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State of Maryland

Electrification in Maryland: Understanding "Headroom"

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ELECTRIFICATION: KEY CONCEPT OF “HEADROOM”

Generally, the concept of “headroom” refers to the additional capacity of the electric system available to accommodate growth without the need to install new and larger equipment. This report seeks to depict minimum levels of “headroom” on the electric system by comparing differences between an electric system’s seasonal peak demands—specifically, the spread between the *summer* peak demand for electricity and, for most Maryland utilities, the lower *winter* peak demand. Differences in seasonal demand are a useful metric for assessing the basic capacity of the electric system to handle anticipated increases in electric usage.

For decades, Maryland has been a summer “peaking” state. For most utilities, electricity demand is at its highest level on the hottest days of the summer when air conditioners are running full force on top of normal electricity consumption; with a lower peak demand during the coldest days of the winter when electric heating is running full force. As part of regular and prudent operations, electric distribution companies have built their distribution and transmission systems to meet the larger summer peak.

Gradually over time, Maryland is expected to become a winter peaking state. New electric technologies for heating, cooling, and other building appliances—such as air source electric heat pumps—are already lower cost than fossil fuel systems for new buildings, and often the lower cost solution for replacing systems in older buildings. Their costs to customers will decrease further with new electrification tax incentives and rebates under the federal Inflation Reduction Act. These technologies are also a key part of the solution for meeting the State’s climate goals.

As electrification develops over time and Maryland’s buildings are heated through electricity rather than fossil fuels, the winter system peak will eventually catch up to the summer system peak and then exceed the summer peak. The “room” for the winter peak to grow before it overtakes the summer peak, for which the electric transmission and distribution system has been built, is a measure of what we call the “minimum headroom” that exists on the overall system.

Importantly, the delta between the summer peak and the winter peak does not make up the entire headroom (capacity available to accommodate growth) for two reasons: (a) the systems still have some headroom above the current summer peak; (b) the physical capacity of the systems is greater in the winter season than in the summer season, due to the impacts of ambient temperature on the system. Because the seasonal peak differences understate total headroom, we use the term “minimum headroom” in the figures below in this report.

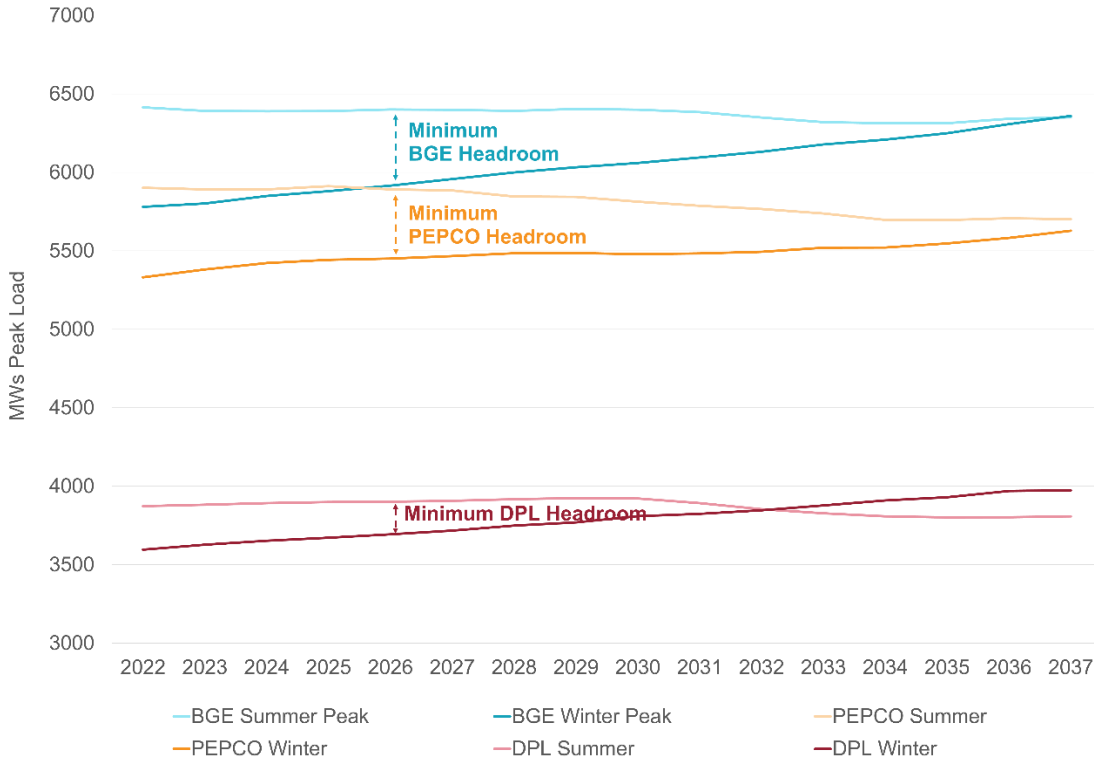
The graphs and commentary on the pages that follow strongly suggest that headroom is available in Maryland to accommodate a gradual increase in winter peak demand from electrification. These assessments of headroom refer to the overall capacity of Maryland’s electric system. They do not mean that specific geographic locations may not need upgrades to meet growing demand. The amount of headroom differs widely at distribution circuits and substations within each utility. The State’s electric utilities spend hundreds of millions of dollars annually to maintain and enhance their systems to maintain system reliability and to meet growing and changing electric demand at the local level.

PJM—MINIMUM HEADROOM PROJECTIONS

PJM is the regional transmission organization for D.C. and 13 states, including Maryland, responsible for ensuring the safety, reliability, and security of the bulk power system. Subject to the Federal Energy Regulatory Commission’s oversight, PJM’s responsibility is to make sure the transmission system can meet the region’s power needs and that sufficient generation is available through a competitive market.

PJM performs an annual forecast of seasonal peak electric loads and usage for the electric distribution companies (“EDCs”) in D.C. and the participating states. The following graph shows PJM’s forecast released in January 2022 for the zones served primarily by three Exelon subsidiaries: BGE, Pepco, and Delmarva Power (DPL). For each utility, the higher line shows the summer peak for each year, while the lower line shows the winter peak for each year; the difference between the summer and winter peak for each utility is available headroom for the winter system to grow. The PJM forecast shows BGE’s winter peak will not catch up to summer peak until around 2037, with an even later date for Pepco and around 2032 for DPL.[1]

Figure 1. Maryland EDCs Winter vs Summer Peak Loads (“Headroom”), 2022-2037



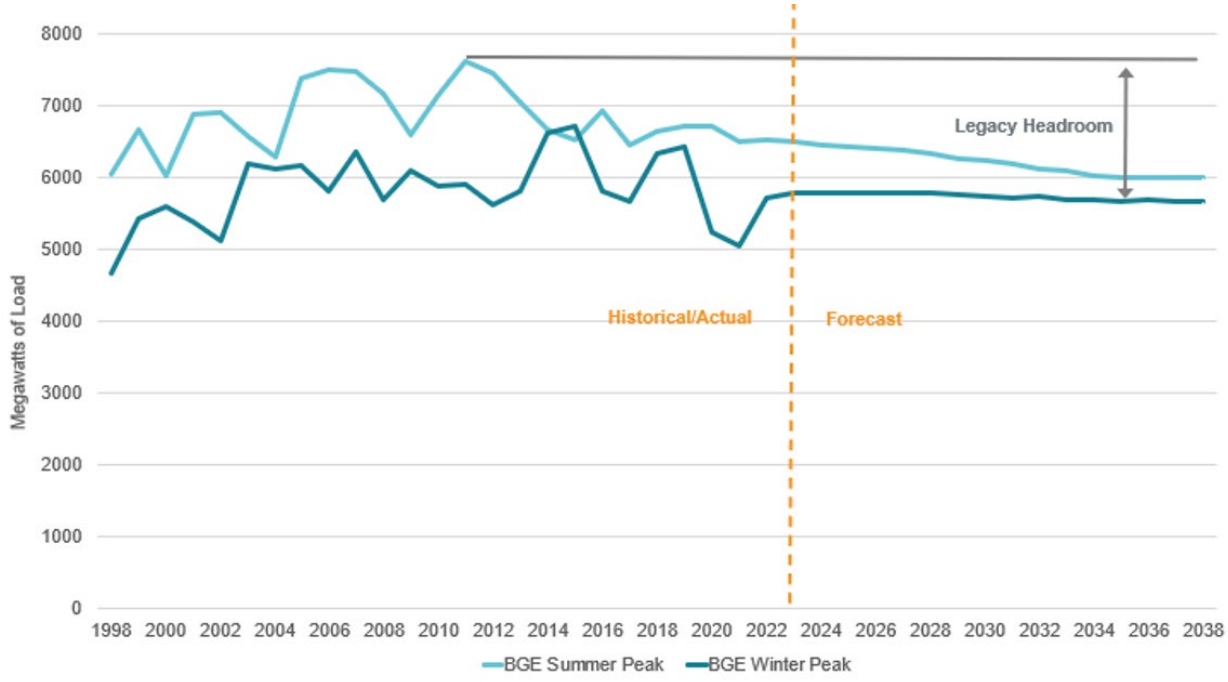
[1] This figure is based on data from the most recent *PJM Load Forecast Report* (January 2022), available at https://www.pjm.com/committees-and-groups/subcommittees/las. Current PJM data accounts for projections regarding the adoption of electric vehicles, distributed energy resources, and energy efficiency deployments but not high levels of building electrification. PJM indicates that it will be updating its forecasting in the 2023 planning cycle to accommodate forecasts of building electrification.

PJM—MINIMUM HEADROOM: HISTORICAL SEASONAL PEAKS

In 2011 BGE was able to meet a summer peak of more than 7,500 megawatts (MW), and in 2006-07, it was able to meet summer peaks of just under 7,500 MW. By contrast, its winter peak for 2021 was 5,800 MW, and PJM forecasts BGE's winter peak to rise to about 6,300 MW in 2037, still well short of the approximate 7,500 MW peak demand it handled in 2011 and earlier.[2]

The utility has spent more than $4 billion on its distribution and transmission system since meeting these much higher peaks more than a decade ago. These costs are approved by the Public Service Commission or federal regulators and recovered in rates, and customers ultimately pay 3-4 more times once the utility's return is added in. In September 2022, Exelon informed investors that in 2022 BGE would spend $500 million on its distribution system and $275 million on its transmission system, with similar numbers in future years. Presumably, this capital spending is enhancing system performance and reliability at least to levels the system encountered in past years.

Figure 2. BGE Winter and Summer Loads – Historical and Forecast 1998-2037

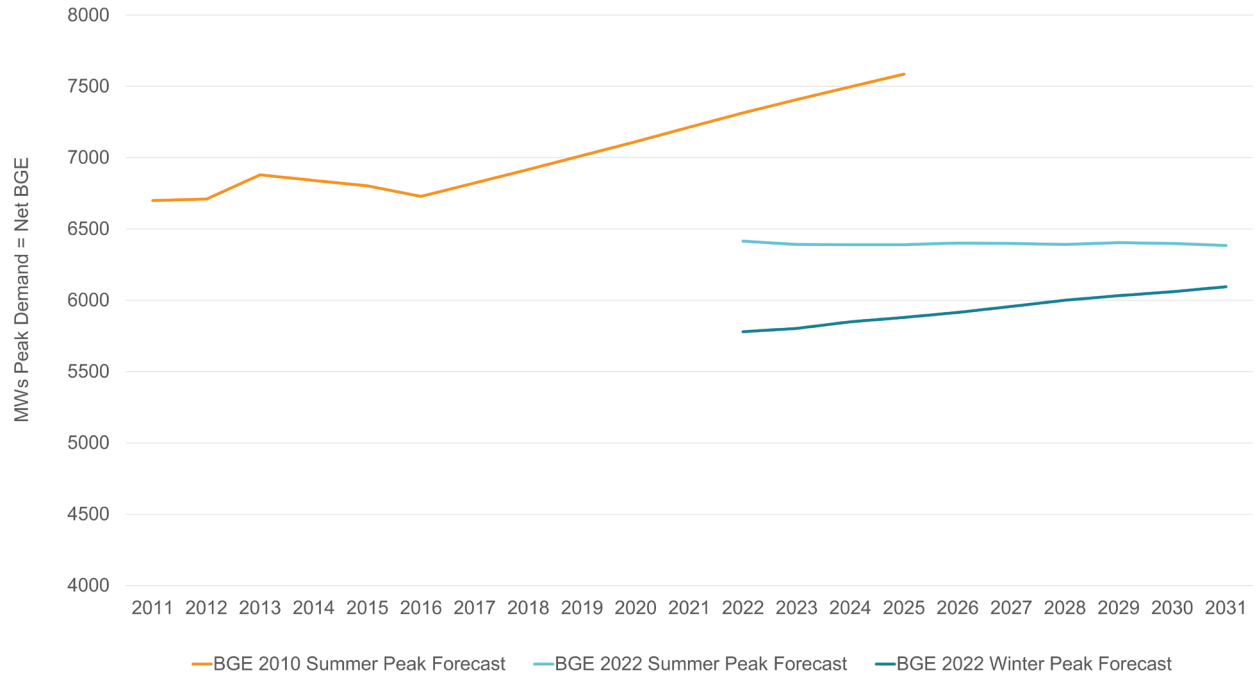


[2] This figure is based on data from PJM's 2023 Preliminary Load Forecast. *See Reference Only – Summer Forecasts* (Oct. 24, 2022) and *Reference Only – Winter Forecasts* (Oct. 24, 2022), available under Meeting Materials for the 10.27.2022 Load Analysis Subcommittee, https://www.pjm.com/committees-and-groups/subcommittees/las.

BGE—MINIMUM HEADROOM: DECADE-OLD FORECAST PROJECTS HIGH PEAK DEMAND

Twelve years ago, BGE projected peaks in demand far greater than the demand that has been realized today and that it now projects for future years. In past years—unlike today—BGE was not sounding major alarms about its ability to handle the gradual increase in electric demands. The graph below shows this, by depicting BGE’s forecast of its annual peak load filed with the PSC in 2010 (projecting out to 2025) and compares it with the lower current forecasts the company made in 2022 for its winter and summer peak loads (projecting out to 2031).[3]

Figure 3. BGE 2010 Net Peak Demand Forecast (Annual, Summer) Compared to 2022 Net Peak Demand Forecasts (Summer and Winter)

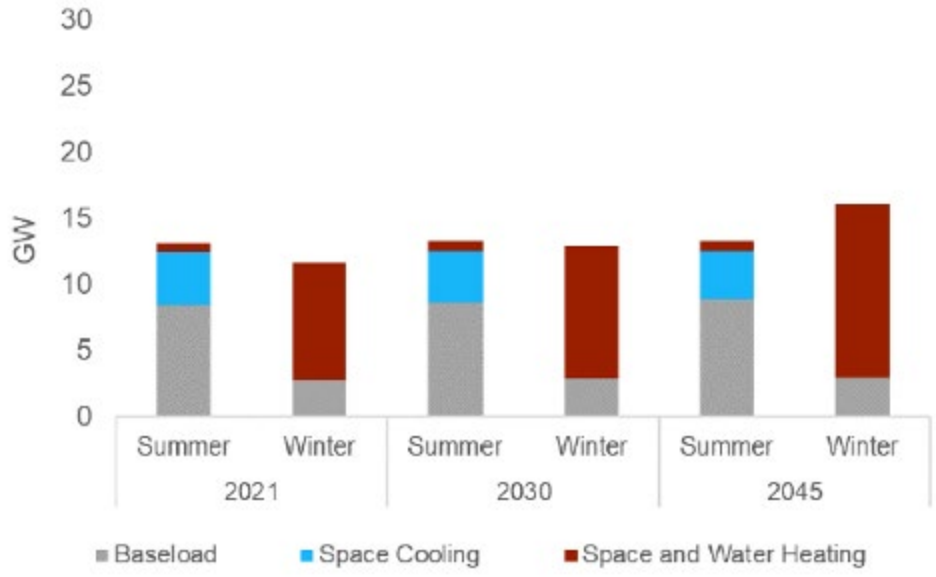


[3] This figure is based on data from successive Ten-Year Plans of Electric Companies in Maryland, prepared by the Maryland Public Service Commission based on submissions from the utilities. *See Ten-Year Plan (2011-2020) of Electric Companies in Maryland* (Feb. 9, 2012); and *Ten-Year Plan (2022-2031) of Electric Companies in Maryland* (Nov. 7, 2022), available at https://www.psc.state.md.us/commission-reports/. 2010 was the last year for which the PSC included 15-year projections with only a single annual peak load projection. The following year, the report began breaking out separate winter and summer peaks, but with the forecast horizon reduced to 10 years.

MD BUILDING STUDY—MINIMUM HEADROOM UNTIL AFTER 2030 WITH HIGH RESIDENTIAL ELECTRIFICATION

In a 2021 study conducted for the Maryland Commission on Climate Change, consulting firm Energy and Environmental Economics, Inc. found that even with high residential electrification, Maryland’s system would remain a summer-peaking system until after 2030.[4]

Figure 4. Contribution to 1-in-2 System Peak by Sector

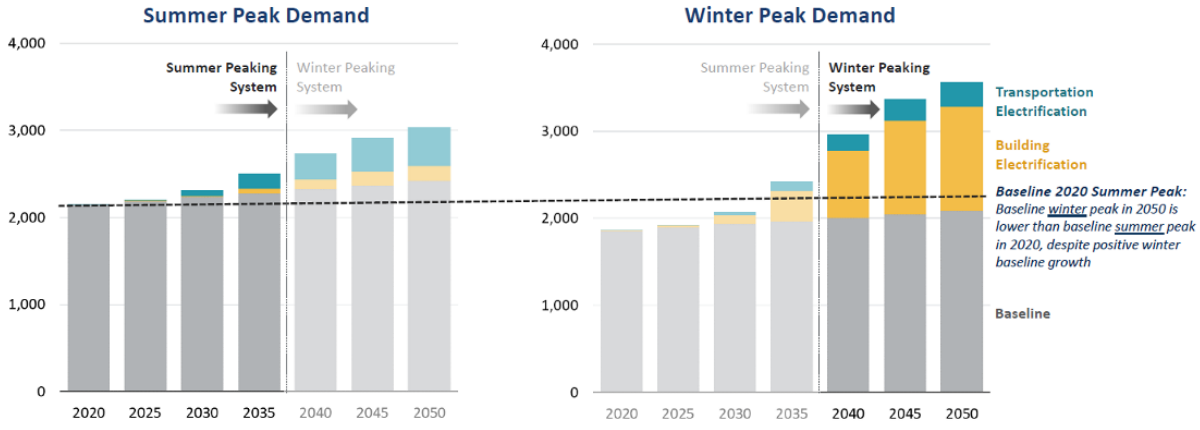


[4] Energy and Environmental Economics, *Maryland Building Decarbonization Study Final Report* at 50 (Oct. 20, 2021).

PEPCO—MINIMUM HEADROOM IN THE DISTRICT OF COLUMBIA UNTIL AFTER 2035

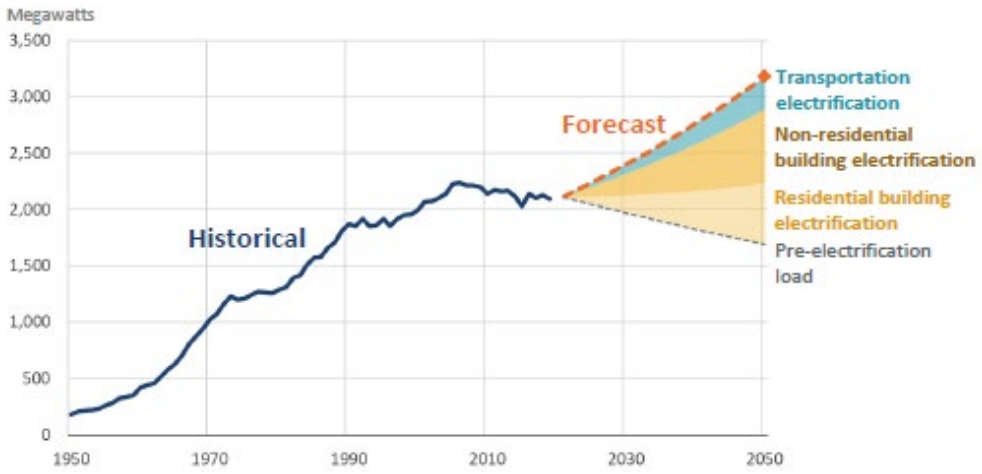
In a study prepared for Pepco, the Brattle Group found that under a high electrification pathway to meet D.C.'s climate goals, Pepco's system would remain a summer-peaking system until after 2035.[5]

Figure 5. Baseline Load Growth in Sensitivity Case



While the baseline load trajectory is based on summer and winter growth of 0.4% per year in the sensitivity case, the **2021-2050 rate of change for baseline load appears negative** in figures. This is due to the transition from a summer-peaking system to a winter peaking system with electrification.

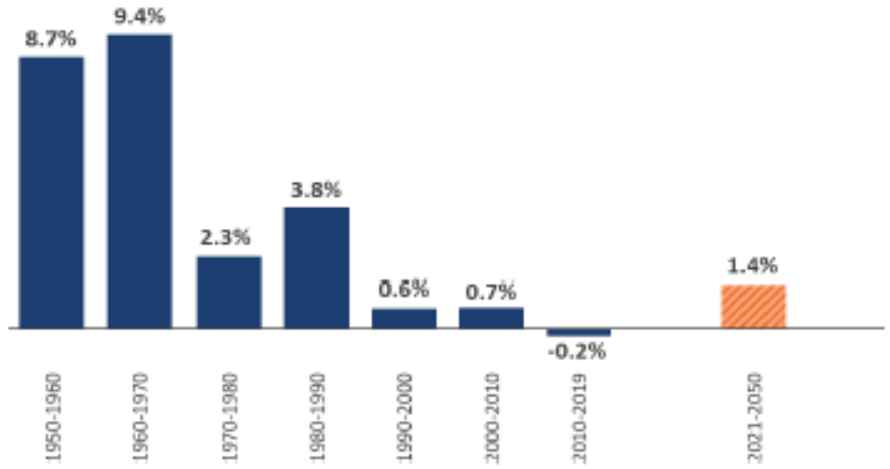
Figure 6. Pepco DC System Peak Demand (MW) *Before EE and Load Flexibility*[6]



[5] The Brattle Group, *An Assessment of Electrification Impacts on the Pepco DC System* at 33 (Aug. 31, 2021) (emphasis added).

[6] *Id.* The study also demonstrates that Energy Efficiency (EE) and Load Flexibility measures—i.e., load shifting and load building during times of excess power supply—can help to moderate the load impacts of electrification on the

Figure 7. Compound Annual Growth Rate *by Decade*



Summary of Findings[7]

With electrification, Pepco DC’s future rate of load growth will remain within recent historical ranges

- Historically, Pepco has reliably managed annual peak demand growth rates **well in excess of 2%**
- If electrification is the primary pathway for achieving the District’s decarbonization goals, we estimate that peak demand will grow at an **average annual rate of 1.4% to 1.7%** between 2021 and 2050
- On average, the system will grow at a rate that is higher than recent observed growth but well below growth rates that Pepco has reliably managed in the past

power grid, reducing the annual peak demand growth rate from the projected 1.4% down to 0.9% between 2021 and 2050. *Id.* at 13-17.

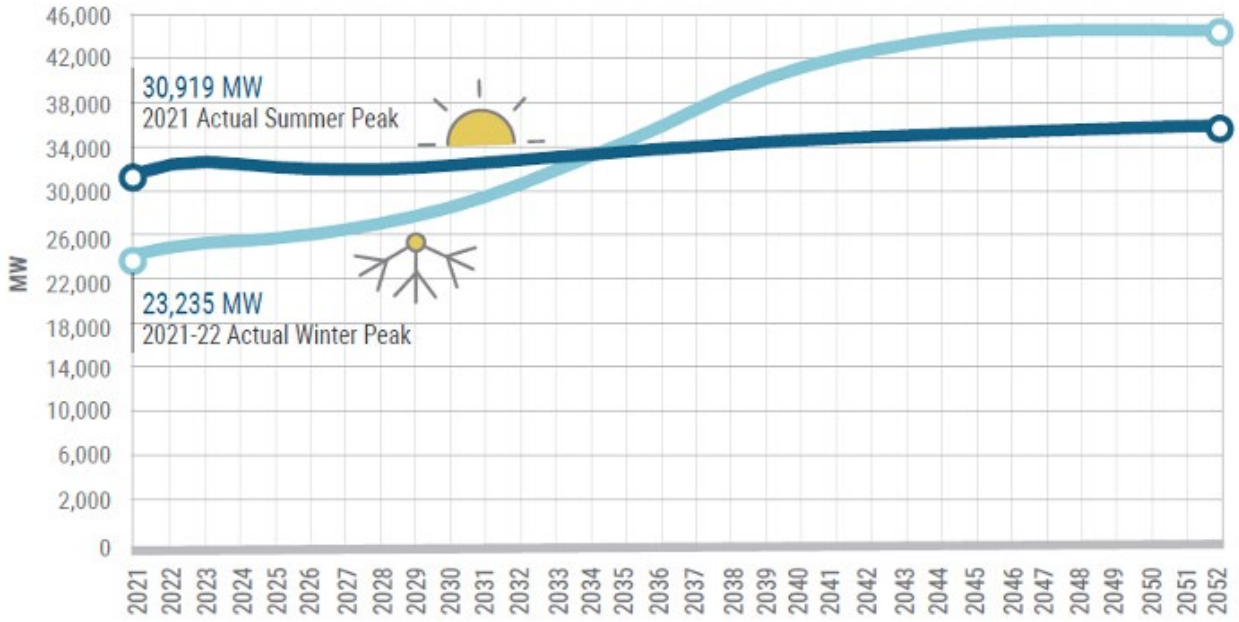
[7] *Id.* at 3.

NYISO—MINIMUM HEADROOM IN NEW YORK UNTIL AFTER 2034

In a 2022 report, the New York Independent System Operator (NYISO) found that New York has minimum headroom to implement the State’s decarbonization policies—largely through electrification—through 2034, when winter peak will overtake summer peak.[8]

For at least three reasons, one should expect greater minimum headroom in Maryland and a later date at which it becomes a winter peaking state. First, New York has a colder climate than Maryland—think Buffalo and Albany compared to Baltimore—which translates to greater system demand in winter as electric heat pumps replace fossil fuels. Second, about 20 percent of New York households currently heat their homes with electricity, compared to 48 percent of Maryland homes. The higher percentage of households that already use electricity for heating in Maryland means there will be a less dramatic increase in demand on the system in Maryland. Third, much of the current electric heating in Maryland is electric resistance heating that will be replaced with highly efficient heat pumps, helping to moderate the expected increase in system demand.

Figure 8. New York Electric Summer and Winter Peak Demand – Actual and Forecast: 2021-2052



[8] NYISO, Power Trends 2022: The Path to a Reliable, Greener Grid for New York at 18 (2022).

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