Optimal ENERGY *Integrated Energy Resources*

POLICY BRIEF:

Reforming Virginia's Energy Efficiency Policy to Lower Ratepayer Bills

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Optimal Energy, Inc.
802-482-5600
www.optenergy.com
10600 Route 116, Suite 3
Hinesburg, VT 05461

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I. INTRODUCTION

Virginia electric rates are among the highest in the south, and are higher than all but one neighboring states.[1] Those rates, combined with low efficiency levels, mean Virginia ratepayers pay monthly electric bills that are among the very highest in the country.[2] Energy efficiency is a significant opportunity to lower the costs-of-living for Virginia ratepayers, and their own electric utilities are often in the best position to offer those efficiency improvements to their customers. Our previous Virginia analysis found increased efficiency could reduce Virginia ratepayers' bills by an average of 12% - or over $15 per month for the average customer of Virginia's largest utility.[3]

Almost every state implements significant utility-delivered energy efficiency programs, to reduce energy bills and the need to build or run more costly power plants. Energy efficiency has real and important impacts: per capita electric use declined by 7 percent between 2010 and 2016, even as gross domestic product (GDP) increased,[4]: two-thirds of that lower energy use is from energy efficiency improvement.[5] Energy efficiency has real impacts at kitchen tables around the country: one leading efficiency state reduced its per capita electricity use by 10% over the same period (and by 15% over the last decade).[6]

Utility-delivered energy efficiency programs ease ratepayer access to updated technology in buildings – like better lighting, heating or air conditioning upgrades, and insulation – to improve performance and reduce energy costs in homes and businesses. Efficiency programs lower energy use across the entire economy, from residential homes and apartments to small commercial spaces, big box stores, office towers, and school campuses or manufacturing facilities. Efficiency programs are available to improve nearly every energy system, including heating, cooling, insulation, lighting, plug-in appliances, and energy-intensive industrial processes, throughout a state's economy.

Energy efficiency is not only a readily available, bill-lowering resource across all sectors of the economy, it's a significantly less expensive resource for meeting the economy's energy needs than building new power generation. A survey of energy efficiency across 20 states found the average cost of saved energy via improved efficiency to be $28 per megawatt hour (MWh), or 2.8 cents per kilowatt hour,[7] significantly lower than the $42-$55 per MWh cost of Virginia's largest source of electricity, gas plants.[8] And as the cost of natural gas – Virginia's primary fuel for power plants – rises,[9] the cost savings from energy efficiency for Virginia ratepayers will likely increase.

II. THE SLOW GROWTH OF ENERGY EFFICIENCY IN VIRGINIA'S ENERGY MIX

Energy efficiency is an attractive but still largely untapped resource for Virginia, to not only tackle its higher-than-average electric rates and bills, but also reduce air pollution emissions from power plants at net-zero cost.[10] Despite this opportunity for energy bill savings for working Virginia families and low-cost emissions reductions, past policies in Virginia have stymied the growth of this resource compared to other states that now have lower bills.

In a regulated state like Virginia with state-sanctioned electric monopolies, proactive policies are often needed to correct the incentives investor-owned monopolies must maximize the bulk

sale of electricity. Efficiency policies balance the interests of ratepayers with those of the monopolies. Accordingly, energy efficiency was first stated as a Virginia goal in 2007, when the legislature set a non-binding savings target.[11] While that helped initiate energy efficiency programs, actual energy savings delivered were well below that state goal.

Virginia's chronic under-performance on efficiency savings was partly due to two key policy barriers put in place in 2009 at the State Corporation Commission (SCC). First, the Commission established the prioritization of the highly punitive Rate Impact Measure (RIM) test, a now-disfavored approach rarely relied on in other states, that disqualified many effective efficiency programs from being offered, programs that could have benefited ratepayers. Second, the SCC required restrictive investment limits on efficiency programs that restrict utilities to only delivering a small fraction of the full potential of ratepayer bill reductions.[12] That latter restriction is still in place today, with low levels of efficiency and unnecessarily high bills and rates as a result.

Despite the "lost decade" of minimal bill reductions from energy efficiency in 2007-2017, major reforms in 2018 significantly expanded Virginia's efficiency opportunity. Legislation that year established a minimum floor of efficiency investment for Virginia's largest utilities.[13] Just as important, the same 2018 legislation removed the SCC's overreliance on the punitive "RIM test," which had previously kept highly effective efficiency upgrades from being deployed across the Virginia economy. Additionally, the law initiated an energy efficiency stakeholder process to more strategically plan the utilities' nascent, but growing, portfolio of efficiency offerings.

Despite those significant 2018 efficiency reforms, Virginia has still had some of the lowest efficiency savings of any state in the US, with only 6 states achieving lower savings, as of 2020.[14] Importantly, legislation in that same year significantly improved Virginia's low performance, by establishing Virginia's first energy efficiency resource standard (EERS). An EERS requires regulated monopolies deliver a minimum amount of energy efficiency savings across the electric system, through vetted, cost-effective programs that improve the performance of lighting, HVAC, insulation, and electric appliances in buildings across the economy.

Specifically, Virginia electric monopolies must now meet a minimum floor of annual savings levels, in each year, 2022-2025. The SCC is responsible for setting post-2025 standards. The same 2020 legislation also included other significant efficiency policy reforms, one of the most important of which is allowing larger commercial customers to qualify for cost-effective energy efficiency programs to lower their energy costs.[15]Like the 2018 reforms, Virginia's EERS is a significant advance: it sets for the first time a minimum level of energy savings across the state's regulated monopoly electric system.

While important to improve Virginia's regulated utilities' modest efficiency performance to date, Virginia's savings targets significantly lag behind those of most other states (as discussed below in Section III). Just as importantly, the absence of any specific standards after 2025 lacks the regulatory and ratepayer certainty on how much bill-lowering efficiency utilities should include in their regular long-term planning. This resource gap is reflected in the absence of utility planning for efficiency resources beyond the modest 2025 targets, despite the significant longer-

term plans for costlier supply-side generation assets in the long-term Integrated Resource Plans of Virginia's largest utility.[16]

Both strengthening and making Virginia's efficiency standard a clear and permanent Virginia resource, then, will bring significant additional economic and clean air benefits to Virginia and its ratepayers.[17]

This brief assesses other states' energy efficiency levels, to provide a benchmark for strengthening Virginia's energy efficiency targets and identifies other policy enhancements to ensure Virginia ratepayers can reduce their bills through untapped efficiency resources, while also maximizing emissions reductions at the lowest cost.

III. VIRGINIA'S CURRENT EFFICIENCY SAVINGS REQUIREMENT

Similar to the requirement that state-sanctioned monopoly utilities provide adequate and reasonably priced electricity to all customers, an Energy Efficiency Resource Standard (EERS) requires that utilities deliver at least a minimum amount of energy savings to their customers, through utility-offered efficiency improvements. Doing so lowers the total cost of the electric system, by improving its overall efficiency.

Virginia now requires a minimum level of efficiency delivered across its system. Virginia law takes a modified approach from many other states, in how utilities measure EERS compliance before their regulators at the SCC: Virginia's energy savings compliance is measured in "total annual energy savings." This concept allows the utilities to "rollover" savings from efficiency measures installed in all previous years that are still operational, as well as the savings from measures installed in the current compliance year. For example, compliance in 2022 may be met with savings from efficiency improvements made not just in 2022, but in any previous year as well.

Virginia is an outlier in relying on "total annual" savings. While some states, like Illinois, use Virginia's approach, most states instead measure compliance in "incremental" savings; for compliance purposes, an incremental standard only counts savings from measures installed in the current compliance year, rather than including savings from all previous years.[18] For example, compliance in 2022 under the incremental standard may only be met with savings from improvements made in that compliance year, 2022. "Total annual" and "incremental" are simply different ways of measuring and verifying compliance with any year's required savings target.

Both "incremental" and "total annual" compliance measurement standards offer advantages and disadvantages. Total annual measurement has the advantage of implicitly encouraging longer lifetime measures. However, quantifying which previous years' measures are still delivering savings is more complex, and could even be contentious. Incremental measurement is far simpler to quantify and less subject to fluctuations based on specific policy decisions.

Current policy in Virginia allows savings from programs in years before the Virginia EERS was enacted to count towards the EERS goals. This may mean that the Virginia EERS requires fewer efficiency savings than it could otherwise deliver. The most important policy design component and outcome is additionality, in this case, the level of additional savings resulting

from the EERS. By this measure of additionality, Virginia likely falls well short of most other states' efficiency standards.[19]

IV. COMPARING VIRGINIA'S ENERGY EFFICIENCY PERFORMANCE WITH OTHER STATES

Virginia's EERS standard, through 2025, will certainly drive some level of expansion of Virginia's modest efficiency offerings, especially if utilities push beyond the efficiency additions delivered through 2018's reforms. That growth in efficiency resources is a significant step forward for a lower-performing state like Virginia, especially one faced with high rates and bills.[20]

However, the specific targets set in Virginia's EERS are low compared to those other EERS states. The table below lists the savings target for every state with an EERS, the year the EERS was originally enacted, and the relevant time frame for that target (most EERS's increase in stringency over time).[21]

Table 1: EERS Savings Targets by State[22]

	Incremental Annual Targets – Electric	Date Range	Year Enacted Originally
New York	3%	Ramp up by 2025	2008
Massachusetts	2.70%	2019-2021	2008
Arizona	2.50%	2016-2020	2011
Rhode Island	2.50%	2018-2020	2006
Vermont	2.40%	2018-2020	1999
Maine	2.30%	2020-2023	2010
New Jersey	2.15% for IOUs (2.0% statewide)	Ramp up over 5 years	2018
Illinois	2.08%	2022-2025	2007
Maryland	2%	Increase by 0.2% per year starting in 2016	2008
Colorado	1.70%	2019-2023	2007
California	1.60%	2020-2025	2004
Minnesota	1.50%	beginning in 2010	2007
Hawaii	1.40%	2016-2030	2004
New Hampshire	1.30%	2020	2015
Oregon	1.30%	2020-2021	2016
Utah*	1.30%	2010-2024	2008
Arkansas	1.20%	2020-2022	2011
Connecticut	1.11%	2019-2021	2007
Michigan	1%	Ongoing	2008
New Mexico	1%	2021-2025	2008
Washington	0.90%	Ongoing	2006
Iowa	0.89%	2019-2023	2008
Pennsylvania	0.80%	2016-2020	2008
**Virginia ** **	**0.79%[23]**	**2022-2025**	**2020**
Wisconsin	0.6%-0.7%	2019-2022	2011
Texas***	0.4% of peak demand	Ongoing	1999

*Renewable portfolio standard that allows efficiency to be counted

**Statewide number, comparing 2020 EERS savings to total Virginia sales as shown in 2020 EIA-861 data. Note that this assumes no savings from programs before 2022 are included towards the EERS target. To the extent that this is allowed, the actual EERS is lower than shown.

***peak demand

As seen above, Virginia's statewide EERS requirement is lower than 23 out of the 25 other EERS states. It's important to note that Virginia's savings target may be even lower than shown above, as the table assumes all savings counting towards the EERS comes from measures installed in 2022 and later. However, as Virginia measures compliance by total annual savings, including measures installed in previous years and still operational, while most other states' EERS goals only count incremental savings in each program year. Once these previous years' savings are included for Virginia's compliance, Virginia's mandated incremental targets shown above are likely lower, and most likely drop Virginia below Wisconsin in the next-to-last position.

Comparisons with what other utilities deliver are also useful to assess the relative strength of a utility's EERS. The savings targets of Virginia's largest utility, at about 1.25% incremental per year, is extremely low for a utility of its size (though it is a significant increase from recent levels). In 2018, the utility was 49th of the 50 largest electric utilities, measured by energy savings as a percentage of sales.[24] Encouragingly, due to Virginia's recent reforms in 2018, the utility approximately doubled its savings between 2018 and 2020; however, that improvement would only bring it to 46th out of the same 50 largest utilities.[25] Virginia's modest performance is all the more striking when one considers that many of these utilities are already achieving, today, far higher savings than those required four years from now, under Virginia's own modest EERS, (shown in Table 2 below). While Virginia has seen modest improvement in efficiency savings, significant headroom exists to approach the levels already achieved by comparable utilities.

Table 2: Large Utilities with Higher Savings in 2018 Than VA's Maximum EERS Target in 2025[26]

Utility	Net 2018 Savings as a % of Sales
National Grid - MA	3.73%
Eversource - MA	3.15%
San Diego Gas & Electric - CA	2.35%
Commonwealth Edison - IL	2.08%
Salt River Project - AZ	2.05%
Baltimore Gas and Electric – MD	1.96%
Northern States Power (Xcel) - MN	1.73%
Los Angeles Department of Water and Power – CA	1.63%
Pacific Gas and Electric – CA	1.61%
Southern California Edison – CA	1.55%
Consumers Energy – MI	1.55%
Eversource - CT	1.54%
DTE Electric - MI	1.50%
Public Service Co. of Colorado (Xcel) - CO	1.45%
Portland General Electric - OR	1.45%
Long Island Power Authority - LI	1.41%
Duke Energy - Oh	1.32%
MidAmerican Energy - IA	1.27%
Dominion – VA*	**0.08%***

*Reflects actual 2018 savings

V. THE FAVORABLE CONDITIONS IN VIRGINIA TO DELIVER RATEPAYERS SUBSTANTIAL EFFICIENCY SAVINGS

Despite its significantly lower EERS targets compared to its peers, the Virginia economy has several built-in factors that will likely give it comparatively greater efficiency performance than many states. Virginia's higher potential includes those states already delivering much higher levels of energy savings today than will be eventually required under Virginia's EERS in 2025.

Two significant factors are (1) Virginia's already-high rate of electrification, especially in electric resistance heating, and (2) its shorter history of capturing potential efficiency savings available across the state's economy.

Virginia's Opportunity to Improve the Electrical Efficiency of its Highly-electrified Buildings

The level of electric efficiency potential available for lowering energy costs is directly related to the number of technologies fueled by electricity, as opposed to gas, fuel oil, propane, or wood. A large portion of total household energy expenditures, regardless of fuel, goes to pay for space and water heating. This is particularly true in Southern states: heating and hot water combine to make up 50% of total household energy use in Virginia's South Atlantic census division.[27] Those are very significant efficiency opportunities.

Of further potential for savings, heating and hot water traditionally use "resistance heat," the most inefficient means of generating heat. While most common efficiency measures reduce energy use on the order of 5%-20%, heat pumps can provide an over 60% energy reduction when replacing resistance heating.

A major opportunity for Virginia energy savings, therefore, is its high level of inefficient resistance heating. Electric resistance heating is an inefficient and obsolete technology, and heat pumps – the replacement technology – are well established, affordable, and effective, particularly for Virginia's relatively mild winters. Converting to heat pumps from electric resistance heat reduces energy usage and heating costs by over 60%, or 3,900 kWh[28], representing just a 3.5-year payback on the full cost of a new heat pump, even before any utility rebates are included.[29] A focused effort in Virginia replacing electric resistance heat with "air source" heat pumps in Virginia will drive significant levels of savings not necessarily available to other states, while greatly improving the energy affordability for many Virginian households.

Similar to its high levels of inefficient resistance heating, Virginia's high penetration of electric cooling offers another significant bill savings opportunity not available elsewhere. Indeed, many Northeastern and Midwestern states with higher savings targets than Virginia do not have this efficiency potential for HVAC improvement.[30] Indeed, a full 82% of homes in Virginia's census region have central air conditioning. That compares to only 27% of New England homes; as shown above in Table 1, despite this large discrepancy, many New England states already, today, achieve significantly higher electricity efficiency savings than will eventually be required here in Virginia under its modest EERS.

To be sure, many states with higher efficiency savings than Virginia are less electrified, and therefore have fewer opportunities for electricity savings. As another example, in Virginia's census division, 61% of heating systems and 68% of hot water systems are electric.[31] In the Northeast, by contrast, only 9% of heating systems and only 36% of hot water systems are electric.[32] Despite Virginia's additional electric load with significant savings potential, Virginia achieves far lower savings – 0.18% of sales by Virginia's largest utility in 2020,[33] compared to between 0.93% and 2.51% for New England states[34].

Looking at Virginia's heating, 55 percent of homes use electricity as the primary heat source, with a full 33% specifically using electric resistance heat.[35,36] This is more than double the saturation of electric resistance heating than, for example, the efficiency leadership state of Massachusetts. There, only 14% of homes have electric baseboards (and many of those are to heat one section of a home, which is also heated by natural gas).[37] Despite this, that state is already, today, meeting an efficiency standard over three times greater than the standard Virginia utilities have yet to achieve.

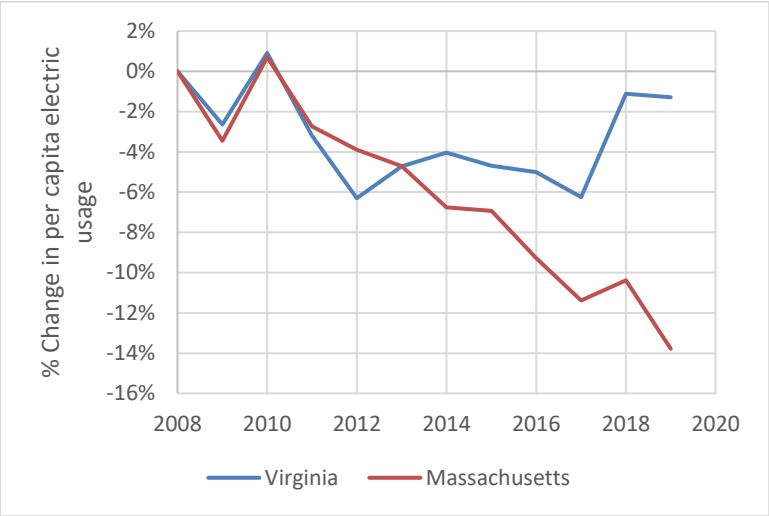
Taken together, the Commonwealth's unique building stock characteristics of electrification give it substantial headroom for far greater savings than that achieved in less electrified states, states that nonetheless already far outpace Virginia in energy efficiency.

Virginia's Lack of History of Robust Efficiency Programs and Savings

Another distinct advantage for significant efficiency growth in Virginia is its untapped "low-hanging fruit." As discussed in the previous section, Virginia has traditionally had very low levels of efficiency programs compared to other states; as a result, its largest utility serves just a very small fraction of its customer base with its efficiency programs.[38] As shown in Table 1, states with an EERS have had one in place, on average, for over a decade. Vermont, for example, despite also being less electrified than Virginia, has already been achieving incremental annual efficiency savings of over 2%, for *at least 13 years*.[39]

Other states' longer history of delivering energy efficiency has a striking impact on total energy use. The figure below shows the change in per capita electricity use of Virginia and Massachusetts, between 2008, when its EERS began, and 2019: Virginia's total per capita energy use has remained relatively flat, while Massachusetts' electricity declined by a full 15%.[40]

Figure 1: Percent Change in Electricity Usage Per Capita in MA vs. VA



Virginia can eventually deliver similarly dramatic savings levels. The Commonwealth has a still untapped market of more efficient equipment (be it insulation, appliances, lighting, or HVAC), with which to reduce energy use and corresponding bills. The SCC's long-running requirement of low investment limits has also kept efficiency savings artificially low. The vast untapped market for replacing inefficient, outdated equipment presents specific Virginia opportunities to make up lost ground and catch up to the efficient practices of other states that have long histories of robust efficiency growth. Further, Virginia can look to these other jurisdictions for efficiency program and design best practices and implement successful programs faster than those earlier adopters.

Given that Virginia is far more electrified than top efficiency performance states, as discussed above, and that its utilities have offered far fewer programs for a far shorter time, means significant, still-untapped opportunities remain, for future reductions in Virginia electric bills.

VI. POLICY RECOMMENDATIONS TO MAXIMIZE BILL REDUCTIONS THROUGH INCREASED ENERGY EFFICIENCY

Set a Clear, Long-term Savings Goal of At Least 2.0% Incremental (or Its Total Annual Equivalent)

Rather than a temporary standard through 2025, and an unknown and therefore ineffective standard beyond 2025, a permanent standard should be put in place as soon as possible: utilities strategically plan to deploy efficiency resources to meet known future standards, in the same manner they regularly make long-term plans for supply-side resources.

Ramping up to an incremental annual goal of at least 2.0% of utility retail sales would eventually bring Virginia out of the bottom tier and into the top ten best performing states. A 2% goal is exceedingly reasonable: 2% is already, today, being achieved in 7 states, none of which has

Virginia's efficiency advantages of being both highly electrified and having untapped "low-hanging fruit" savings still available. The less-electrified states of New York and New Jersey, for example, recently set efficiency targets well above 2%. A ramp-up to these levels over 8-10 years would be much slower than is required in New Jersey and has already been achieved in other states; however, it would have the advantage of providing state utilities ample lead-time to expand and plan programs.

While incremental savings compliance measurement is the norm, due to its simplicity, long-term targets could still be set in "total annual savings." However, any total annual standard should nonetheless rise to the equivalent of 2% incremental per year to at least match the achievement today by less-electrified leadership states.

An even more effective approach would be to require all cost-effective efficiency as the target, with a floor of no less than 2% incremental savings per year. This is the more holistic approach seven other states take.[41] Under that approach, periodic energy efficiency potential studies, conducted every 3-5 years, evaluates the maximum achievable potential in Virginia, to inform the targets for the next program cycle. If this approach is taken, a legislative backstop should be put in place to protect against overly pessimistic assessments – for example, the greater of either 2% incremental savings, or all cost-effective savings, as determined by the potential study.

Further Clarify How to Calculate Total Annual Savings

Virginia EERS includes savings from measures installed in pre-2022 years for compliance, a significant dilution of the early year targets: savings from previous year programs lack additionality. While the precise dilution of the standard is uncertain, it is likely significant. (For example, 10 years of programs with an average measure life of 10 years and average incremental savings of 0.1% translates to 1% savings – nearly the entire 1.25% total annual goal in 2022.)

By contrast, Illinois's EERS, which also uses total annual savings, limits the dilution of the standard by previously installed measures, and clarifies those savings' decay rate.

If policymakers elect to retain the "total annual" compliance metric, greater compliance specificity would ensure the policy delivers maximum additionality of savings. Policymakers should therefore explicitly define how much savings from previous years can be counted towards the EERS and set the total EERS target to achieve 2% annual savings incrementally beyond previous years. For example, if total annual savings from program years 2012-2021 is 1% of sales, a total annual EERS target of 3% would ensure that incremental annual savings in program year 2022 would reach 2% of sales. One high-level method to calculate previous years' savings by Virginia's largest utility, we estimate a 10-year measure life for all programs. In this case, measures installed in 2013-2021 will still produce about 01.26% of 2019 sales in 2022, and 1.24% of 2019 sales in 2023.[42] Under those assumptions, Table 3 shows how an EERS expressed in total annual savings ensures that efficiency savings ramp up to 2% per year on an incremental basis, by 2030.[43]

Table 3: Sample Incremental and Total Annual Savings Targets for an EERS

Year	Savings from Previous Years	Incremental Annual Target	Total Annual Target
2022	1.26%	0.40%	1.66%
2023	1.64%	1.00%	2.64%
2024	2.54%	1.25%	3.79%
2025	3.65%	1.35%	5.00%
2026	4.76%	1.50%	6.26%
2027	6.13%	1.75%	7.88%
2028	7.78%	1.80%	9.58%
2029	9.41%	1.90%	11.31%
2030	11.13%	2.00%	13.13%

Alternatively, the legislation could specify that only savings from measures installed beginning the first year of the EERS (2022) can be counted towards the total annual savings requirement. This would simplify the calculations determining the targets and ensure the additionality of the policy is not eroded by pre-existing programs.

Clarify The EERS Target is Measured in Net Savings

Energy efficiency results can be measured in gross savings, which is the savings tracked in the program database, or net savings, which represents the savings that are actually attributable to the utility efficiency programs. These two calculations differ because some program participants would have installed the measure even without the program ("freeriders"). Other participants may install additional non-program measures because of the program and some customers will be influenced by the program and save energy, but never formally participate in the program ("spillover").

Policymakers should clarify that Virginia's EERS targets are measured by "net" savings, to avoid diluting the standard's additionality with "free credit", to ensure that programs are actually moving the market, and to reduce the incentive for low incentives on measures that are already highly adopted regardless of program incentives.

Eliminate restrictive investment ceilings that leave savings potential unrealized

Since 2009, the SCC's practice of severely limiting efficiency investment is in stark contrast to the very high levels of utility investment in more-expensive generation construction. That costly policy severely curtails the ability of Virginia's regulated monopoly utilities to lower customer bills through the widespread availability of efficiency measures. Artificially low investment ceilings should be significantly raised, so that all feasible and cost-effective efficiency potential can be harvested across the system.

Allow fuel switching from oil/propane to electric to count on a site energy basis

Increasing concerns about air pollution have caused many states to begin broadening the focus of efficiency programs to look at emissions more holistically. Massachusetts, for example, has set all the goals for its upcoming program cycle to be based on emissions reductions. Illinois recently allowed utilities to count electric savings from fuel switching oil, propane, or natural gas-fired equipment to electric equipment ("beneficial electrification"), by calculating the total net energy savings at the premise and then converting to MWh. A similar approach in Virginia would allow utilities to look at electrification efficiency measures more broadly and would particularly help Virginia customers who use costly oil or propane fuel heating, and who therefore pay significantly higher costs for space and water heating.

Increase APCo's requirements to match Dominion's

While EERS's in other states do sometimes include lower goals for smaller utilities, the 0.5% annual savings goal for APCo is extremely small, and is the very lowest target in any of the 27 states with an EERS in place. There is no evidence that achieving similar levels of efficiency as a percentage of load is less achievable for smaller utilities. Even if there were, there are several successful models in other states where smaller utilities have coordinated with larger utilities to run robust efficiency programs, or even pay the larger utilities to run programs in their jurisdiction. Having such a large imbalance in savings requirements most certainly leaves cost-effective bill savings on the table and creates intra-state inequities, in which ratepayers living in Dominion's territory will have access to financial incentives and support not available to APCo ratepayers.

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[17] Optimal Energy, 2019. Impacts of a 2% Energy Efficiency Resource Standard in Virginia. December. *available at* www.optenergy.com/wp-content/uploads/2020/01/FINAL-REPORT-VA-2-ERS-Impacts.pdf.
[18] Although many legislative targets express the goals in terms of a cumulative percent savings by a certain year, i.e. 5% of 2019 sales by 2025, in practice these are often calculated as the sum of each year's incremental savings, without regard to the measure lives.
[19] The diluting impact of the total annual metric, assuming an average portfolio measure life of 11 years, in short-to-medium time horizons, incremental annual savings, also assuming compliance begins from zero, can be approximated from total annual savings by taking the difference between the goal and the previous year's goal. For Virginia, this approximately translates to an average incremental annual savings under 2020 legislation of 1.25% for Dominion, and 0.5% for ApCo. However, given that current policy is to allow savings from previous years' programs to count towards the EERS goal, the EERS might not result in significant efficiency beyond what is already required in 2018 legislation. For example, 10 years of programs saving a low level of 0.13% of sales with a 10-year measure life would be enough to meet the EERS year 1 targets, with no additional programs added beyond the 2018 legislation.
[20] EIA, 2020 Average Monthly Bill, *available at* www.eia.gov/electricity/sales_revenue_price/pdf/table5_a.pdf.
[21] Data from the National Conference of State Legislatures (NCSL) and the American Council for an Energy Efficient Economy (ACEEE). *See* here: https://www.ncsl.org/research/energy/energy-efficiency-resource-standards-eers.aspx and here: https://database.aceee.org/state/energy-efficiency-resource-standards.
[22] Note that not every state listed may have an EERS in the most restrictive sense. For example, legislation in Massachusetts, Connecticut, Maine, Rhode Island, California, and Washington calls for all cost-effective efficiency, without specifying explicit targets. In these cases, the savings targets listed come from their latest efficiency plans, typically based on periodic potential studies.
[23] Calculated by adding Dominion's annual incremental EERS requirements (862,300 MWh) and AppCo's requirements (76,500 MWh), and dividing by VA's total 2019 retail sales from the EIA State Electricity Profile (118,435,380 MWh).
[24] Relf, Grace et al. 2020 Utility Energy Efficiency Scorecard. ACEEE. February 2020, *available at* www.aceee.org/sites/default/files/pdfs/u2004%20rev_0.pdf.
[25] Ibid.
[26] Ibid
[27] EIA, 2015. "Residential Energy Consumption Survey." Table CE3.4.
[28] According to the Mid-Atlantic Technical Reference Manual (TRM), a typical 2-ton electric resistance heating system in Virginia will use 6,600 kWh in the heating season. Converting to a heat pump reduces this to 2,700 kWh, a savings of 3,900 kWh
[29] Costs and Full Load Hours from Mid-Atlantic TRM. See NEEP, 2018. "Mid-Atlantic Technical Reference Manual, Version 8," May. Lexington, Mass.: Northeast Energy Efficiency Partnerships, *available at* https://neep.org/sites/default/files/resources/Mid_Atlantic_TRM_V8_0.pdf.
[30] EIA. RECS 2015, *available at* www.eia.gov/consumption/residential/reports/2009/air-conditioning.php.
[31] EIA, 2015. "Residential Energy Consumption Survey. Tables HC 8.8 and HC 6.8.
[32] EIA, 2015. "Residential Energy Consumption Survey. Tables HC 8.7 and HC 6.7.
[33] EIA 861 Data for 2020

[34] ACEEE. The 2020 State Energy Efficiency Scorecard. December 2020, *available at* www.aceee.org/sites/default/files/pdfs/u2011.pdf.
[35] EIA, 2009. "Household Energy Use in Virginia," *available at* www.eia.gov/consumption/residential/reports/2009/state_briefs/pdf/VA.pdf.
[36] EIA, 2016. "2015 RECS Survey Data," in *Residential Energy Consumption Survey (RECS)*: Table HC6.8: Space Heating in the South and West Regions, *available at* www.eia.gov/consumption/residential/data/2015/hc/php/hc6.8.php.
[37] Navigant Consulting, 2019. Massachusetts Residential Baseline Study. April 20, *available at* https://ma-eeac.org/wp-content/uploads/RES-1-Residential-Baseline-Study-Comprehensive-Report-2019-04-30.pdf.
[38] Dominion testimony, SCC Case PUR-2020-00274, at 3, *available at* https://scc.virginia.gov/docketsearch/DOCS/4q%24y01!.PDF.
[39] ACEEE, 2010. The 2010 State Energy Efficiency Scorecard. October, *available at* www.aceee.org/sites/default/files/publications/researchreports/e107.pdf.
[40] Electricity Use from EIA's State Energy Data System, Tables CT3 for MA and VA. Population data from the US Census Bureau.
[41] ACEEE Policy Brief. State Energy Efficiency Resource Standards (EERS). May 2019, *available at* www.aceee.org/sites/default/files/state-eers-0519.pdf.
[42] Calculated by looking at Dominion's historical efficiency savings as shown in EIA-861 forms. As a simplification, we assume that savings last for 10 years. This is in line with a typical average measure life, but a more detailed analysis would show some savings dropping off sooner than 10 years, and some savings lasting longer.
[43] We assume incremental annual savings in 2023-2030 are 0.4%, 1.0%, 1.25%, 1.35%, 1.5%, 1.75%, 1.8%, 1.9%, and 2.0%. We also continue assumption that savings will last for 10 years.

Optimal Energy, Inc.
802-482-5600
www.optenergy.com
10600 Route 116, Suite 3
Hinesburg, VT 05461