

## **AMERICAN COUNCIL FOR AN ENERGY-EFFICIENT ECONOMY'S COMMENTS**

The American Council for an Energy-Efficient Economy (ACEEE) offers these comments in response to the Pennsylvania Public Utility Commission's request within the [tentative order regarding interconnection and tariffs for large load customers](#) filed on November 6, 2025 within docket M-2025-3054271.

As the PUC considers appropriate responses to the issue of load growth interconnection and tariffs, we encourage the Commission to make decisions with a full understanding of the value of demand-side measures (DSM)—energy efficiency (EE) and demand response (DR)—in meeting the load growth challenge. ACEEE's research on this topic will appear in a new report *Lightening the Load: Demand-side Solutions for the New Era of Explosive Electric Load Growth* to be published in January 2026. The comments herein are informed by that research. References for all information presented here are in the *Lightening the Load*, an embargoed copy of which can be provided upon request.

### **Demand-side measures have massive untapped potential**

The proposed build-out of new generation resources can be mitigated by ample untapped energy and peak reduction resources. Energy efficiency has the potential to reduce annual electricity consumption by 8–26%, enough to offset 27–57% of total anticipated load growth at the national level. Most experts agree the U.S. has about 100–200 GW of DR potential available within the next decade, which by itself is roughly 1–2 times larger than the most aggressive projections of total U.S. data center capacity in 2030. Utility EE programs have the potential to support an additional 88–148 GW of peak demand reduction by 2030. **Together, DSM can more than cover foreseeable large-load additions, even under high growth scenarios.**

**We recommend that Pennsylvania utilities prioritize the following 10 DSM programs.** These programs were selected for their proven capability to reduce summer or winter peak electricity demand.

#### **Efficiency measures**

- Program to replace electric furnaces with ENERGY STAR® heat pumps
- Attic insulation and sealing incentive program
- Heat pump water heaters incentive program
- Smart thermostat incentive program (an efficiency program that helps enable the DR program listed below)
- Set of energy efficiency programs serving low-income homeowners and renters, including low-cost kits distributed by community groups and more comprehensive whole-home retrofit programs for single-family homes and multifamily apartments
- Small commercial and industrial retrofit program

- Monitoring-based commissioning program for large commercial buildings<sup>1</sup>

#### Demand response measures

- Central air conditioner/electric heating with smart thermostat control
- Water heater timing controls
- Electric vehicle managed charging

Small commercial and industrial (C&I) measures save a lot more in the summer than in the winter, and electric furnace replacement primarily reduces winter loads and peaks. Two opportunities that should receive accelerated attention are smart thermostat control for central AC and electric heating, and replacing electric furnaces with ENERGY STAR heat pumps at the time existing central air conditioners need to be replaced.

PECO, PPL, and West Penn already administer some of these recommended EE programs including residential HVAC equipment and heat pump water heaters, but there remains much room for improvement. An evaluation of EE program offerings among the largest 53 utilities in the U.S. ranks PECO, PPL, and West Penn 31<sup>st</sup>, 42<sup>nd</sup>, and 48<sup>th</sup>, respectively. We recommend that the Commission require utilities, at a minimum, to introduce or scale up the priority DSM programs indicated above.

**Savings from DSM programs can also be realized quickly.** The fastest-growing utility EE programs of the last decade have an average annual growth rate of about 43%. A handful of programs that were provided adequate budgets have doubled their lifetime savings year over year. Virtual power plants (VPPs), which aggregate distributed energy resources (DERs) to provide similar services as a conventional generation plant, can be operationalized in less than 6 months. Only 6.0% of U.S. energy consumers participated in a retail DR program in 2024, which demonstrates massive potential to quickly expand the resource. Moreover, demand-side resources are ideal for avoiding the cost, siting, environmental compliance, emissions, and delay issues associated with new generation.

#### **Demand-side measures offer greater economic benefits than supply-side resources**

Ratepayers deserve the lowest-cost electricity system that is both safe and reliable. **DSM offers less expensive energy and capacity than supply-side resources.** An analysis of DSM programs in 2024 from the largest utilities in the country (by retail sales) finds that top-performing DR programs achieved demand reductions at a cost of \$6.62–\$44.13/kW-year. According to Lazard’s Levelized Cost of Energy research, the lowest-cost supply-side resource for peak reduction costs \$51.72/kW-year.

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<sup>1</sup> Monitoring-based commissioning is a process that uses data from building energy management systems that are common in large buildings, along with some additional strategically placed sensors to help analyze and optimize building operations. Typical energy savings of about 9% can be achieved.

A similar conclusion is reached for energy efficiency. The median cost of energy savings achieved through utility EE programs is \$20.70/MWh, a value significantly below the average wholesale price of electricity, which in 2025 is projected to be \$43.90/MWh—about twice the cost of EE. PECO, PPL, and West Penn are no exceptions. In 2024, they realized energy savings at costs of \$30.51, \$32.17, and \$26.89 per MWh, respectively.

Moreover, these costs do not include deferred or avoided distribution system upgrades (e.g., substations, transformers, power lines), which are projected to be the largest single cost induced by load growth in the absence of DSM. Traditional electricity distribution system upgrades often cost tens of billions of dollars. Demand flexibility could cut those costs in half.

Because demand-side programs can be scaled in months, EE and DR can provide additional headroom on the grid much more quickly than supply-side resources. New gas generation has historically been able to stand up in a few years, but load growth is causing supply chain delays that have increased procurement times for new turbines closer to 5 years. The speed advantage provided by DSM allows large load customers to interconnect and start generating economic returns more quickly.

### **Demand-side measures better protect ratepayers**

Load growth projections are shaped by assumptions around anticipated improvements in AI's energy efficiency (electricity consumed per computation) and computational efficiency (amount of computation performed per unit of hardware), upgrades to the electric grid, varying rates of AI adoption, and a range of other external influences. Data center load forecasts are particularly prone to inflation because of the way data center developers interact with utilities during site selection and project planning. Utilities often receive multiple interconnection requests for the same project (i.e., from project owners and developers), and the same project may appear in multiple utilities' forecasts. For this reason, many experts refer to these as "phantom loads" that may or may not actually materialize.

Utilities often overestimate future demand, leading to overbuilding of supply-side resources that may go underutilized, resulting in stranded costs that are passed on to ratepayers. Moreover, between 2006 and 2023 utility planners, on average, overestimated electricity demand by 8% in their five-year forecasts and by 17% in their ten-year forecasts. This forecast error is even higher for more recent years: forecasts made between 2012 and 2023 were, on average, 23% higher than the actual loads.

DSM protects ratepayers from overbuild and stranded costs by providing a cost-effective alternative to meeting the load that will actually materialize without the risk of having to pay for supply-side resources that will go underutilized. In this way, **demand-side options offer a no-regrets approach that acts as a hedge against uncertain load growth**. Should the new load actually emerge, demand-side solutions provide additional headroom, lightening the load that must be met with generation resources. Should the load not materialize, the utility will have

procured a least-cost energy resource that benefits both participating customers and ratepayers as a whole by reducing energy and capacity costs.

Within this context, energy efficiency stands out as perhaps the most reliable energy resource available. Unlike generation, energy efficiency is “always on”, delivering savings when operational, and requiring no energy demand when not. Once deployed, energy efficiency does not need to be actively managed. It can be targeted to specific geographic locations to minimize localized grid constraints, such as overloaded distribution feeders. It can also be preferentially directed to customers at risk of nonpayment, lowering the chances of their winding up in arrears. In short, it makes the entire challenge of meeting demand with generation easier and less risky to manage.

DSM programs have delivered grid benefits for decades, and evaluation, measurement, and verification (EM&V) reports exist to confirm that reported savings are accurate and credible. These reports, which are generally produced every 1–3 years, not only verify achieved savings, but also examine issues like free-ridership to determine what percentage of the achieved savings occurred only because of the program’s existence. Verification can be made even more reliable if they rely on “measured” savings that compare actual energy use before and after the installation of efficiency measures. Evaluating behavioral measures goes even further by comparing results from program participants and a control group. In short, the energy efficiency community takes multiple steps to ensure that EE delivers what it promises.

Demand-side measures also buy utilities time. As demand-side procurements are installed, utilities will act in a way that gradually and increasingly lowers the demand that must be met with higher-cost resources. This buys time for utilities to evaluate how much new generation will actually be needed while serving as a reliability resource while new loads interconnect.

### **Software solutions maximize DSM**

Modern energy software is the “operating system” for DSM. At the data layer, integration with advanced metering infrastructure (AMI), submetering, Internet of things (IoT) sensors, and building automation systems (BAS)/energy management systems (EMS) yields high-granularity telemetry across HVAC, lighting, process loads, EV charging, and storage—exposing inefficiencies and revealing when and where loads can be shifted. The foundation of any successful demand flexibility program is real-time data, enabling analytics to identify peak periods and action opportunities.

At the control/optimization layer, software enables automated curtailment (smart thermostats, CTA-2045 water heaters, direct load control on HVAC/refrigeration/compressed air) and managed EV charging (V1G) or bidirectional vehicle-to-grid/vehicle-to-building (V2G/V2B) dispatch. AI and machine learning engines can now tune setpoints and set schedules and charging windows to coincide with low-cost hours and minimize peak coincidence—turning buildings and vehicle fleets into grid-responsive assets while maintaining service quality.

At the aggregation/market layer, distributed energy resource management systems (DERMS) and VPP platforms unify thousands of devices into dispatchable portfolios with forecast, commit, dispatch, and verify workflows. Utilities can forecast reliable shed, enroll diverse customers, and measure delivered impacts with device-level telemetry—critical for EM&V confidence and capacity accreditation.

Finally, software supports compliance & customer engagement: automated reporting for building performance standards and DSM performance incentive mechanisms (PIMs); dashboards and alerts to nudge behavior; and program management systems that tie field data, eligibility, and tracking into one pipeline.

### **The PA PUC can support LLCs' investment in DSM**

The Commission can require large load customers to meet a minimum standard of DSM adoption as a condition of their expedited interconnection, access to firm capacity, or other benefits. This can be realized through multiple pathways including:

- Setting minimum load flexibility goals (e.g., explicit MW/percent targets for DSM contributions during peak seasons)
- Approving and overseeing demand-side PIMs to incentivize higher DSM adoption
- Requiring that updated market potential studies include granular assessments (e.g., feeder level) that enable consideration of novel DSM opportunities
- Allowing large load customers to earn capacity accreditation for “bringing their own additional DSM” including through third-party purchases or paying into existing utility programs
- Requiring utilities to engage large load customers in an IRP-like process to determine the optimal set of demand- and supply-side resources to meet grid needs (a la all-source procurement) and strengthen DSM procurement requirements
- Directing utilities (or authorizing third parties) to create VPP tariffs that allow large loads to aggregate behind-the-meter assets (e.g., batteries, flexible loads) into dispatchable capacity
- Requiring large load customers/utilities to share critical information about proposed load centers needed to evaluate resource needs and potential DSM solutions
- Analyzing and supporting the potential of thermal energy networks through regulatory proceedings

### **LLC reporting should include the number of executed Energy Service Agreements (ESAs)**

We support inclusion of the number of executed ESAs in reporting. While these are often considered in the context of renewable energy, information about the extent to which LLCs are taking advantage of demand-side resources is also important. EE and DR are the least-cost resources for energy and capacity reduction. Knowing how much utilities are utilizing is important to ensure needs are being met at low cost and with minimal externalities.

## **LLC reporting should include distribution system impacts, curtailment events, and impacts on low-income ratepayers**

We support any form of transparency—even if behind a non-disclosure agreement—that enables the Commission and stakeholders to evaluate investments made in serving LLCs. The costs of local network upgrades, transmission investments, etc. ought to be evaluated in the context of non-wires alternatives. Failure to disclose that information deprives stakeholders of the ability to evaluate whether the lowest-cost resources are being utilized, a scenario that could place ratepayers at risk of elevated costs.

A record of distribution-level curtailments or interruptions related to LLCs should also be provided. The existence of such events indicates that there are insufficient energy resources available to meet demand. Transparency regarding the frequency and duration of curtailments can inform what level of DSM is needed to address future instances of grid stress. The absence of such information deprives DSM service providers from being able to provide reliable and cost-effective options for enhancing grid reliability.

**We strongly support inclusion of measures undertaken to mitigate the potential impacts of LLC rates on low-income or disadvantaged communities.** More than half of Pennsylvania households making less than the area median income experience a high energy burden—defined as having energy bills that exceed 6% of household income. The impact is felt most acutely in counties like Schuylkill, Columbia, Wayne, Susquehanna, and Clearfield, where the average household making less than 80% of the area median income is severely energy burdened, meaning their energy costs exceed 10% of their incomes.

Energy burdened households spend a disproportionately high share of their income on home energy costs, often forcing families to make trade-offs between paying utility bills and covering essentials like food, medicine, or rent. This places these households at increased risk of energy insecurity (difficulty paying bills, risk of disconnection) and adverse health impacts from living in unsafe indoor temperatures.

Demand-side measures are particularly well-suited to address the energy burden that many Pennsylvania households face. They can be specifically targeted to areas that are disproportionately impacted by the presence of large load customers. This not only alleviates distribution system constraints that can increase costs for all ratepayers, but also provides cost saving measures for the households that need them most. It is critical that there be transparency around these potential impacts to ensure that energy solutions decided upon by this Commission are protecting all ratepayers and not just those more financially well off.

ACEEE supports utility outreach that includes **community engagement with low-income communities** in their service territories to inform the design or improvement of their energy efficiency programs. Including low-income customer groups in the program planning process provides authentic opportunities for engagement and feedback. Failure to engage community

members during program design risks missing insights and overlooking structural issues that could impede effective delivery of efficiency solutions.