Establishing a Clean Energy Standard in Pennsylvania

The fight against climate change is growing more urgent. 2020 was the 6th consecutive year in which the U.S. suffered 10 or more billion-dollar weather and climate disasters[1], and two-thirds of Americans say the government should do more to address the problem.[2] At the same time, the U.S. energy mix is in flux. Coal use in the United States is on the decline, and natural gas use is on the rise. Renewable energy is increasingly cost-competitive with fossil generation and is generally cheaper in the United States on a "levelized" basis.[3] Nuclear energy is struggling economically.

In the midst of this dynamic landscape, Pennsylvania faces choices about what its energy future will look like. A clean energy standard (CES) should play a critical role in shaping that future, with a focus on achieving a 100% zero-carbon electricity sector by 2050.

Background: Pennsylvania's "Restructured" Electric Power Sector

In Pennsylvania and other states with "restructured" or "deregulated" power sectors, electric utilities do not generate electricity themselves.[4] Instead, electric utilities (and other electricity suppliers) buy electric power on wholesale electricity markets designed and administered by the PJM Interconnection or through power purchase agreements, then resell it on a retail basis to customers.

Under this system, state policymakers have various policy tools available to them to reduce the carbon pollution associated with electricity use in Pennsylvania. Among other things, they can require utilities to improve energy efficiency, which reduces total demand. They can establish limits on carbon dioxide (CO2) pollution from power plants, as the Department of Environmental Protection (DEP) is now doing through its proposed CO2 budget trading regulation. Policymakers can also direct utilities to buy non- or low-emitting electricity for distribution to customers; this is what a CES would do, using a structure similar to that of the current Alternative Energy Portfolio Standards (AEPS) in Pennsylvania, which require utilities to buy electricity from a combination of "Tier I" and "Tier II" resources.

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[1] National Oceanic and Atmospheric Administration, National Centers for Environmental Information, *Billion-Dollar Weather and Climate Disasters: Overview*, 2021, https://www.ncdc.noaa.gov/billions/

[2] Alec Tyson and Brian Kennedy, "Two-Thirds of Americans Think Government Should Do More on Climate", Pew Research Center, June 23, 2020, https://www.pewresearch.org/science/2020/06/23/two-thirds-of-americans-think-government-should-do-more-on-climate/

[3] "Levelized Cost of Energy and Levelized Cost of Storage – 2020", Lazard, Oct. 19, 2020, https://www.lazard.com/perspective/levelized-cost-of-energy-and-levelized-cost-of-storage-2020/

[4] Pennsylvania Electricity Generation Customer Choice and Competition Act, 1996 Act 138, https://www.legis.state.pa.us/cfdocs/legis/li/uconsCheck.cfm?yr=1996&sessInd=0&act=138

What is a Clean Energy Standard?

A CES is a policy that requires electric utilities and competitive suppliers to make non-emitting energy an increasingly large percentage of their sales to consumers over time. Unlike the AEPS, which includes both high- and low-carbon electricity resources, a CES focuses on promoting low- and zero-carbon resources. Unlike the Renewable Portfolio Standards (RPSs) in many states that limit eligibility to renewables, a CES is more technology-inclusive and does not lock in existing technologies to the exclusion of potential new ones.

In addition to renewables, a CES could theoretically include technologies such as existing and advanced nuclear plants, emerging technologies such as hydrogen, and fossil-fuel-fired plants with carbon capture, utilization, and storage (CCUS). Depending on how it is designed, a CES framework could also allow utilities to implement a range of options – including energy efficiency – to help drive utility- and distributed-scale programs for clean energy deployment. Its emphasis on driving an electricity system that does not emit greenhouse gases means a CES can be aligned closely with broader climate and emission reduction goals.

Why does Pennsylvania need a CES?

Across the country, states are beginning to expand their RPSs into CESs (often retaining an RPS element within the broader CES). States with a legally binding CES currently include California, Colorado, Massachusetts, Nevada, New Mexico, New York, and Virginia.[5] Numerous utilities around the country have likewise made commitments to achieve zero-carbon electricity systems by 2050 or earlier.[6] Pennsylvania should follow their lead, particularly if it wishes to remain an energy exporter.

After Pennsylvania's AEPS was enacted in 2004, the statute's requirements built slowly but steadily until peaking in May, 2021. The AEPS now requires that 18% of the state's electricity come from alternative energy resources and that requirement will continue until the AEPS is amended or replaced. Out of that 18%, 8% has to come from Tier I sources including solar (which has a minimum 0.5% requirement), wind, small-scale hydro, geothermal, biomass, biogas, coal mine methane, and fuel cells. The rest has to come from Tier II resources, including waste coal, distributed generation, demand-side management, municipal solid waste, manufacturing byproducts, and integrated gasification combined cycle coal facilities. Now that the AEPS has reached its ceiling, it is time for Pennsylvania to revamp, modernize, and expand the AEPS into a CES to achieve a zero-carbon electricity sector by no later than 2050.

A CES could help preserve existing sources of zero-carbon generation, such as the current nuclear fleet, while providing market potential for newer resources such as advanced nuclear, hydrogen, or even fossil generation with carbon capture. A CES could also help ensure that Pennsylvania's generation portfolio does not become over-reliant on natural gas; this is beneficial in terms of avoiding both harmful greenhouse gas emissions and the energy security risks of putting too many eggs in one energy basket.

Beyond the benefits in terms of greenhouse gas emissions, air quality, and energy security, Pennsylvania's adoption of a CES would drive vital investment and job growth in the state. Before

[5] *See* Clean Air Task Force, *State and Utility Decarbonization Commitments*, Oct. 1, 2020, https://www.catf.us/2020/10/state-and-regional-decarbonization-commitments/

[6] *See* Smart Electric Power Alliance, *Utilities' path to a carbon-free energy system by 2050*, https://sepapower.org/utility-transformation-challenge/utility-carbon-reduction-tracker/

COVID, clean energy jobs had been growing for years in Pennsylvania[7] at a far higher rate than the state's average job growth[8]. While the state has been gaining clean energy jobs, there is potential for so much more – particularly as Pennsylvania begins to dig out from the economic damage caused by the COVID pandemic.[9] A CES would drive substantial economic benefits and investment – providing a level of certainty that would attract more developers of renewable energy projects to the state and enabling the growth of other zero-carbon generation options that can take advantage of the resources Pennsylvania has in abundance. A CES could be a key part of economic recovery for Pennsylvania's workers and businesses.

A CES would also complement and maximize the benefits of other state policies that promote clean energy in the electric power sector. For example, a CES would complement Pennsylvania's plan to join the Regional Greenhouse Gas Initiative (RGGI) – a multi-state, market-driven program to reduce carbon dioxide emissions in the electric power sector. Whereas RGGI places declining limits on carbon emissions from Pennsylvania power plants, a CES would require electric utilities and retail suppliers (which, as noted earlier, do not own power plants) to purchase an ever-greater share of their electricity from clean sources. These programs, addressing emissions in the electric power sector from different angles, would complement each other in a range of ways. For instance, modeling from the DEP projects that coal's current precipitous decline would be marginally accelerated by joining RGGI, but the modeling also makes very clear that joining RGGI would have little impact on natural gas generation in the state through 2030.[10] Deeper, more targeted policy action such as a CES is needed to drive more non-emitting generation in Pennsylvania and ensure that Pennsylvania achieves a net-zero generation profile no later than 2050. On the other hand, RGGI, unlike a CES, will raise much-needed funds that could be used for investments in bill assistance, worker training, additional clean energy deployment, or other measures. In addition, a CES could help reduce "leakage" of emissions to neighboring states not under the RGGI cap, since electricity purchases – whether from in-state or out-of-state sources – would have to be non-emitting as well. Such a policy would help the competitiveness of in-state non-emitting generation and help maintain Pennsylvania's position as a top electricity exporter.

What are the key questions that need to be answered in designing a CES?

At the most basic level, development of a CES involves setting a target (e.g., 100% by 2050), deciding which technologies and facilities are included, and allowing credit trading among the electricity companies subject to the CES. In designing a CES, however, the details matter a lot. Questions and issues to decide on include (but are by no means limited to) the following:[11]

Which technologies qualify as "clean"?

"Clean energy" is a term that means many different things to different people. Choices about eligible technologies have implications for how achievable targets are and how much achieving the targets might cost. Non-emitting energy sources are very heterogenous, with significant differences in

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[7] E2, *Clean Jobs Pennsylvania 2020: Pennsylvania's Key to Economic Recovery*, Sept. 2020, https://e2.org/wp-content/uploads/2020/09/Clean-Jobs-Pennsylvania-2020.pdf

[8] BW Research Partnership, *2020 Pennsylvania Clean Energy Employment Report*, 2020, http://files.dep.state.pa.us/Energy/Office%20of%20Energy%20and%20Technology/OETDPortalFiles/2020EnergyReport/2020_PACEIR_FINAL_1.1.pdf

[9] E2, *Clean Jobs Pennsylvania 2020*, Sept. 23, 2020, https://e2.org/reports/clean-jobs-pennsylvania-2020/

[10] PADEP, *IPM Modeling Results Discussion Reference Case and RGGI Policy Scenario*, Apr. 23, 2020, http://files.dep.state.pa.us/Air/AirQuality/AQPortalFiles/Advisory%20Committees/Air%20Quality%20Technical%20Advisory%20Committee/2020/4-23-20/RGGI%20IPM%20Modeling%20Webinar.pdf (and data tables at Reference Case Results and Policy Case Results)

[11] *See generally* Center for Climate and Energy Solutions, *Clean Energy Standards: State and Federal Policy Options and Considerations*, Nov. 2019, https://www.c2es.org/site/assets/uploads/2019/11/clean-energy-standards-state-and-federal-policy-options-and-considerations.pdf. *See also* Natural Resources Defense Council, *Clean Energy Standards: Why We Like Them & What to Look For*, July 8, 2020, https://www.nrdc.org/experts/ben-longstreth/clean-energy-standards-why-we-them-what-look; Resources for the Future, *Clean Energy Standards*, Jan. 2019, https://media.rff.org/documents/CleanEnergy-Issue20Brief_2.pdf; Third Way and Breakthrough Institute, *Clean Energy Standards: How More States Can Become Climate Leaders*, June 27, 2018, https://www.thirdway.org/report/clean-energy-standards-how-more-states-can-become-climate-leaders

their current and projected costs, level of current technological readiness, environmental impacts other than carbon dioxide pollution, and grid attributes.[12] In addition, energy technologies are constantly evolving, with technology and deployment breakthroughs and setbacks that make it impossible to predict the future success of any given technology. Designers of a CES could list out specific technologies that qualify (potentially in tiers and/or carve-outs), with a particular focus on driving near-term deployment of non-emitting technologies that are already cost-effective, as well as potentially providing a pathway for emerging technologies. Alternatively, designers of a CES could allow any resource that meets a set of performance criteria (e.g., greenhouse gas intensity) to qualify for credits, allowing utilities and retail energy suppliers to take advantage of technological advances and market developments. A hybrid of these approaches has generally been the route that states have taken. New Mexico's 100% zero-carbon target, for instance, has a minimum 80% renewables requirement, but the last 20% is open to all generation sources that emit no CO2 into the atmosphere as a result of electricity production.[13]

How are existing clean resources treated?

If the goal is to achieve a zero-carbon electricity sector, it makes intuitive sense to include in a CES existing as well as new zero-carbon resources. There are implications to that choice, though. If existing generation is included in defining the base amount of electricity sales used to determine the CES requirements (i.e., amount of clean generation divided by electricity sales) or can be used to comply with the CES, it rewards utilities and generators that have invested early in providing customers with clean electricity, but less new clean generation may get built, particularly in the earlier years – potentially running counter to the need to spur lots of new clean energy deployment to meet decarbonization goals. Such an approach could also lead to significant flows of funding to existing zero-carbon generators – which could be seen as either beneficial (if the goal is to provide them with economic support to keep them operating) or negative (i.e., seen as undeserved windfall profits). On the other hand, if the base quantity of electricity sales excludes existing clean energy sources (e.g., existing hydro), more of the new resources that are built will have to be clean, but the target will not reflect the total electricity supply. For instance, when Massachusetts in 2017 initially defined eligibility for its CES, it excluded nuclear and hydro plants in operation before 2011, though the state modified the CES in 2020 to add requirements for procurement from clean existing generation units.[14] In the CES that Virginia adopted in 2020, meanwhile, the base amount of electricity against which the percentage requirements are applied excludes amounts supplied from existing nuclear power plants and from any zero-carbon generating facility placed into service in 2030 or later.[15]

How is energy efficiency treated?

Related to the treatment of existing resources, designers of a CES have to figure out how to treat energy efficiency, given the existence of other policies that would drive energy savings under "business as usual". Energy efficiency could either be kept under a separate standard (i.e., an Energy Efficiency Resource Standard, or EERS) or incorporated into the CES. If the latter, designers of a CES have to decide how many credits to award to efficiency and if there are limits or caps on how much of a target can be met with efficiency. Energy efficiency is often the least expensive resource available, so crediting lots of energy efficiency as part of a CES will reduce the costs of meeting the CES but will also reduce deployment of new clean generation. Michigan's RPS allows up to 10% of the renewable energy credit standard to be met with credits generated under the state's EERS,[16] while Nevada's CES phases out over time the ability of energy efficiency to satisfy a

[12] There is also a related question about whether qualifying technologies have to have grid attributes at all (i.e., limiting CES eligibility to electricity-generating technologies) or whether non-emitting thermal technologies (e.g., geothermal or wastewater heating and cooling) also qualify under the CES.

[13] New Mexico Energy Transition Act, SB489, 2019, https://www.nmlegis.gov/Sessions/19%20Regular/bills/senate/SB0489.pdf

[14] Massachusetts, 310 CMR 7.75, 2020, https://www.mass.gov/doc/310-cmr-775-clean-energy-standard-amendments-july-2020/download

[15] Virginia Clean Economy Act, HB 1526, 2020, https://lis.virginia.gov/cgi-bin/legp604.exe?201+ful+CHAP1193+pdf

[16] Michigan Clean and Renewable Energy and Energy Waste Reduction Act, Act 295 §460.1028, 2016, https://www.michigan.gov/documents/mpsc/mcl-Act-295-of-2008_579268_7.pdf

portion of the standard, eliminating that option entirely starting in 2025.[17] New Mexico Massachusetts, Rhode Island, and other states, meanwhile, limit their CES to zero-carbon generation sources, keeping their EERS and CES completely separate.[18] Pennsylvania currently includes demand side management, including energy efficiency, as a qualifying alternative energy source under the AEPS.

Who is the regulated entity?

Many policies and regulations that aim to reduce pollution focus on the generators of that pollution; in the electricity sector, that is the power plants. However, a CES is designed to increase the supply of clean energy delivered to customers; thus the appropriate entity to regulate are the electric utilities. In theory, a CES could be designed to regulate generators as well, with non-emitting energy requirements tied to percentages of their electricity generation. In practice, though, all states that have adopted renewable or alternative energy portfolio standards, including Pennsylvania, have chosen to regulate electric utilities – the companies that deliver electricity to homes and businesses – with non-emitting energy requirements tied to percentages of their electricity sales. Designers of a CES (or any kind of electricity standard) also have to decide if municipal utilities (munis) and rural electric cooperatives (co-ops) are to be included under the standard in addition to investor-owned utilities (IOUs). Currently, Pennsylvania's AEPS applies just to IOUs and retail suppliers; co-ops only have to offer customers voluntary energy efficiency and demand side management programs.

What is the level of ambition?

To address the climate crisis, developed countries such as the United States need to reduce emissions rapidly and achieve net-zero economy-wide by around mid-century. The power sector plays a critical role in achieving that decarbonization, particularly since electrification will be a core emission reduction strategy in some other sectors (e.g., transportation). A key question in designing a CES, then, is how deeply and how quickly to reduce the power sector's emissions. As of late 2020, 39 U.S. electric utilities had goals of being carbon-free or net-zero, often by 2040 or 2050.[19] A CES can help utilities and other companies achieve their net-zero commitments. States such as Nevada and Virginia have established goals of 100% non-emitting energy by 2050, while California, New Mexico, and Washington have set goals for 2045 and New York for 2040.[20] President Biden has called for decarbonizing the U.S. electricity system by 2035.[21]

How quickly does the target increase?

A CES could have annual targets that increase in a steady, linear fashion or targets that start off modestly but then accelerate more quickly in later years when technological options have presumably increased and costs have presumably decreased. Pennsylvania's AEPS generally increased fairly steadily towards its 2021 goal of 18%. Virginia's 100% target increases by only 1% per year from 2021-23, 2% in 2024, and then 3-4% every year thereafter.[22] Likewise, New Mexico's increased from 15% to 20% between 2015 and 2020, then jumps to 40% in 2025, 50% in 2030, 80% in 2040, and 100% in 2045.[23]

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[17] Nevada NRS 704.7821, https://www.leg.state.nv.us/nrs/nrs-704.html#NRS704Sec7821

[18] *See, for example,* New Mexico Energy Transition Act, SB489, 2019, https://www.nmlegis.gov/Sessions/19%20Regular/bills/senate/SB0489.pdf; New Mexico HB291, 2019, https://www.nmlegis.gov/Sessions/19%20Regular/final/HB0291.pdf

[19] *See* Smart Electric Power Alliance, *Utilities' path to a carbon-free energy system by 2050*, https://sepapower.org/utility-transformation-challenge/utility-carbon-reduction-tracker/

[20] Clean Air Task Force, *State Technology-Inclusive Clean Energy Standards and Corporate Commitments – The National State of Play*, Oct. 2020, https://www.catf.us/wp-content/uploads/2020/10/State-Actions-and-Utility-Pledges-1.pdf

[21] The White House, *FACT SHEET: President Biden Takes Executive Actions to Tackle the Climate Crisis at Home and Abroad, Create Jobs, and Restore Scientific Integrity Across Federal Government*, Jan. 27, 2021, https://www.whitehouse.gov/briefing-room/statements-releases/2021/01/27/fact-sheet-president-biden-takes-executive-actions-to-tackle-the-climate-crisis-at-home-and-abroad-create-jobs-and-restore-scientific-integrity-across-federal-government/

[22] Virginia Clean Economy Act, HB 1526, 2020, https://lis.virginia.gov/cgi-bin/legp604.exe?201+ful+CHAP1193+pdf

[23] New Mexico Energy Transition Act, SB489, 2019, https://www.nmlegis.gov/Sessions/19%20Regular/bills/senate/SB0489.pdf

How does the credit market work?

Renewable and alternative energy portfolio standards generally utilize markets that assign and track credits for all generation that complies with the standards. This provides flexibility for complying entities to buy or sell extra credits as needed, making the program more cost-effective and making verification of compliance easier. Credit trading already takes place under Pennsylvania's AEPS (via Alternative Energy Credits). Designers of a CES have to decide how to structure the credit market, including addressing questions such as whether to allow banking and borrowing of credits, whether to create price boundaries for traded credits (e.g., an alternative compliance payment, which essentially acts as a price ceiling), and whether all tiers or types of technologies under a CES are under one credit system or separate ones. New York, for instance, has within its CES both an RPS and a separate zero-emission credit (ZEC) program for existing nuclear assets; those programs are separate, and the ZEC program does not involve trading.[24] The Massachusetts CES has an alternative compliance payment and, starting in 2021, allows banked credits from the previous two years to be used for compliance.[25] New Mexico allows credits to carry forward for up to four years.[26]

Are there partial or bonus credits for particular technologies or approaches?

At the simplest level, a CES could provide a tradable credit for every unit of clean electricity, but particular technologies or approaches could be given partial or additional credits. For example, if a technology (e.g., natural gas) is seen as only partly advancing the goals of a CES, it could be awarded partial credits, perhaps proportional to its carbon intensity profile; some federal CES proposals have adopted this approach of awarding partial credits based on carbon intensity.[27] Conversely, if a state wants to prioritize certain resources (even if potentially more expensive), a CES could provide more credits and/or specific carve-outs for sales of electricity from those technologies. In New York, for instance, the same law that increased the CES goals to 70% renewables by 2030 and 100% zero-carbon by 2040 also directed procurement of set amounts of solar, energy storage, and offshore wind.[28] A CES could also theoretically provide short-term credits for early retirement of high-emitting generation (though, in a competitive restructured market like Pennsylvania's, that would involve carving some credits for generators out of the broader market of utility actors).

Conclusion

With the AEPS reaching its ceiling in 2021, it is time for Pennsylvania to modernize and expand the AEPS into a clean energy standard to achieve a zero-carbon electricity sector. While there are numerous important questions to consider in deciding on the design of a CES, Pennsylvania can learn from a range of examples in other states. With a technology-inclusive focus on low- and zero-carbon energy resources, a CES can play a key role in shaping Pennsylvania's energy future, accelerating the decarbonization of the electricity sector, driving job creation and economic development, and maintaining the state's energy leadership in a net-zero economy.

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[24] New York State, *Clean Energy Standard: LSE Obligations*, https://www.nyserda.ny.gov/All-Programs/Programs/Clean-Energy-Standard/LSE-Obligations

[25] Massachusetts, 310 CMR 7.75, 2020, https://www.mass.gov/doc/310-cmr-775-clean-energy-standard-amendments-july-2020/download

[26] New Mexico Energy Transition Act, SB489, 2019, https://www.nmlegis.gov/Sessions/19%20Regular/bills/senate/SB0489.pdf

[27] *See, e.g.*, Clean Energy Standard Act of 2019, H.R.2597, https://www.congress.gov/bill/116th-congress/house-bill/2597/text

[28] New York Climate Leadership and Community Protection Act, 2019, https://www.nysenate.gov/legislation/bills/2019/s6599