West Virginia University
Bridge Initiative for Science and Technology
Policy, Leadership, and Communications

Legislative Science and Technology Note

Electrical Grid Capacity and West Virginia

August 2024

The electrical grid (power grid) is the combination of electricity generation, transmission, distribution, and control systems. Grid capacity refers to the ability of the electrical grid to reliably generate and deliver power to homes and businesses where and when it is needed. Generation capacity is the amount of electricity a utility is able to generate from coal, natural gas, or other sources.

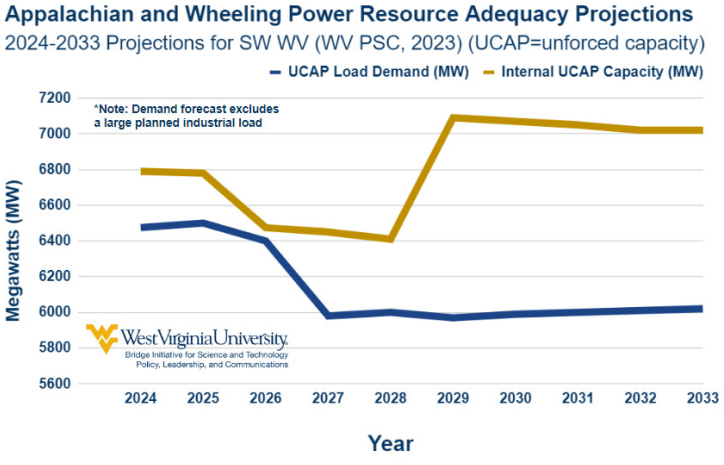
National and regional demand for electricity is increasing. While West Virginia utilities forecast only modest growth or decreasing demand in coming years, regional demand growth could impact West Virginia in several ways. This Science and Technology Note considers opportunities and challenges increased regional electricity demand poses for West Virginia's grid, utilities, and economy.

Research Highlights

- Rising regional electricity demand, driven largely by power-hungry data centers in Northern Virginia, presents challenges and opportunities for West Virginia. West Virginia coal-fired power plants are remaining open, and transmission lines are being built and upgraded to accommodate Virginia's power demand.
- While West Virginia's electricity demand is not currently forecast to increase drastically, upgrading an aging electrical grid presents opportunities to improve power reliability and enable future economic growth in West Virginia.
- Policy options include incentivizing "advanced conductoring" upgrades to the power system, requiring utility plans to consider grid-enhancing technologies, and expanding the existing ratepayer discount program.

West Virginia Challenge and Opportunity

National and regional electricity demand growth not seen "in a generation" has returned, spurred by power-hungry artificial intelligence (AI) applications, increased electrification, and new domestic manufacturing. PJM, the regional transmission organization (RTO) that coordinates the flow of electricity for 65 million people in West Virginia and 12 other states, is warning that new electricity additions may not keep pace with legacy plant retirements and new demand by 2030. Grid planners doubled 5-year demand growth forecasts from 2022 to 2023, and new projections are likely underestimated. One report suggests that to meet demand, PJM needs to add generation capacity equivalent to 15% of total 2022 US electricity consumption by 2040. Demand growth is not evenly distributed. Virginia's electricity consumption could increase 85% in the next 15 years, while parts of West Virginia are forecast to have decreased demand between 2025-2027 (see figure).



Source: WVU Bridge Initative, recreated from WV PSC Report (2023).

West Virginia stands to benefit from participating in the required buildout of electricity generation and transmission infrastructure to help meet growing regional demand. Already, retirements of West Virginia coal-fired electricity plants (Longview, Harrison and Fort Martin plants) are being delayed, and transmission lines being upgraded, to deliver power to northern Virginia's "data center alley." Further investment in local electricity distribution capacity could attract businesses and residents to West Virginia. However, the new demand-growth era could increase electricity costs for West Virginia ratepayers, decrease reliability, and increase pollution in communities near power plants.

Several factors contribute to grid capacity. The planning reserve margin is how much more electricity supply (generation capacity) than demand (peak load) is in the power system. Reserve margins between 15-20% are considered balanced; PJM has an anticipated 34% reserve margin (oversupply) in 2024. Resource adequacy describes the ability of the power system as a whole to deliver electricity where and when it is needed. Reserve margins,

fuel reliability, weather impacts, and other factors contribute to resource adequacy. For example, PJM has struggled to deliver power during winter storms despite its large reserve margin. PJM acknowledges the need to better verify its generation resources' ability to provide power when needed.

Adding generation capacity, upgrading and building new higher capacity transmission and distribution infrastructure, incorporating grid-enhancing technologies, proactive grid planning and demand-side management could improve resource adequacy. Challenges include years-long wait times for new generation project approval (PJM's interconnection queue) and complex permitting and approval processes for new transmission lines (a new transmission line takes an average of ten years to build). Upgrading existing power lines and transformers (advanced conductoring) can quickly double line capacity at half the cost of building new lines. Residential, commercial, and utility scale renewable energy creates grid management challenges like balancing two-way power flows, but can also (along with grid-management technologies) help meet demand and improve resilience.

West Virginia Status and Policies

Appalachian Power Company (APCo) and Wheeling Power Company (WPCo) are SW West Virginia's electric utilities, while Monongahela Power (Mon Power) and Potomac Edison (PE) serve NE West Virginia. Mon Power and PE are not obligated to meet electricity demand internally, instead purchasing needed electricity from PJM capacity markets or third parties. Mon Power and PE will need external generation capacity to meet projected demand growth between 2024-2033 in NE WV. Therefore, NE West Virginia may be more susceptible to rate increases and potential power bottlenecks from large increases in regional electricity demand. APCo and WPCo are obligated to internally meet their customers' electricity needs at times of peak demand. Their ten-year load (demand) and capacity (supply) forecasts (see figure) show inconsistent power demand due to decreasing numbers of residential customers, with particularly small capacity margins in 2025-2026. Further, these 2023 forecasts do not include a large planned industrial load, and could increase further if West Virginia attracts new companies in data centers and manufacturing.

In 2023, the Grid Stabilization and Security Act (SB 188) required the government to locate suitable sites and otherwise promote generation of electricity from natural gas in West Virginia. HB 3437 (2023) would have required utilities to reinvest some profits into infrastructure or reliability, but did not pass. HB 5528 (2024) extended and expanded the Renewable Energy Facilities Program, but still limits total eligible utility-owned renewable capacity to 400 megawatts for all of West Virginia. HB 4770 (2024) would have created energy efficiency programs in West Virginia. State utilities created a pilot program providing variable electricity pricing to industrial ratepayers in West Virginia. Finally, West Virginia's Special Reduced Rate Service Program (§150-3-4.16) provides a 20% discount on utility bills to qualifying low-income customers.

Possible Benefits for West Virginia

Acting to meet growing regional power demand could bring benefits to West Virginia. Delayed retirement of coal-fired power plants and transmission line construction provide jobs to West Virginians. Enhancing West Virginia's grid capacity could improve system reliability and enable further economic growth. Existing industries and new technologies are increasingly powered by electricity. Power consumption can only grow as fast as the ability of the grid to meet it, and underbuilding capacity may mean economic opportunities are lost to other states. Policy, rather than technology or investment, is a primary barrier to meeting demand growth; policies are needed to ensure system improvements don't drastically raise electricity prices. Demand growth spreads the cost of investment over a longer time horizon, effectively making necessary upgrades cheaper.

Other State Policies and West Virginia Policy Options

States are taking a number of actions to address rising electricity needs. In 2024, Virginia required (HB 862) utilities to "comprehensively" consider advanced conductors and grid-modernizing technologies in grid planning. New York and Ohio utility commissions have adopted the Next Generation System Platform (DSPx) to aid in grid-modernization planning. In 2023, Montana incentivized advanced conductor programs (HB 729) to expand grid capacity. In 2019, South Carolina and Montana required utilities to consider possible demand-side management programs like variable electricity pricing.

Policy options include streamlining permitting processes for new local electricity generation, and incentivizing transmission and distribution upgrades (advanced conductoring). In 2015, West Virginia allowed (SB 390) expedited cost recovery for necessary natural gas utility infrastructure projects. Other options include encouraging adoption of grid-enhancing technologies to improve grid reliability and capacity, and encouraging proactive grid planning between local, state and regional stakeholders. Another policy option is expanding the existing ratepayer discount programs to counter potential rising electricity prices.

This Legislative Science & Technology Note was written by Ryan Nesselrodt, PhD, West Virginia Science and Technology Policy Fellow, on behalf of the Bridge Initiative for Science and Technology Policy, Leadership, and Communications. Please see https://scitechpolicy.wvu.edu/ or contact scitechpolicy@mail.wvu.edu for more information.