Plant or the Energy Efficiency Alternative. These analyses rely on an input-output framework of the Virginia economy, which assesses the economy-wide effects of these changes in outlays and sector-specific economic activity levels.
- Our analyses account for the cost of power that DVP *would otherwise continue to purchase* from the PJM Interconnection to meet electricity needs within its service territory. In both cases, these purchases, and their related rate impacts, are assumed to be avoided by either (1) operation of the Plant or (2) the reduction of electricity demand resulting from energy efficiency investments. *All analyses and reported results – for both the Plant and Energy Efficiency Alternative cases – are relative to a baseline in which DVP continues to purchase energy from PJM.*
- The Energy Efficiency Alternative analyses are *based on an assumption that DVP would be entirely responsible for the cost of installing and maintaining these investments and administering the program to accomplish these investments, and that these costs would be passed on to electricity customers in electricity rates.* Two energy efficiency cost cases (*low* and *medium*) were developed based on an analysis of cost-effective energy efficiency opportunities in Virginia undertaken by the American Council for an Energy-Efficient Economy (ACEEE 2008).³ The energy efficiency cost cases include the cost of energy efficiency-based reductions in electricity consumption *and* a substantial cost-adder to account for administrative and marketing costs.
- Our analyses account for the cost of a carbon emissions regulation. Although the final structure of an eventual carbon emissions regulation cannot be known at this time, it appears very likely that an emissions permit program or carbon emissions tax will be implemented in the next few years. Under such a program, sources such as the Plant, which is expected to emit approximately 5.4 million tons of carbon dioxide per year, would incur additional costs to continue to emit carbon. Because coal has the highest carbon-content among electric generating sources, the relative cost burden to the Plant's generation is likely to be substantial. For our analyses, we relied on estimates of emission permit prices from several recent studies performed for the Lieberman-Warner Climate Security Act (S. 2191). We developed a *low cost case* (using an initial permit price of \$23 per ton emissions) and a *mid cost case* (using an initial permit price of \$39 per ton of emissions) for the analysis. We adopted a mid-range assumption that 50 percent of the Plant's carbon emissions – and emissions from purchased power providers – would incur the permit cost for the life of the analysis. Carbon emissions permit prices increase over time at rates indicated by the Lieberman-Warner Act analyses.
- We escalated all costs – for energy inputs, purchased power, energy efficiency outlays, etc. – over time at appropriate rates of increase based on projected increases in energy costs and electricity prices and/or historical changes in the GDP Deflator.

³ See, American Council for an Energy-Efficient Economy (ACEEE). 2008. *Energizing Virginia: Efficiency First*. Report number E085, September 2008.