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ISSUE PAPER

30X30: VIRGINIA'S KEY TO CLIMATE ACTION AND GROWING THE ECONOMY

The Trump Administration came into office pledging to undo the significant gains achieved by the Obama Administration to expand clean energy and reduce the key contributor to dangerous climate change: unchecked carbon pollution from power plants that makes up nearly 40 percent of our country's carbon footprint. In the early days of the Trump era, that pledge—and Trump's actions as President so far—have caused deep uncertainty about the direction the country will take in the months and years ahead. Trump's EPA administrator, for example, has spent his career opposing the mission of the agency he now leads. While this cloud of uncertainty presents a challenge, it is also an opportunity for states to continue moving ahead and charting their own environmental and economic destiny.

Virginia has perhaps one of the greatest near-term opportunities to take decisive action to create new jobs that improve the economy and address climate change. The Old Dominion can do so chiefly by setting its own limits on the carbon pollution released by fossil-fuel power plants operating in the state, and reducing that pollution 30 percent by 2030. Doing so will help clean up the air and unleash one of the state's greatest untapped resources: clean energy.

Clean energy, derived from solar and wind power, is currently one of the biggest energy-related job creators in the nation,[1] yet Virginia is sitting on the sidelines. Nationwide, solar energy alone employs over 350,000 people, significantly more than the 200,000 people who work at power plants that burn oil, gas, and coal combined.[2] Rather than watch this shift to a cleaner 21st century energy system pass the state by, Virginia has an opportunity to join in this clean energy job growth by limiting carbon and unleashing a carbon-free economy.

The smart time to act is now. Clean energy jobs have surged elsewhere in the nation, largely because the costs of deploying clean energy technology relative to polluting sources have been declining rapidly—a trend that continues to persist. The price of wind, for example, has fallen 66 percent since 2009. Solar has seen an even more dramatic cost decline, with the price of utility-scale solar falling by 85 percent since 2009.[3] Similarly, unsubsidized solar energy is now substantially cheaper to build than new coal-fired power plants, and it costs about the same as building natural gas-fired power plants.[4]

Independent energy market analysts such as Goldman Sachs and Morgan Stanley forecast that falling costs of renewable energy and the resulting explosive growth in renewable energy will continue, regardless of the Trump administration's support for fossil fuels.[5]

Two days after the 2016 presidential election, Morgan Stanley stated that "wind and solar power are now sufficiently cost-competitive enough in the U.S. to withstand Trump's anti-climate stance," finding that "it's the economics and not the politics that's driving the use of renewables."[6] Similarly, Goldman Sachs predicts that "solar, wind, hydropower and other sustainable sources are expected to account for half of our global energy mix by 2030."[7] And because, in addition to their cost savings benefits, renewable generation sources (along with energy efficiency) emit no pollution, these are the best sources to help grow Virginia's 21st century economy while cutting carbon pollution.

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Ensuring a durable Virginia economy also heavily depends on slowing climate change and reducing the pollution that causes it. We're already seeing climate impacts in the form of sea level rise along Virginia's coastal communities, especially in the densely populated Hampton Roads region, home to the world's largest naval base.[8] Costs related to climate change are forecast to dramatically increase, with many billions of dollars' worth of property at risk from sea level rise alone,[9] adding significant strain to already-stretched federal, state, and local budgets.

Given these environmental and economic imperatives, scaling up clean energy and limiting pollution from Virginia's largest stationary carbon emitter—power plants—will be an economic win-win. By limiting and reducing carbon from the power sector, the state can begin doing its part to slow and eventually reverse climate change and its cost shocks. Doing so includes avoiding the construction of unnecessary, costly, and carbon-intensive natural gas plants by the state's largest electric utility, Dominion Virginia Power. A state carbon limit should be coupled with smart policies to capture the state's vast, untapped clean energy potential; doing so will grow the state's economy, create jobs, and lower energy costs for everyday Virginians.

The Natural Resources Defense Council (NRDC) has prepared this fact sheet as a guide on how Virginia can limit and reduce carbon pollution from power plants operating in the state, grow its economy, tackle dangerous climate change, and become a national and international clean energy leader.

30X30: VIRGINIA'S KEY TO UNLOCKING THE CLEAN ENERGY ECONOMY AND SLOWING CLIMATE CHANGE BY LIMITING CARBON POLLUTION FROM POWER PLANTS 30 PERCENT BY 2030

The Trump administration appears poised to prop up polluting fossil fuel interests, and the jury is out on whether it will do anything at all to try to rein in climate change. President Trump has appointed an assortment of fossil-fuel supporters to his administration. He's also begun acting on his campaign promises to roll back a variety of federal regulations that protect Americans' clean air and water.[10] In this climate change and clean energy leadership vacuum at the federal level, Virginia can step up to lead the way to a clean, prosperous future.

In June 2016, Virginia Governor Terry McAuliffe began that work when he signed Executive Order 57, directing his Secretary of Natural Resources to convene a workgroup and recommend concrete steps to reduce carbon pollution from Virginia's power plants. The group is charged with evaluating options under Virginia's existing authority to address carbon pollution.

In 2017, the governor can take the next appropriate step and set a sensible limit[11] on climate-changing pollution from the electricity sector, while also making affordable clean energy and energy efficiency a meaningful share of Virginia's energy supply and the driver of a growing economy.

Specifically, the governor should fulfill his stated commitment to tackle climate change by immediately setting a sensible carbon pollution limit on the state's power plant fleet, and by requiring those same power plants to achieve a modest, 2 percent annual reduction in carbon pollution (from 2015 levels) through 2030. This "30x30" clean energy plan will reduce the state's carbon pollution from power plants by 30 percent by 2030.[12]

MODESTLY GROWING VIRGINIA'S CLEAN ENERGY SUPPLY WILL ACHIEVE THE 30X30 POLLUTION REDUCTION

Achieving a 30x30 carbon pollution reduction through clean energy growth requires just two job-creating measures: lowering energy costs by modestly increasing energy efficiency, and increasing Virginia's energy independence by modestly growing its renewable energy supply.

Here are the specifics of how to achieve 30x30:

- **Energy efficiency:** gradually increasing Virginia's electricity-sector energy efficiency to 1.5 percent energy savings each year;[13] and
- **Renewable energy:** gradually increasing Virginia's renewable energy to 20 percent of the state's electricity mix by 2030.

These two essential initiatives to complement carbon limits on the power sector are eminently achievable, as they essentially entail "catching up" to the clean energy transition already sweeping the nation.

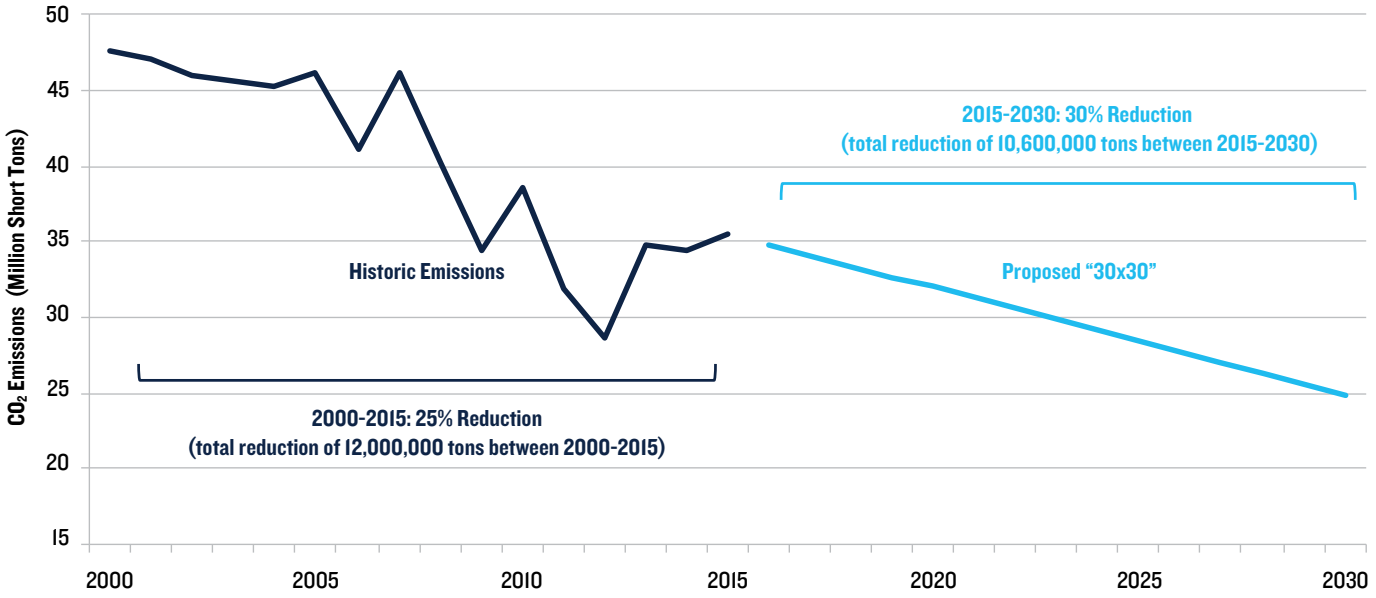
A 30x30 plan to curb carbon pollution and grow clean energy has another benefit: energy independence. By reducing energy imports of out-of-state electricity by over 50 percent,[14] as well as reducing the state's dependence on imported natural gas, Virginia will be more energy secure.

A 30x30 goal is not only sensible, it's a Virginia-style approach to addressing pollution. Because Virginia has *already* successfully made similar reductions in carbon pollution. From 2000-2015, Virginia's power sector reduced its carbon pollution by 25 percent. 30x30 would continue that progress at a similar rate.[15] (See Figure 1.)

Virginia cut carbon pollution in this way due largely to an economic shift away from higher-pollution, higher-cost energy supplies.[17] That seismic shift from dirtier to cleaner continues today across the nation, as renewables and energy efficiency dominate growth in the energy industry.[18] To continue its progress toward cleaner air, Virginia should embrace this trend by scaling up renewables and efficiency in a 30x30 carbon reduction plan.

FIGURE I: 30X30 CARBON POLLUTION REDUCTIONS WOULD CONTINUE VIRGINIA'S PROGRESS IN CUTTING POLLUTION

Historic and proposed electric-sector carbon pollution reductions in Virginia.[16]



MEETING 30X30 & UNLOCKING VIRGINIA'S VAST ENERGY EFFICIENCY RESERVES

Improving end-use energy efficiency is the most cost-effective, climate-friendly way to reduce carbon pollution from power plants. Virginia can meet the 30x30 carbon reduction goal by gradually increasing its annual electricity-sector energy efficiency to 1.5 percent energy savings (as a percent of the state's retail electricity sales) per year.[19] That means meeting the same needs of Virginia's economy, but with 1.5 percent less electricity, by relying on commonsense technology improvements such as more efficient lighting and better-weatherized buildings. Reaching 1.5 percent annual energy efficiency savings would require an increase of 0.2 percent per year, between the years 2017 and 2024.[20] This is a feasible ramp-up rate, based on robust analysis and the experience of many states.[21]

The ability to ramp up to a modest 1.5 percent annual energy efficiency savings is also widely proven: 8 states have recently achieved 1.5 percent annual energy efficiency savings.[22] Thirteen states have established energy efficiency targets equivalent to annual savings of between 1.5 percent and 3 percent, for 2017 or beyond.[23] This includes Virginia's neighbor, Maryland, which, based on its past efficiency success, now calls for utilities to ramp up their energy efficiency programs to achieve 2 percent annual savings.[24] Another six states have energy efficiency targets between 1 percent and 1.5 percent of retail sales for 2017 or beyond.[25]

Clearly, if so many states will achieve similar levels of efficiency or more, and relatively soon, Virginia can do so by 2030.

Energy Efficiency Will Save Virginians Money and Create Jobs

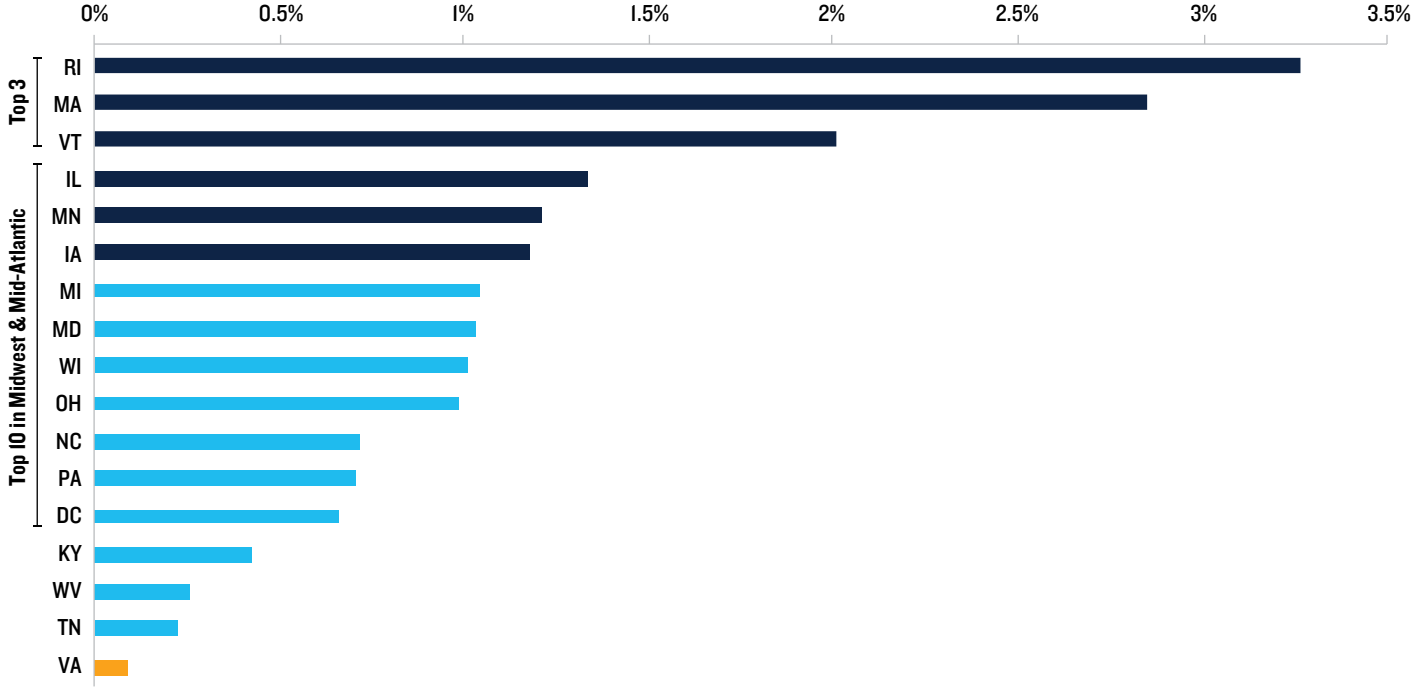
Energy efficiency technology—such as upgrading to LED light bulbs, weatherizing homes and buildings and tuning up commercial HVAC systems – keeps billions of dollars in consumers' pockets through energy savings[26] and creates jobs. The U.S. Department of Energy estimates there are already 75,552 jobs in energy efficiency in Virginia,[27] and boosting efficiency could add an additional 5,600 jobs in Virginia by 2020 alone.[28]

Virginia Has Tremendous Growth Potential in Energy Efficiency

Despite this vast untapped potential for job creation in the energy efficiency sector, the Commonwealth remains one of the lowest performing states in the country in the reduction of unnecessary and costly electricity waste.[29] (See Figure 2.)

FIGURE 2: 30X30 CAN BE ACHIEVED BY CATCHING UP WITH STATES ALREADY LOWERING ENERGY BILLS THROUGH ENERGY EFFICIENCY

2015 Energy Efficiency savings for Virginia, neighboring states, the top 3 states nationwide, and the top 10 states in the Midwest and Mid-Atlantic.[30]



This low performance in Virginia has a direct negative impact on the state economy: state electric bills are the 10th highest in the nation.[31] Virginia's bills are higher than California, New York, and at least five other states that are actively cutting their carbon pollution through bill-reducing energy efficiency investments.[32] Instead, by making its economy leaner and stronger, an efficiency increase will make Virginia's economy more competitive with other leading states.

Energy Efficiency is the Lowest Cost Electric Sector Resource

Not only does efficiency reduce out-of-pocket energy costs, it's also the cheapest form of meeting energy needs: the cheapest kilowatt-hour is the one not used in the first place. The average cost of energy efficiency is 4.6 ¢ per kWh.[33] In contrast, the average retail price of electricity in 2015 in Virginia was almost double that, at 9.31¢ per kWh.[34]

Rather than pay that higher cost of generating electricity, which also causes more pollution and worsens climate change, Virginia can instead create jobs and lower energy bills by achieving a 30x30 goal that maximizes the state's potential for energy efficiency gains.

MEETING 30X30 AND BRINGING A RENEWABLE ENERGY ECONOMY TO VIRGINIA

In addition to energy efficiency, a smart 30x30 climate plan would expand renewable energy to 20 percent[35] of the state's electricity supply.[36]

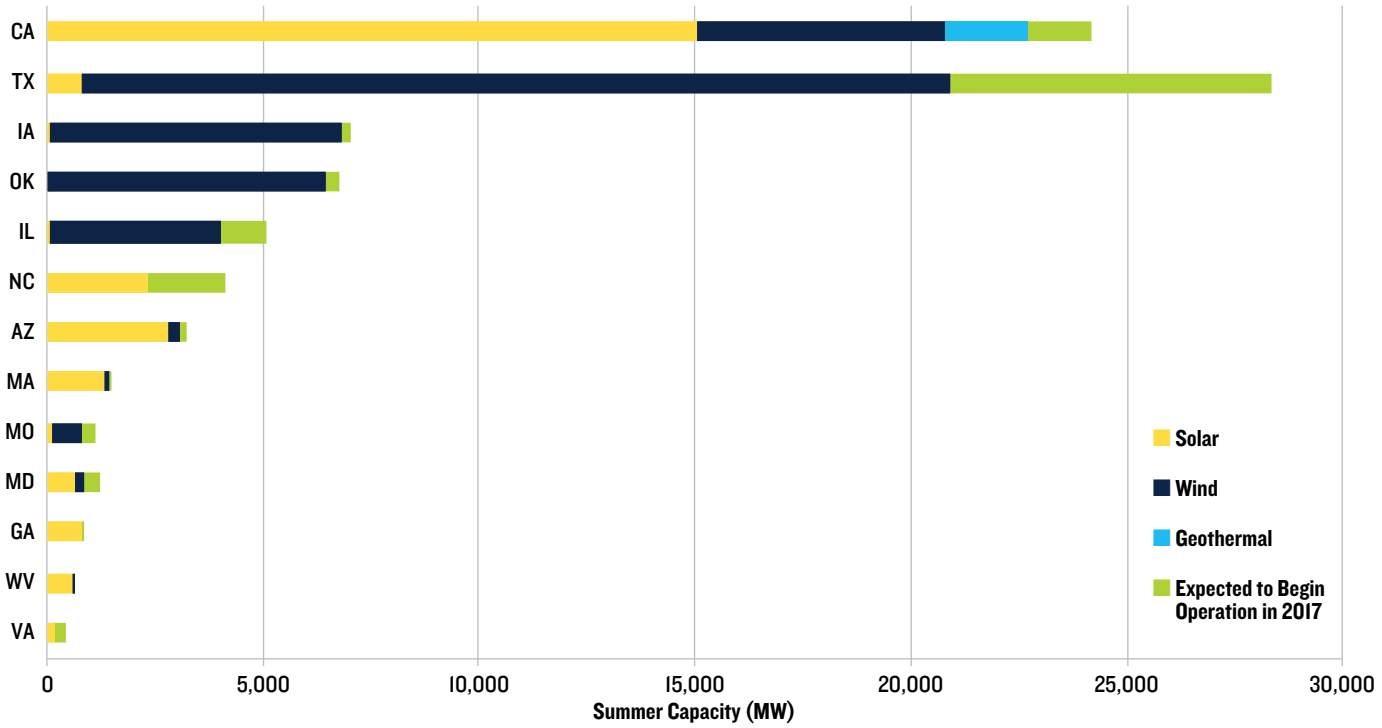
Similar to energy efficiency, this level of renewables is already in place in many states: seven states are likely to have already generated more than 20 percent of in-state generation from renewable sources last year, with another five states already achieving greater than 15 percent of in-state generation from renewables.[37] Many more states will exceed 20 percent renewable generation: a total of 17 states[38] have binding clean energy standards that require renewable energy levels of over 20 percent by 2030.[39] Clearly, 20 percent renewables by 2030 is a sensible, achievable goal. Virginia should join the many states already leading the way on clean energy with a 30x30 plan.

Virginia Has Tremendous Growth Potential in Renewable Energy

Similar to its underperformance in energy efficiency, Virginia lags behind almost every state in the country in clean energy derived from the sun and wind.[40] (See Figure 3.)

FIGURE 3: 30X30 CAN BE ACHIEVED BY CATCHING UP WITH THESE STATES THAT HAVE A CLEAN ENERGY ECONOMY

Renewable Energy Capacity by State as of November 2016.[41]



This is a missed opportunity to strengthen the state economy. Wind and solar are the fastest growing sources of electricity capacity,[42] and drive some of the fastest growing job sectors in the U.S.[43] It's no surprise that there are now more jobs in the clean energy sector than there are jobs in the fossil fuel (coal, oil, & gas) sectors.[44]

Clean Energy Will Increase Virginia's Energy Independence

Like energy efficiency, investments in in-state renewable energy would improve Virginia's energy independence.[45] Unlike natural gas generators, which must import gas from out-of-state, solar and wind (and energy efficiency) are abundant and carbon-free resources *within* Virginia's borders. Taking advantage of the state's clean energy potential will keep Virginians' dollars and jobs in-state. A recent study found that Virginia's solar jobs grew 65 percent in just one year (from 1,963 to 3,236).[46] That growth would accelerate if Virginia addresses climate change by simply expanding its clean energy to levels already widely seen across the country.

Clean Energy Will Attract Businesses to the Commonwealth

Finally, expanding renewables would enable Virginia to compete in a modern economy. Figure 3 above shows how far behind Virginia is in renewables. This is a missed business opportunity. A majority of Fortune 100 companies have renewable energy goals, and 21 companies in the Fortune 500, including Walmart, Apple, GM, Microsoft, and Proctor & Gamble, have committed to being 100 percent powered by renewable energy.[47] Virginia's 30x30 plan will increasingly attract these businesses that demand clean energy in the 21st century.

POLLUTER CLAIMS THAT A GROWING ECONOMY DEPENDS ON POLLUTION ARE WRONG

A well-executed 30x30 Virginia plan will grow the state economy. As outlined below, claims to the contrary—that growing the economy depends on increasing pollution—are not supported by the facts.

It's true that some companies profit from putting pollution into the air and worsening climate change – increasing costs for everyone else. However, claims that economic growth in general depends on carbon pollution are false.[48] The argument that clean air and clean energy standards come at the cost of jobs, often advanced by groups that are funded by fossil fuel businesses, such as the U.S. Chamber of Commerce, is outdated and long disproven. Our modern economy no longer depends on limitless smokestack soot and pollution. This is true at the national level, as well as right here in Virginia.

Virginia's Economy Grew while Cutting Carbon Pollution

For example, Virginia's economy grew by almost 30 percent between 2000-2015,[49] even as carbon pollution from the electric sector fell by almost 25 percent.[50] (See Figure 4.)

Nationally, the trend of growing the economy while also getting cleaner is about the same as Virginia's clean growth. Between 2000 and 2015, United States carbon emissions from the electric sector fell by almost 20 percent, while the American economy grew by 30 percent.[52]

States that Cut Carbon Pollution Also Grow Their Economies

Other states have proven that a 30x30 plan to continue cleaning up pollution will not inhibit economic growth. Nearly a decade ago, the nine states[53] in the Regional Greenhouse Gas Initiative (RGGI) set a goal of limiting and reducing carbon pollution by 2.5 percent per year (a larger reduction than the 2 percent reductions proposed for Virginia under 30x30). And yet, those states have achieved even greater carbon reductions than planned, while also seeing significant economic growth.[54]

Specifically, these nine states reduced their carbon pollution from their electric power sector by an average of over 4 percent per year, for a total of about 30 percent between 2008 and 2015,[55] while the states' economies grew. (See figure 5.)

Not only did the RGGI states' economies grow while they slashed their pollution, they grew at a *faster pace than the rest of the country*: according to a recent Acadia Center study.[57]

Reducing Carbon Has Also Reduced Electricity Costs

In addition to boosting the economy while cutting carbon, these states showed that reducing carbon can also reduce electricity costs: while the rest of the country saw prices increase by 7.2 percent between 2008 and 2015, electricity prices in RGGI states fell by 3.2 percent.[58]

And we don't only need to look at the RGGI states to disprove the claim that strong health and safety standards and robust economic growth cannot coincide. Nationally, as our country established clean air protections over recent decades, the American economy continued to grow: the Clean Air Act alone has cleaned our air of smog and soot by 70 percent between 1970 and 2015, while at the same time the economy grew by 246 percent.[59]

Virginia can secure the same economic, health, and environmental success under a 30x30 plan to cut carbon. Claims to the contrary simply aren't based on the evidence from Virginia and the rest of the country.

FIGURE 4: VIRGINIA CARBON POLLUTION VERSUS STATE GROSS DOMESTIC PRODUCT.[51]

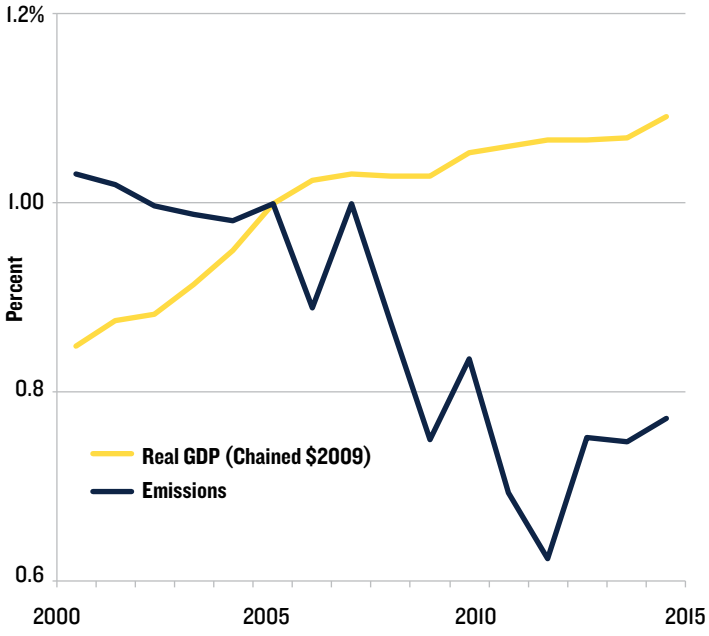
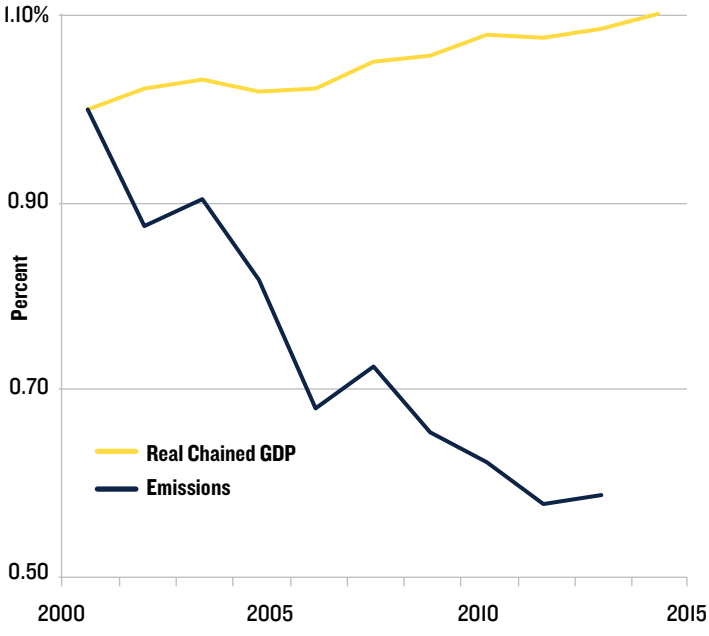


FIGURE 5: RGGI STATES CARBON POLLUTION VERSUS RGGI GROSS DOMESTIC PRODUCT.[56]



MORE NATURAL GAS IN VIRGINIA IS DIRTIER, RISKIER, AND UNNEEDED

One of the key stumbling blocks to Virginia cleaning up the air with clean energy is Virginia's largest electric utility provider, which has long-range plans laid out in its Integrated Resource Plan to release not less carbon pollution, but much more.

If state regulators approve Virginia Dominion Power's plans to build a steady succession of new and costly natural gas plants, the company will increase its carbon pollution in Virginia by at least 35 percent[60] by 2030.[61] That is the opposite direction Dominion, and utilities across the country, have gone in recent years. Dominion helped the state reduce carbon pollution by 25 percent between 2000 and 2015, while the state economy grew, by moving *away* from the dirtiest energy sources.[62]

Now Dominion wants to reverse Virginia's progress in cleaning the air and slowing climate change. That pollution increase would not only harm Virginia's ability to slow dangerous climate change, but the plants themselves are not even necessary to maintain Virginia's electricity supply.

Polluting Natural Gas Plants Would Be a Costly Reversal of Virginia's Progress

Dominion's significant spikes in carbon pollution are driven by their proposal to build up to 3,500 MW of new, carbon-intensive natural gas plants in the state.[63] These new plants would be in *addition* to the five large, carbon-polluting plants in a row that Dominion will build this decade in Virginia.[64] Those already-approved plants comprise a total of 5,500 MW[65] of new, carbon-intensive capacity built by Dominion in Virginia.

The additional 3,500 MW of new natural gas-powered plants that Dominion proposes to build would carry a price tag of at least $2 billion, and would be paid for by Virginians.[66] Because these power plants would also rely on imported natural gas, large sums of Virginia dollars will be required not just to build the plants, but will also be sent out-of-state to pay imported fuel costs. Such an expensive plan to pollute is not sensible, especially when Virginia already has access to an abundance of electric power supply, both untapped clean energy potential within the state, as well as from an already-existing supply on the regional grid.

More Costly, Polluting Natural Gas Plants in Virginia Are Unnecessary

A look at how Virginia fits into the broader regional electric grid illustrates why Dominion's massive proposed build out of new gas plants is unnecessary. Known as "PJM," the regional transmission operator encompasses Virginia and 12 other eastern states. PJM serves as the independent operator of a high-voltage electricity grid that efficiently serves over 60 million people.[67]

PJM ensures that there is always a sufficient and least-cost power supply to meet everyone's needs, including here in the Commonwealth. And according to the current PJM electricity market, the new carbon-emitting generation in Virginia that Dominion proposes to build is not needed: PJM currently has an over *20 percent extra supply* of electric generation, above and beyond what is needed to sufficiently meet the energy needs of customers in Virginia.[68]

Thus, building new polluting power plants in Virginia is unnecessary to meet customers' electricity needs. Just as important, because the fossil fuel to supply these unnecessary plants must be imported via pipeline from out-of-state, Dominion would miss the opportunity to develop Virginia's own domestic clean energy resources.

And those clean resources are cheaper than, or cost-competitive with,[69] carbon-intensive natural gas plants, and are the better driver of a modern Virginia economy. Indeed, the state's other utility, APCo, knows this, as it plans to meet customer needs by building more wind and solar capacity, rather than unnecessary, polluting gas plants.[70]

So if Dominion wants to help Virginia fight climate change, become a clean energy leader, and achieve energy independence, it should invest instead in in-state clean resources such as solar, on- and offshore wind, and energy efficiency.

Dominion has reduced pollution in the past. Now that we are well into a clean energy-based 21st century, Dominion can be part of the solution in taking Virginia forward on climate change, not backwards.

ENDNOTES

1 U.S. Department of Energy, U.S. Energy and Employment Report, January 2017, *available at* https://energy.gov/downloads/2017-us-energy-and-employment-report, at 30.

2 *Id.* at 28-29.

3 Lazard, "Lazard's Levelized Cost of Energy Analysis: Version 10.0," December 2016, *available at* www.lazard.com/media/438038/levelized-cost-of-energy-v100.pdf, at 10.

4 *Id.* at 2. Cost is levelized over the life of the investment. The LCOE of a NGCC plant is $48-$78/MWh. In contrast, the unsubsidized cost of wind and solar are $32-$62/MWh and $46-$56/MWh, respectively. With the federal ITC/PTC renewable tax credits, the cost of wind and solar falls to $14-$48/MWh and $36-$44/MWh, respectively.

5 *See, e.g.,* Goldman Sachs Equity Research, *The Low Carbon Economy: Technology in the Driver's Seat*, November 28, 2016, *available at* http://www.goldmansachs.com/our-thinking/pages/new-energy-landscape-folder/report-the-low-carbon-economy/report-2016.pdf, at 4.

6 Morgan Stanley, "Why Clean Energy Can Withstand Changing Political Winds," November 11, 2016, *available at* https://www.morganstanley.com/ideas/clean-energy-trump.

7 Goldman Sachs, "Clean Energy: The Future is Here," *available at* www.goldmansachs.com/our-thinking/new-energy-landscape/low-carbon-economy/clean-energy/index.html.

8 *See, e.g.,* Hampton Roads Planning District Committee "Climate Change in Hampton Roads," February 2010, *available at* http://www.hrpdcva.gov/uploads/docs/Climate_Change_Final_Report_All.pdf.

9 Risky Business Institute, *The Bottom Line on Climate Change: Come Heat and High Water*, July 2015, *available at* https://riskybusiness.org/site/assets/uploads/2015/09/Climate-Risk-in-Southeast-and-Texas.pdf, at 93.

10 For example, the Trump administration has already withdrawn the U.S. EPA's final Mercury Effluent Rule.

11 The authority granted by Virginia's air pollution statute, specifically under Va. Code §§ 10.1-1306 – 1308, permits Governor McAuliffe to set carbon pollution limits.

12 In 2015, the state's electric power sector emitted 35,534,699 short tons of carbon pollution, according to data from U.S. EPA's FLIGHT (Facility Level Information on Greenhouse Gases Tool), *available at* https://ghgdata.epa.gov/ghgp/main.do. A 30x30 plan would reduce carbon dioxide (CO2) emissions from power plants by 30 percent, to 24,874,289 short tons, in 2030.

13 NRDC assumed that statewide electricity-sector energy efficiency, measured as an annual kWh reduction in total retail electricity sales, increased by 0.2 percent each year starting in 2017, until reaching and maintaining 1.5 percent in 2024 and beyond. 2015 savings were 0.06 percent (EIA Form 861). NRDC assumed 2016 savings rose slightly, to 0.1 percent.

14 NRDC analysis conducted using the MJ Bradley & Associates Clean Power Plan Evaluation tool, available at www.mjbradley.com/about-us/case-studies/clean-power-plan-evaluation-tools. 2012 imports were 44,726,566 MWh. In 2030, under NRDC's 30x30 approach, imports fall to 17,896,053 MWh.

15 NRDC analysis, relying on U.S. EIA's State Carbon Dioxide Emissions data for 2000-2010 (available at http://www.eia.gov/environment/emissions/state/) and U.S. EPA's FLIGHT data set for 2010-2015 (available at https://ghgdata.epa.gov/ghgp/main.do).

16 In million short tons. Source: EIA State Carbon Dioxide Emissions (available at http://www.eia.gov/environment/emissions/state/) and U.S. EPA's FLIGHT data set for 2010-2015 (available at https://ghgdata.epa.gov/ghgp/main.do).

17 For example, in 2000, coal supplied 51.5 percent of VA's in-state generation while gas only made up 6 percent of in-state generation. By 2015, gas was the dominant source – with 39.4 percent of in-state generation coming from natural gas, as compared to coal, which supplied only 20.4 percent of in-state needs. Nuclear generation was steady between 2000 and 2005. *See* EIA, "Net Generation by State by Type of Producer by Energy Source (EIA-906, EIA-920, and EIA-923)," last updated October 12, 2016, *available at* https://www.eia.gov/electricity/data/state/.

18 *See, generally,* NRDC, *Accelerating into a Clean Energy Future,* December 2016, *available at* https://www.nrdc.org/sites/default/files/energy-environment-report-2016.pdf.

19 NRDC analysis conducted using the MJ Bradley & Associates Clean Power Plan Evaluation tool, available at www.mjbradley.com/about-us/case-studies/clean-power-plan-evaluation-tools. NRDC assumed 1.5 percent annual electricity-sector energy efficiency, measured as an annual kWh reduction in total retail electricity sales, with an annual ramp rate of 0.2 percent, starting after 2017, until 1.5 percent savings is reached in 2024 and maintained in each year through 2030. Therefore, the annual savings starts at 0.10 percent in 2017, and grows to 0.3 percent in 2018, 0.5 percent in 2019, etc., until 1.5 percent annual savings is achieved in 2024 and maintained thereafter.

20 Savings in 2016 are assumed to be 0.1 percent of sales, slightly higher than 2015 levels of 0.06 percent (EIA Form 861).

21 *See, e.g.*, Analysis Group, *Assessment of the EPA's Clean Power Plan: Evaluation of Energy Efficiency Program Ramp Rates and Savings Levels*, December 1, 2014, *available at* http://www.analysisgroup.com/uploadedfiles/content/insights/publishing/assessment_of_epa_clean_power_plan.pdf.

22 *See* American Council for an Energy Efficient Economy (ACEEE), *State Energy Efficiency Scorecard Report*, 2016, *available at* http://aceee.org/state-policy/scorecard. States achieving greater than 1.5 percent annual incremental savings include: RI, MA, VT, CA, ME, and HI. WA and CT achieved 1.425 and 1.48 percent, respectively. In addition, according to ACEEE's 2014 and 2015 Scorecards, AZ and MI have also achieved savings above 1.5 percent in the last three years.

23 As a percentage of utility retail sales. ACEEE, "State Energy Efficiency Resource Standards," January 2017, *available at* http://aceee.org/policy-brief/state-energy-efficiency-resource-standard-activity. This includes AZ, CA, CO, CT, IL, ME, MD, MA, MN, OH, RI, VT, and WA.

24 U.S. Department of Energy, "Empower Maryland Efficiency Act," *available at* www.energy.gov/savings/empower-maryland-efficiency-act.

25 ACEEE, "State Energy Efficiency Resource Standards," January 2017, *available at* http://aceee.org/policy-brief/state-energy-efficiency-resource-standard-activity. This includes AR, HI, IA, MI, NH, and OR.

26 NRDC, *Accelerating into a Clean Energy Future,* December 2016, *available at* www.nrdc.org/sites/default/files/energy-environment-report-2016.pdf, at 6.

27 U.S. Department of Energy, *U.S. Energy and Jobs Report State Charts*, January 2017, Virginia state chart available at https://energy.gov/downloads/2017-us-energy-and-employment-report, at 278.

28 NRDC, "Virginia Can Create 5,600 Efficiency-Related Jobs, Cut Electricity Bills, and Curb Carbon Pollution," May 2014, *available at* www.nrdc.org/sites/default/files/cps-state-benefits-VA.pdf.

29 ACEEE, *2016 State Energy Efficiency Scorecard*, September 2016, available at http://aceee.org/sites/default/files/publications/researchreports/u1606.pdf, at 28. Virginia ranks 47th out of 50 for 2015 net incremental electricity savings, with a savings rate of 0.06 percent. The average savings for the U.S. was 0.71 percent, and the top state is Rhode Island, with savings of 2.91 percent.

30 State savings expressed as a percent of 2015 retail sales. Source: EIA Form 861 for 2015.

31 Energy Information Administration, "2015 Average Monthly Bill – Residential," *available at* www.eia.gov/electricity/sales_revenue_price/pdf/table5_a.pdf.

32 *See id.* The other five states are Massachusetts, New Hampshire, Vermont, Rhode Island, and Maine.

33 Ian M. Hoffman, Gregory Rybka, Greg Leventis, Charles A. Goldman, Lisa Schwartz, Megan Billingsley, and Steven Schiller, "The Total Cost of Saving Electricity through Utility Customer-Funded Energy Efficiency Programs: Estimates at the National, State, Sector and Program Level," Lawrence Berkley National Lab, April 2015.

34 Energy Information Administration, "State Electricity Profiles," January 2017, *available at* http://www.eia.gov/electricity/state/.

35 NRDC analysis conducted using the MJ Bradley & Associates Clean Power Plan Evaluation tool, available at www.mjbradley.com/about-us/case-studies/clean-power-plan-evaluation-tools.

36 The 20 percent renewable electricity supply requirement to meet 30x30 would apply to total state electricity demand, not just in-state generation, and is in addition to the 1.5 percent annual electricity savings, as a percentage of total statewide retail sales, as previously described.

37 Analysis conducted using U.S. Energy Information Administration's "Electric Power Monthly" reports, relying on December 2015 – November 2016 data, *available at* www.eia.gov/electricity/monthly/. Figures include estimated distributed generation from solar, as well as both fossil- and renewable-generation from industrial and commercial sectors. States generating over 20 percent renewables are IA, KS, SD, CA, OK, VT, and ND. States generating over 15 percent renewables are CO, NV, MN, HI, and ID.

38 Including the District of Columbia.

39 States with binding standards include: CA, OR, NV, CO, NM, MN, IL, NY, VT, NH, RI, MA, CT, NJ, DE, MD, and the District of Columbia. *See* "Database for State Incentives and Renewable Energy," *available at* http://programs.dsireusa.org/system/program.

40 Energy Information Administration's "Electric Power Monthly," available at http://www.eia.gov/electricity/monthly/. Data for December 2015- November 2016, total non-hydro renewables production (excluding biomass) in Virginia was 52 GWh over the 12-month period. In the same 12 month period, Virginia generated 91,733 GWh of power in-state, with total retail sales of 110,502 GWh (including electricity imports). Total percent of in-state generation from renewables is 0.06 percent, ranking the state 45th of 50. The U.S. average was 7.2 percent, with the top performer, Iowa, achieving over 36 percent of in-state generation during the same period.

41 EIA's "Electric Power Monthly," January 2017; SNL Energy for 2017 additions. Solar includes utility-scale and estimated distributed generation. Renewables levels are net summer capacity.

42 Energy Information Administration, "Renewable generation capacity expected to account for most 2016 capacity additions," January 10, 2017, *available at* http://www.eia.gov/todayinenergy/detail.php?id=29492.

43 *See, e.g.,* Bureau of Labor Statistics, "Wind Turbine Technicians," 2016, *available at* http://www.bls.gov/ooh/installation-maintenance-and-repair/wind-turbine-technicians.htm. Wind turbine technician is the fastest growing job in the country and is expected to grow at a rate of 108 percent between 2014-2024, compared to the average growth rate of 7 percent for all other occupations.

44 *See generally,* U.S. Department of Energy, U.S. Energy and Employment Report, January 2017, *available at* https://energy.gov/downloads/2017-us-energy-and-employment-report.

45 NRDC analysis conducted using the MJ Bradley & Associates Clean Power Plan Evaluation tool, available at www.mjbradley.com/about-us/case-studies/clean-power-plan-evaluation-tools. 2012 imports were 44,726,566 MWh. In 2030, under NRDC's 30x30 approach, imports fall to 17,896,053 MWh.

46 Solar Foundation, *National Solar Jobs Census 2016*, February 2017, *available at* http://www.thesolarfoundation.org/national, at 50.

47 Advanced Energy Economy, "2016 Corporate Advanced Energy Commitments," December 2016, *available at* http://info.aee.net/growth-in-corporate-advanced-energy-demand-market-benefits-report, at 1-2.

48 *See, generally,* Brookings Institution, *Growth, Carbon, and Trump: States Are Decoupling Economic Growth from Emissions Growth,* December 8, 2016, *available at* www.brookings.edu/blog/the-avenue/2016/12/08/decoupling-economic-growth-from-emissions-growth.

49 *See* U.S. Bureau of Economic Analysis's "Regional Data," "Annual GDP by State," and "Real GDP in chained dollars," *available at* www.bea.gov/iTable/index_regional.cfm. Figures adjusted for inflation.

50 *See* Energy Information Administration's State Carbon Dioxide Emissions data for 2000-2015, *available at* www.eia.gov/environment/emissions/state, and U.S. EPA's FLIGHT data set for 2010-2015, *available at* https://ghgdata.epa.gov/ghgp/main.do.

51 Emissions data from EIA's State Carbon Dioxide Emissions, *available at* www.eia.gov/environment/emissions/state, and U.S. EPA's FLIGHT data *available at* https://ghgdata.epa.gov/ghgp/main.do. Economic data from BEA Regional Data, "Real Gross Domestic Product, Chained Dollars," *available at* https://www.bea.gov/itable/index.cfm.

52 *See* Energy Information Administration, "U.S. energy-related carbon dioxide emissions in 2015 are 12 percent below their 2005 levels," Today in Energy, May 6, 2016, *available at* www.eia.gov/todayinenergy/detail.php?id=26152; U.S. Bureau of Economic Analysis's "National Data," U.S. Bureau of Economic Analysis's "National Data." *See* Section 1 "Domestic Product and Income," Table 1.1.6 "Gross Domestic Product, chained dollars," *available at* www.bea.gov/iTable/index_nipa.cfm. Figures adjusted for inflation.

53 Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont.

54 *See, generally*, Analysis Group, *The Economic Impacts of the Regional Greenhouse Gas Initiative on Nine Northeast and Mid-Atlantic States*, July 2015, *available at* www.analysisgroup.com/uploadedfiles/content/insights/publishing/analysis_group_rggi_report_july_2015.pdf, at 1-14; The Regional Greenhouse Gas Initiative, *The Investment of RGGI Proceeds through 2014,* September 2016, *available at* https://www.rggi.org/docs/ProceedsReport/RGGI_Proceeds_Report_2014.pdf, at 3.

55 *See* Energy Information Administration's State Carbon Dioxide Emissions data for 2000-2015, *available at* www.eia.gov/environment/emissions/state.

56 Emissions data from EIA's State Carbon Dioxide Emissions, *available at* www.eia.gov/environment/emissions/state. Economic data from BEA Regional Data, "Real Gross Domestic Product, Chained Dollars," *available at* https://www.bea.gov/itable/index.cfm.

57 Acadia Center, *Regional Greenhouse Gas Initiative Report, Part I: Measuring Success*, July 2016, *available at* http://acadiacenter.org/document/measuring-rggi-success, at 9. National economic growth excludes California, which also has a carbon reduction program.

58 *Id.* at 5.

59 U.S. EPA, "Progress Cleaning the Air and Improving People's Health," *available at* www.epa.gov/clean-air-act-overview/progress-cleaning-air-and-improving-peoples-health.

60 Carbon pollution increases in 2030 according to Dominion's "Plan A" in the Company's 2016 Integrated Resource Plan. For projected 2030 emissions, *see* SCC Case No. PUE-2016-00049, Dominion's emissions by plant projections in Company's discovery response to Question No. 3 of the Interrogatories and Requests for Production of Documents by Sierra Club (First Set). Both 2015 and 2030 numbers also include emissions from Mt. Storm. Both 2015 and 2030 calculations follow Dominion's biomass accounting method in the company's IRP and count biomass as zero-emitting. NRDC does not agree with this approach; in 2015, company-owned biomass plants emitted an additional 16,800 short tons of carbon pollution.

61 Emissions increase is compared to 2015 levels, based on U.S. EPA's FLIGHT data for 2015, *available at* https://ghgdata.epa.gov/ghgp/main.do.

62 NRDC analysis using U.S. EIA's State Carbon Dioxide Emissions data for 2005-2010, *available at* http://www.eia.gov/environment/emissions/state/, and U.S. EPA's FLIGHT data set for 2010-2015, *available at* https://ghgdata.epa.gov/ghgp/main.do.

63 Dominion Virginia Power, Integrated Resource Planning Report, April 29, 2016, *available at* https://dom.com/library/domcom/pdfs/corporate/2016-irp.pdf?la=en, at 13-15.

64 *See id.*, appendix 3A.

65 *Id.*

66 Based on the $1.3 billion cost of Dominion's under-construction Greensville power plant.

67 *See generally,* PJM, "PJM at a Glance," *available at* http://www.pjm.com/~/media/about-pjm/newsroom/fact-sheets/pjm-at-a-glance.ashx.

68 PJM, 2019-2020 Base Residual Auction Results, 2016, *available at* www.pjm.com/~/media/markets-ops/rpm/rpm-auction-info/2019-2020-base-residual-auction-report.ashx, at 1.

69 Lazard, "Lazard's Levelized Cost of Energy Analysis: Version 10.0," December 2016, *available at* www.lazard.com/media/438038/levelized-cost-of-energy-v100.pdf. The LCOE of a NGCC plant is $48-$78/MWh. In contrast, the unsubsidized cost of wind and solar are $32-$62/MWh and $46-$56/MWh, respectively. With the federal ITC/PTC renewable tax credits, the cost of wind and solar falls to $14-$48/MWh and $36-$44/MWh, respectively.

70 Appalachian Power, *Integrated Resource Planning Report*, April 29, 2016, *available at* www.scc.virginia.gov/docketsearch/DOCS/38jp01!.PDF, at ES-7.