

Dominion Virginia Power and Clean Power Plan Costs: A brief review of the Dominion's 2015 Integrated Resource Plan compliance cost estimates

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Abstract:

The Dominion Virginia Power filing with the State Corporation Commission does not really provide an integrated resource plan (IRP). Rather, Dominion argues that the uncertainty over federal greenhouse gas regulation is too great to allow the company to do an integrated plan. The document presents cost estimates for complying with the proposed federal regulations, known as the Clean Power Plan (CPP), that force reductions in greenhouse gas emissions from existing power plants. The IRP incorrectly attributes to the CPP costs that would occur with or without the CPP. This and other modeling choices result in substantially overstated estimates of compliance costs.

Forward

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This report is intended to add to the policy conversation concerning Virginia's energy future and, in particular, the Commonwealth's response to increased concerns about greenhouse gases and climate change. Pending federal regulations bring this issue to the center of energy policy issues in Virginia. Crafting an effective policy response to the federal proposal and to concerns about climate change generally requires that we bring the very best information and analysis to bear on the problem. In providing this review of Dominion's 2015 Integrated Resource Plan, we hope to encourage a constructive discussion of compliance options.

Introduction

Dominion Virginia Power (hereinafter, Dominion) submitted its 2015 Integrated Resource Plan (IRP) to the Virginia State Corporation Commission on July 1, 2015 (Dominion, 2015a). At the time of the release of Dominion's IRP, the U.S. Environmental Protection Agency (EPA) had not yet published its final rule regulating emissions of greenhouse gases from existing power plants. Even now that EPA has released its final rule, referred to as the Clean Power Plan (CPP), it is a time of considerable uncertainty over the future of Virginia's electricity supply. However the implementation of the CPP plays out, it is critical that policy makers in Virginia have accurate estimates of the costs of complying with those rules.

Dominion's 2015 IRP provides a number of estimates for the costs of complying with EPA's draft rule. There are a number of reasons why Dominion's method for calculating costs would overestimate the cost of complying with the draft CPP. It is this tendency of Dominion's methodology to overstate costs that is the subject of this analysis. Given that the final CPP regulation relaxes Virginia's emission reduction requirements, the correctly estimated costs of compliance should fall even further once the changes to the final rule are incorporated into the analysis. When the costs are re-estimated for the final rule, care should be taken to correct the methodology used so that it does not overstate compliance costs.

The setting

Dominion's 2015 plan is very different from both the 2014 and 2013 plans. In fact, the new document does not really present an integrated resource plan, arguing that doing so is infeasible given that the uncertainty over pending federal regulations is so great (p. 5). Instead of presenting integrated resource plans for the full planning horizon, Dominion presents one short term plan that covers the years 2015 through 2020 and assigns to the short term plan a subset of resources already well-along in their development, and almost sure to be implemented. The rest of the resource plan discussion focuses on more speculative scenarios for the planning horizon extending through 2030. The scenarios comprise a "base" least-cost plan and four stylized resource plans, each of the latter four being compliant with the CPP. These compliant plans are "stylized" in the sense that they

each depend heavily on single sources of non-fossil generation: solar PV, wind, and nuclear. The single exception is Plan B: Co-fire, which combines a substantial expansion in solar PV with companion natural gas generation.

The base plan is also stylized in that, while it minimizes production costs, it was rejected in the 2014 IRP as a preferred plan on the grounds that it placed ratepayers at risk due to over-reliance on natural gas for expanded production (Dominion, 2014). But in the 2015 IRP, that base plan, rejected by Dominion just a year ago, serves as the benchmark against which costs of compliance with the CPP will be measured and apports a significant share of expected generation costs to the CPP. Just as an obvious example, in the nuclear scenario where the North Anna 3 unit is brought online in 2028, the incremental cost of completing the third North Anna unit over the base plan is listed as a CPP compliance cost (\$7 billion), even though this was Dominion's preferred option just last year (Dominion, 2014, p. xii).

In the following pages, we will argue that Dominion's 2015 Integrated Resource Plan compares an unrealistic and very cheap baseline to unrealistic and expensive alternative policy scenarios. It chooses as its baseline, a scenario that it rejected just the year before and that doesn't include resources that the company knows will be developed whether or not the CPP is implemented. Then it generates four unrealistic compliance alternatives and demonstrates how costly they are as compared with the unworkable baseline. This has the effect of maximizing the apparent costs of the compliant policy alternatives even though there was never any possibility of implementing either the cheap baseline or the overpriced alternative. The 2015 IRP even reports on a Monte Carlo analysis of the risks involved in each of the unworkable scenarios to see what risks they would impose, which probably tells us little about the risks of more sensible, diversified generation portfolios.

The least cost scenario

The "Least Cost Non-compliant Plan" (least cost plan) is offered up as a business as usual scenario, where the coal fleet (net of pending retirements) remains in place and natural gas generation is expanded to meet future growth in demand and to reduce imports of electricity (p. 112). As a BAU scenario, this one fails on a number of accounts. For one thing, there is no added company-owned solar PV and no wind even though Dominion has agreed to add 400 MW (nameplate) of company-owned solar PV by 2020 (Dominion Power, 2015b). The capital cost of this solar capacity is reported to be \$700 million or around 16% of the increased compliance costs attributed to Plan A (p. 113). Using the conversion factors provided by Dominion on page 87, these solar installations alone can be expected to produce around 800 gigawatt hours of electricity each year, offsetting the need to generate this electricity with coal or natural gas and offsetting Dominion's need to purchase renewable energy certificates (RECs) to meet the state renewable portfolio goal. These items need to be subtracted from the incremental cost of compliance.

Dominion's base plan contains zero additional solar PV for the 10 years from 2020 to 2030. This defies reason. A paltry 20 MW per year during this period would increase by half the increment to in-state solar capacity. There seems to be little doubt that some additional solar PV capacity would be built between 2020 and 2030 even without the CPP, and these additions would offset the need to purchase RECs to meet the state renewables goal. So we can say with some certainty that the compliance cost estimates are overstated due to a systematic understating of the future contribution of solar PV.

And there is every expectation that the company will build a demonstration off-shore wind facility for 12 MW of capacity. This will almost certainly occur whether or not the CPP is passed. It is also reasonable to expect some modest development of on-shore wind capacity. Apex Clean Energy already has more than 200 MW of capacity that the company expects to have completed by 2018 (Apex Clean Energy, 2015). In its 2014 IRP preferred plan, Dominion had around 250 MW of onshore capacity by 2029 with an expected output of around 900 gigawatt hours per year of renewables (Dominion Power, 2014, p. 5). Now these investments are all marked as CPP compliance expenditures. As with solar PV, some significant share of these investments are likely even without the CPP and offset Dominion's generation and REC costs. The assumption that no solar PV or on-shore wind will be added from 2020 to 2030 is highly unrealistic, which implies that Dominion's chosen baseline is also highly unrealistic.

Adding just the anticipated wind and solar together, we have over \$1 billion in capital expenditures and 1,500 gigawatt hours per year in non-fossil generation, both of which need to be shifted from the CPP compliant plans to the base case. This shift will reduce the anticipated compliance costs accordingly.

But the BAU plan has a bigger problem. Just one year ago, Dominion described this path as too risky because of its over-reliance on natural gas (Dominion Power 2014, p. xiv). It is risky not just because future regulations might place limits on CO₂ emissions. It is also risky due to possible changes in natural gas prices. Should the U.S. lift restrictions on the export of natural gas, then gas prices would rise to the new world price, which would likely be higher than current domestic prices. On the other hand, if current, low natural gas prices were to continue and the supply demonstrated to be reliable, then it would probably be tempting to cut back on coal-fired generation without regard to the CPP, in which case compliance would be less costly to achieve. Today's least cost plan was unacceptable just last year. The changes between that plan and this one inappropriately shifts costs to the cost of complying with the CPP.

The nuclear option

Another important shift between this plan and previous ones can be seen in the discussion of Plan C, the nuclear power option. In its 2014 plan, Dominion favored the building of the third nuclear reactor at the North Anna nuclear facility as a key element in its preferred, fuel diversity plan. In fact, Dominion applied for an early site permit for the facility in 2003, long before the prospect of regulations on greenhouse gas emissions.

Dominion has repeatedly claimed that North Anna 3 would provide reliable, cost-effective generation but has recently added to that list that building North Anna 3 would bring Virginia into compliance with the CPP. Perversely, Dominion now lists the entire \$7 billion incremental cost of completing and operating the third North Anna reactor as a cost of complying with the CPP (p. 113). In just one year, the company's favorite plan has become a \$7 billion burden solely attributable to the CPP.

There is more. The building of North Anna 3 can reasonably be expected to provide a surplus of emission reductions that could be sold to generators in other states. This export of emission reductions would be a source of income to the state on the order of millions of dollars a year. This emission reduction income would be netted against any costs of compliance, however measured. Exports of emission reductions would be greater to the extent that renewables are added to the state energy mix, so it is important to account for additional wind and solar even in the nuclear scenario. Otherwise, net compliance costs will likely be overestimated.

If Dominion believes that North Anna 3 is no longer justified, say due to reduced demand growth or due to cheaper alternatives, it has not made this point clear in its IRP. If, on the other hand, Dominion still believes, as it did last year, that the plan involving the additional reactor has greater net benefits than the riskier least cost plan, then the additional costs of building North Anna 3 are not due to CPP compliance. According to Dominion's 2014 IRP, the incremental \$7 billion in costs are more than compensated for by the benefits of the added, reliable, non-fossil baseline generation. That this brings Virginia into compliance with the CPP is an added bonus.

It is reasonable to argue that the new federal regulations on greenhouse gas emissions makes it more likely that North Anna 3 will be built. Given the recent slowdown in electricity demand growth, the persistently low price of natural gas, and the falling price of solar PV, it is quite possible that Dominion would actually never complete the third North Anna reactor. There are a number of ways to handle the allocation of compliance cost estimates, but they all start with an explicit acknowledgement that completing the reactor is not as likely as it used to be and may not be completed unless the federal regulations come into force. Then, the IRP could account for the increased probability of completion and apportion costs accordingly.

For example, suppose that without the CPP, there is a 40% probability of completing North Anna 3 but with the CPP that probability is 50%. This means that 1/5 of the net additional cost of compliance (for an *optimal* plan that includes North Anna 3) should be apportioned to the CPP and 4/5 to other causes. Any potential net benefits must be apportioned symmetrically, although one might argue that any income from selling emission reductions could only be a benefit under a CPP scenario and so these benefits would go 100% to the CPP case.

This is not the only way to treat the case where the CPP serves to change the relative probability of two cases, but it a standard and transparent way of doing so. What is not correct is to apportion all of the costs of completing North Anna 3 to CPP compliance costs.

Options A, B and D

The alternative scenarios, plans A, B and D, all share some common flaws, aside from the already noted problem that they include costs that belong in the baseline. Each plan relies primarily on one technology: solar PV or wind, or, in the case of B, two technologies, solar PV combined with natural gas combustion turbines.

Almost any realistic plan will include some expansion of solar PV and some wind. But any compliant plan will be accompanied by an explicit or implicit price on CO₂ emissions. This implies that some energy efficiency measures that were not cost-effective before will be so now. Some combined heat and power projects that were not worthwhile, may now generate a profit. More effort will be applied to research and development to lower the cost of energy storage, energy efficiency, and previously unprofitable alternatives to fossil fired generation. Higher prices for fossil energy will lower the trajectory of demand. It is simply not sensible to expect these other things to stay constant. Even if you don't have good estimates for the size of these other effects, it should be acknowledged that there will be a tendency for these other factors to lower the total cost of compliance.

Dominion does acknowledge that the plans A through D are not likely to be realistic resource plans (p. 7), and yet, these are the plans provided. We have already listed factors that lead to an overestimation of the incremental cost of compliant plans over the least cost compliant plan. That said, it is rather surprising to note that the North Anna 3 option has, by Dominion's own estimates, a \$3 billion higher net present value cost than the aggressive solar PV option in Plan A. When Dominion does get around to producing a proper CPP-compliant resource plan, it will now face the additional task of justifying spending the extra \$3 billion on the North Anna path rather than spending some smaller amount improving system reliability under an aggressive solar PV path. As grid and storage technologies improve, this may be increasingly hard to do.

No cost minimizing plan

The way Dominion sets up its modeling exercise is almost certain to give exaggerated estimates of compliance costs. First, Dominion assumes the ICF No CO₂ Cost scenario for commodity prices, finds the cost minimizing approach to generating the amount of electricity required to obtain the least cost, non-compliant scenario. For the alternative scenarios, Dominion assumes the ICF commodity price forecast under the CPP. Assuming that there is no change to electricity demand in this world of costly CO₂ emissions, the company selects some clearly unrealistic and non-optimal approaches to generating the same amount of electricity as before. It did not search for the cost minimizing approach given the new ICF commodity price forecast, but rather proposed four unrealistic scenarios. It is extremely unlikely that any of the alternative scenarios it presents are the cheapest or best way of generating the needed power under the new commodity price scenario or regulatory circumstance.

The problem here is in comparing an optimal approach in a world without the CPP to sub-optimal approaches under the CPP. Even Dominion's previously favored North Anna plan looks bad when you model it this way. Under the circumstances, what is amazing about this exercise is how little extra the alternative scenarios cost. If you compare the cost of the solar PV plan to the least cost plan (both scenarios under the base case commodity price assumptions) it only increases total generation costs by 3.4% (p. 123). This exaggerated solar case only costs an added 8.6% when you give it the disadvantage of being in a different commodity price regime where it is clearly non-optimal.

Nor does the Dominion exercise take any advantage of the considerable cost savings from interstate exchange of compliance obligations under the CPP. Every credible model available shows considerable gains from regional approaches to compliance. A cost minimizing compliant plan may include the import or export of emission allowances under a multi-state trading regime. It will involve balancing the costs and benefits of importing power versus generating it within the state.

One very obvious compliance strategy that Dominion could have modeled is not taking any compliance actions but rather purchasing allowances instead. That is, implementing the least cost plan (under the ICF CPP costs) but buying allowances from other states to make up the difference. Published models from PJM and others suggest that allowances may cost on the order of, say, \$30 per short ton in 2030 (PJM Interconnection, 2015). The cost of this strategy is the most that the state would possibly have to pay for compliance.

An optimal plan would be one that minimized the combined cost of changes to the energy mix along with the sale or purchase of allowances. It is clear from Dominion's graph on page 117 that the North Anna 3 option would have the state exporting allowances at the going price from 2028 forward to the tune of millions of dollars of income for the state each year. On the other hand, the cost minimizing non-compliant scenario could be made compliant in the out years by relatively modest annual purchases of allowances.

Finally, Dominion subjects the results of its flawed modeling exercise to Monte Carlo analysis to obtain estimates of the standard deviation of the costs of the various scenarios. Unfortunately, the Monte Carlo analysis is not particularly helpful. Any optimal plan will have very different responses to risk factors as compared to the stylized non-optimal plans offered up by Dominion. The Monte Carlo analysis can wait until Dominion is in a position to propose a preferred resource plan that makes sense in a CPP world.

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