Load Shape Is the Fastest Cost Lever States Control: Retail 2.0

Submitted by Distributed Grid in response to PJM's Call for Papers, Question 2

Attachment: A Vision for a Customer-Led Low Cost Power Grid (GridLab, 2026)

Executive Summary

PJM's Question 2 asks for additional or supplemental paths that States explore to support long-term market durability and/or customer cost stability.

The answer available is to make the load shape of residential loads an economically consequential outcome for load serving entities. This is available to states right now, with no new market design, no new procurement mechanism, and one conforming tariff change to PJM's existing capacity allocation process.

PJM spends enormous resources creating price signals. The load serving entities representing the customer class with the most extreme usage during the most extreme hours barely feel them. At best, the financial loop arrives late and full of friction, so demand curves remain inelastic, vertical, and do not slope.

Electric distribution companies (EDCs) do not have a business model around optimizing load; all costs are passed through to customers and no signals are given for end use customers to optimize load shapes when the system is stressed. Shareholders neither win nor lose.

Retailers are best positioned to shape load without state directives, but they are immediately settled on class average profiles. While some utilities may eventually settle the actual position sixty days later, the value is delayed and the feedback to know if the retailer control algorithms are working correctly arrives too late.

Seven PJM states permit residential retail choice. In each of those states, four state-controlled rule changes would convert load shape from a socialized externality into the foundation of competition among suppliers:

1. Settle residential load on actual interval data in Settlement A, not on class load profiles which in most zones are never fully corrected against each customer's own interval shape. Suppliers cannot optimize if they feel no price signals.
2. Provide suppliers low-latency access to granular interval data for opt-in customers, and functioning Green Button access for prospective customers.
3. Reform capacity cost allocation so a customer's capacity obligation can be adjusted within the delivery year when their physical capability changes, with recognition and pooling of negative Peak Load Contribution values.
4. Permit supplier-consolidated billing. Customers hand over control of thermostats, batteries, and EVs to a brand they trust. The bill is where trust gets built or destroyed. A supplier as a line item on the utility's bill builds no baseline trust for retailers, and trust is foundational to create flexibility within a home.

Four outcomes:

- **Prices fall for everyone, not just participants.** PJM clears at a uniform price, so when flexible loads come off the peak, the aggregate demand curve shifts left and lower prices reach every customer in the zone, including inflexible default service customers.
- **Capacity arrives in months instead of years.** Batteries install inside load pockets, need no transmission upgrade, and go in across thousands of homes at once. (Potentially along with accelerated BTM permitting granted by states.) Private capital funds it, with no utility program budget and no cost socialized across the rate base.

- **Retailers compete on cost of supply instead of marketing games.** A supplier that shapes load pays less for energy and capacity, which creates lower rates or subsidized hardware. The retailer with the best load shapes can offer the lowest prices, giving them a winning edge in the market to attract new customers.
- **Nonperformance lands on the supplier's balance sheet.** A battery that does not discharge at peak leaves the supplier buying that energy at the peak price and carrying a higher obligation the next year. That cost is paid for by the retailer's equity owners. There is no rider, no deferral, and no recovery from ratepayers.

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1. What States Can Do

Question 2 asks for additional or supplemental paths that States explore to support long-term market durability and/or customer cost stability. This paper offers one: states should make load shape an immediately compensated outcome, and in the seven PJM states with residential retail choice, the fastest route is a set of four retail market rule changes already within state authority.

During tight conditions the supply curve becomes nearly vertical, so the last increment of demand sets the price paid on every megawatt-hour cleared. On June 24, 2025, at hour ending 19, the total market price reached $1,988/MWh. A one gigawatt reduction at that hour would have cleared at $1,745/MWh, twelve percent lower for every customer in the footprint. A five gigawatt reduction would have eliminated scarcity pricing entirely and cleared at $101/MWh. The same asymmetry maps to the capacity market, where a leftward shift in the demand curve lowers the clearing price paid by all load, including customers who never participate. This leftward shift is created by market forces of competition for the best load shape.

Speed is the second reason. Behind-the-meter assets reach commercial operation in months. They install inside load centers, require no transmission upgrade, and deploy in parallel across thousands of sites at once. Set against a multi-year PJM interconnection queue, customer-sited flexibility is the only capacity resource in PJM that can respond on the timescale over which the current price pressure is being felt.

The four reforms sit entirely with state commissions and legislatures. The fourth, capacity cost allocation, likely requires a conforming FERC filing to implement a state's direction, addressed in Section 2.3. None requires a change to PJM's market design beyond that one conforming tariff change to capacity obligation allocation, and none asks PJM to procure, credit, or compensate anything. This simply allows for load serving entities to immediately feel the price signals of their actions (or consequences of their inaction).

2. Four Reforms Within State Authority

Residential load shape in PJM does not improve because there is too much friction for load serving entities to feel the price signals of their actions. All the effort PJM spends to create price signals rarely makes it to the load serving entity's shareholders. Four specific rules unlock the price signal friction, and each is within state authority to change. Fixed together, they make load flexibility a scalable core competency for every retailer.

One clarification first. This is NOT a demand response proposal. Demand response is episodic, requires enrollment, is called as an event, is measured against a constructed counterfactual baseline. DR is a registered resource that clears in the PJM Capacity Auction. This is not that.

This proposal is about flexible and sloping demand curves. This is continuous, requires no PJM enrollment, is driven by price rather than centralized dispatch instruction, and is measured with the same metered interval data PJM already uses to calculate load obligations. There is no baseline to estimate because the goal is to make the meter go to zero during critical hours (even better, negative). Nor does any of this create a unique payment: all of this naturally flows through traditional settlement processes (if settlements were cleared on actual interval meter data).

2.1 Settle Residential Load on Actual Interval Data

What's broken. In PJM zones, residential load is submitted to PJM for initial settlement using class load profiles: an average usage pattern applied to the whole customer class. Only a few utilities apply actual individual customer meter data in Settlement B, roughly sixty days later. A supplier that moves a customer's consumption out of the 6 p.m. peak into a midday hour is, in Settlement A, financially indistinguishable from a supplier that did nothing. Meanwhile, in the best case, the flexible supplier finances the gap between the generic profile in Settlement A and its actual position in Settlement B (most utilities do not even settle on actuals even in Settlement B). So at best, it is a working capital drain that grows with how far its customers improve compared to the class average. Flexibility becomes an interest-free advance funded at the supplier's own cost of capital, and it makes the business of load shape management uninvestable. The current settlement process financially penalizes the suppliers doing the right thing when the system needs it.

The change. States should direct electric distribution companies to submit actual interval meter data for residential customers in the initial settlement cycle (Settlement A) rather than class load profiles, with true-up preserved, where it exists, as a data quality backstop.

Why this is foundational. Accurate settlement is what converts a load shape into cash flow. Without it, a supplier that shifts load receives no timely financial recognition (and in most utilities in PJM, no compensation all in the status quo). It is also the enforcement mechanism for the other three reforms. Under profile settlement, a supplier whose customer's battery fails to discharge is charged the class average anyway and faces no consequence. Settled on actual data, that failure appears immediately as energy purchased at the peak price with the retailer shareholders holding that cost.

PJM reform without settlement reform means prices will not reach most load serving entities.

Note, the reason Settlement A data is more valuable than Load optimization requires a feedback loop and immediate data is key. During a heat wave or a winter event, when the value of a correct dispatch decision is highest, a supplier operating without near-real-time interval data is adjusting strategy against information that is days or weeks old. Retailers need their own internal verification loops and this data is simply not available but could and should be.

The evidence. The competitive retail markets with the most residential flexibility settle their customers on actual interval data, not on a class average. ERCOT has settled advanced-metered residential accounts on 15-minute data since December 2009, treating them the same as legacy interval-metered accounts for settlement purposes. That is roughly a decade and a half of operating practice across millions of residential premises here in the US. I have supported strategy plans for many flex-forward retailers, and they always focus in ERCOT purely because it is the only market with immediate settlement on actual interval data. Where a supplier is settled on the class average, the work of shifting a customer's load remains completely uncompensated. In ERCOT it appears within 24 hours of each day’s end.

Australia does the same at finer resolution. The National Electricity Market moved to five-minute settlement in July 2021, AEMO calculates participant liabilities daily and settles weekly, and profiling applies only to accumulation meters. An interval-metered customer is settled on their actual consumption.

Great Britain is migrating toward the same thing. Ofgem's Market-wide Half-Hourly Settlement program was adopted specifically to place the right incentives on retailers to develop time-of-use tariffs, vehicle-to-grid, and battery storage offers, and Ofgem's business case estimated net consumer benefits of GBP 1.6 to 4.5 billion over 2021 to 2045.

These markets reached the same conclusion independently: profile settlement is the binding constraint on flexible loads, otherwise there is no business case.

On cost and timeline. This is a utility systems change, not a tariff amendment, and states should plan for it as one. PJM utilities and shareholders have already been paid for installing advanced metering infrastructure. The remaining work is in settlement and data management systems, not in the meters themselves where AMI is already deployed.

2.2 Low-Latency, Granular Data Access

What's broken. Customers funded advanced metering infrastructure through rates. In much of PJM, citizens, their third party agents, and retail suppliers still receive that data late, at insufficient granularity, or through interfaces that make systematic use impractical. This varies utility to utility. Without easy access to historical usage for prospective customers, it is very challenging to customize the size of the BTM hardware for the specific customer's needs.

The change. Require utilities to make fifteen-minute interval data available to suppliers by intuitive API within twenty-four hours of usage for customers who opt in, and to maintain a functioning Green Button platform for prospective customers so a supplier can size an asset and quote an offer before acquisition.

Why it matters. Two distinct needs are involved.

- Historical data for prospective customers determines whether a battery is worth installing and how large it should be.
- Near-real-time data for existing customers determines whether today's dispatch worked and what tomorrow's should be.

Utilities have generally treated both as one low-priority obligation. They are separate products with separate latency requirements. Smart Meter Texas is a working model of centralized, secure, supplier-accessible interval data at scale, all of which can be replicated in other states since a framework already exists for EDCs to share data timely, granularly, and securely. Great Britain went further and inverted the ownership question. The supplier holds the metering relationship and receives half-hourly data directly, while the distribution network operator can access customer data only for regulated purposes, only under a privacy plan approved by the regulator, and only in aggregated form. Ofgem concluded that the party with the commercial relationship should hold the data. Massachusetts shows the utility-administered version of the same idea. While we are not suggesting to follow the UK, it shows that countries that take data privacy seriously show that 1) qualified data sharing is important and 2) data monopolized by the utility does not have to be the only answer.

2.3 Capacity Cost Allocation Reform

What's broken. A customer's Peak Load Contribution is derived from their metered demand during the prior year's coincident peak hours and is then fixed for the delivery year. When that customer installs a battery, nothing about the obligation changes. A customer installing in October carries a pre-battery obligation until the following summer's peaks reset the value, which takes effect the June after that. The supplier procures capacity for roughly twenty months against a physical reality that no longer exists, and cannot pass through a saving it is not receiving. That timing gap is a large obstacle to customer acquisition economics, because it blocks passing cost savings on to mass-market customers.

Three changes.

1. Permit a supplier to receive a provisional reduction in a customer's capacity obligation when verified behind-the-meter capability is installed, subject to retroactive true-up at the zonal capacity price if the

customer's metered demand during the delivery year's coincident peak hours does not support the reduction.

2. Recognize negative Peak Load Contribution values where a customer's net metered demand during a coincident peak hour is below zero.
3. Permit a supplier to pool negative values within a zone across its portfolio to offset the obligations of less flexible customers, which ComEd's OATT attachment already permits.

Why provisional-with-true-up rather than declaration. The version of this reform that would be fairly criticized is one in which a supplier attests to owning equipment and receives a lower obligation on that basis. Ownership is not performance, and an obligation reduced on an attestation is a cost shifted to other load. But provisional reduction with retroactive true-up produces the commercial outcome the customer requires: enabling the customer to receive a low electricity rate for installing a coordinated battery to replace their immediate capacity tag needs. Upon PTO, the supplier receives relief up front and posts credit to support it. If performance falls short, it pays the zonal capacity price for the shortfall. Credit requirements should scale with the provisional reduction outstanding, so a supplier's ability to obtain relief is bounded by its ability to satisfy the true-up.

On the concern Capacity Cost Allocation Reform shifts cost rather than reducing it

Sustained reduction in metered loads during coincident peak hours from BTM flex lowers PJM's aggregate load forecast, which lowers the reliability requirement, which lowers the quantity procured in subsequent Base Residual Auctions. That is a real reduction in what the system buys and creates lower clearing prices.

It is also self-correcting in a way utility program-based approaches are not. If the assets perform, observed peak load falls and the forecast follows. If they do not, the forecast does not fall and the true-up recovers the difference. Nothing can be over-credited, because the measurement is the metered demand itself.

Pooling is what makes a negative PLC worth anything. A customer whose net demand goes below zero during a coincident peak generates a credit that has no use unless the supplier can apply it against the rest of its book. That is also what lets the value reach customers without hardware, since the supplier can price a portfolio rather than a single premises.

On non-performance

The obligation to perform here is financial rather than administrative, created by exposure rather than by commitment. Failure to discharge during a peak hour produces two automatic consequences, one in each market

In capacity, the customer's elevated metered demand during that hour sets a higher Peak Load Contribution for the following delivery year, so the obligation the supplier sought to reduce comes back. The retailer has incentive to oversize the battery to reduce any mis-timing risk. In energy, under accurate settlement, the supplier is forced buyer at the peak price rather than avoiding the purchase or creating the opportunity to sell back excess hedge length it no longer needs. This risk forces them to accurately predict future system costs.

Neither consequence requires adjudication, certification, or a performance assessment, and neither can be appealed. A supplier that markets a flexibility product and fails to deliver it absorbs the cost on its own balance sheet, a materially different risk allocation than a program in which a utility recovers costs regardless of measured outcome. The strength of the energy-side incentive depends on real-time prices reflecting actual system stress, which is an argument for improving that signal rather than for withholding the reform.

Jurisdiction

This is the one reform in this paper with a federal touchpoint.

- **Two of the three components already exist inside PJM.** ComEd's OATT attachment permits negative PLC values and permits pooling of those values across a supplier's portfolio. Their PLC language sits in a FERC-filed attachment to the PJM Open Access Transmission Tariff. A second Pennsylvania EDC, UGI Electric, recognizes negative PLC and NSPL values as well.
- **The intra-year machinery exists as well.** PJM already reallocates capacity obligations among load serving entities during a delivery year as customers switch suppliers. Adjusting an obligation within a year in response to a verified change in a customer's physical capability uses the same capability, applied to a different triggering event.
- **States have jurisdiction over retail rates, which creates the window for change.** PLC methodology for each zone sits in a zone-specific attachment to PJM's Open Access Transmission Tariff, a FERC-filed document. What a state does control is retail rate design. A commission that requires capacity costs to be allocated directly in retail rates, and requires the retail billing determinant to be allowed to go negative, creates the need for a utility to file the attachment change. Pennsylvania offers a working reference. Retail rate proceedings in the state have produced tariff treatments where a customer's assigned PLC and NSPL can carry negative values for retail billing purposes. That is the retail-side path, and it sits entirely within state authority.

This is where PJM has a constructive role. Zone-by-zone divergence in capacity obligation methodology, where a small number of zones permit negative values and most do not, is itself a source of friction for suppliers operating across a complex footprint. A common framework, implemented as states direct it, would be more efficient than seven separate approaches. ComEd's and UGI's allocation framework allows the clearest expression of capacity price signals to be felt by load serving entities and should be replicated across the PJM footprint.

2.4 Supplier-Consolidated Billing

What's broken. In most PJM choice states the supplier's charges appear as a line item on a utility bill. The party expected to install equipment in a customer's home, coordinate its operation, and be trusted with control of it does not send that customer a bill and does not own the service relationship. Managing EV state of charge, stationary backup state of charge, and temperature are all high trust events during the extreme temperature conditions when the grid needs them most. High-trust retailers simply cannot build brand when they are a line item on someone else's bill, which stalls flexibility growth.

The change. Permit competitive suppliers to issue their own bills to customers, incorporating utility distribution charges, subject to consumer protection and bill content requirements the commission retains full authority to set.

Why it matters here. Supplier consolidated billing is standard practice in Great Britain, Germany, France, Spain, Italy, Japan, Australia, and New Zealand. Every international restructured market put the bill with the supplier. PJM states unbundled generation and left the incumbent utility holding the customer relationship, which was an unfinished transition rather than a considered design. The current retail practices that states object to are a consequence of that structure: a supplier with no name on the bill has no reputational stake in how it treats the customer. A supplier whose name is on the bill cannot hide a price increase inside a utility statement. Selling electricity, an invisible product, is a trust-based relationship. Unlocking flexibility requires a foundation of trust before you change the temperature on a thermostat or State of Charge on a battery.

This reform is usually argued on consumer protection grounds. However this is a market durability argument. Flexibility is a service relationship, which is why this is relevant now and not in the past two decades.

3. Impacts to System Cost

Energy

Reductions in demand during the highest-priced hours produce savings out of proportion to the energy involved, because PJM clears at a uniform price and aggregate demand curves shift left. Every customer in the zone pays the lower clearing price, including any and all customers not participating in flexibility.

Capacity

Sustained reduction in coincident peak demand lowers the forecast that drives the reliability requirement, and a lower requirement reduces the quantity procured in future auctions. Recent auctions have cleared at or near administrative ceilings while remaining short of the reliability requirement. In that condition, reductions in required procurement translate into changes in clearing price, and every megawatt of load in the zone benefits.

Speed

A supplier can coordinate battery installation across thousands of homes in a matter of months, each sited inside the load pocket where the capacity is needed and requiring no transmission upgrade. Set against the multi-year path from queue position to commercial operation, neither replaces the other, but only one responds within the window in which states are currently under pressure.

Distribution and transmission

The same assets, once deployed and controllable, address constraints beyond the wholesale market. Localized distribution peaks, such as clustered overnight electric vehicle charging on a feeder, frequently do not coincide with system peaks, so the same battery can serve both without conflict. States also retain authority over transmission rate design. Structures that tie transmission cost recovery to consumption during peak hours would let customer-sited assets co-optimize against transmission peaks alongside energy and capacity, deferring capex expansion and lowering cost for all load. Unlocking value in the wholesale market creates the business case for BTM assets to be deployed. Once deployed, they can be co-optimized to save on T&D capex since their capex is a sunk cost paid for by retailers who optimize for wholesale markets. The same asset then produces value in four layers: energy, capacity, distribution, and transmission.

4. Sequencing and Where States Can Act (and path for non-retail states)

1. **Settlement on actual interval data.** First, because it is what gives every subsequent reform financial consequence. This is foundational.
2. **Low-latency granular data access.** Second, because optimization requires a feedback loop and because the data infrastructure overlaps substantially with settlement reform. Data access makes the operations possible; settlement makes the economics work.
3. **Capacity cost allocation reform.** Third, because it depends on accurate settlement for its performance discipline and because it carries the conforming filing described above.
4. **Supplier-consolidated billing.** Fourth, because it is the reform most dependent on commission-designed consumer protections and the least dependent on the others. This could be done in parallel to others.

Seven PJM states permit residential retail choice: Delaware, Illinois, Maryland, New Jersey, Ohio, Pennsylvania, and the District of Columbia. In each, the four reforms sit within the existing authority of the commission or the legislature. Several have live proceedings and recently enacted statutes that provide immediate vehicles, including data exchange and advanced metering proceedings in Maryland, recently enacted metering and virtual power plant legislation in New Jersey, and default service program cycles in Pennsylvania.

Beyond retail choice. PJM states without residential retail choice are not without a path, and neither is the default service load that remains in choice states. Most residential customers in the seven choice states have not switched, so their load shape is set by an EDC procurement process with no shape metric in it. Or the load is served in the states without retail choice. The mechanism states control in both cases is the earnings structure of the utility. Performance frameworks in PJM states today are measured in energy saved and megawatts enrolled. None is measured in load factor, coincidence with the zonal peak, or capacity obligation per customer. Adding load shape or price responsiveness metrics is a state decision, requires no PJM market design change, and applies across the footprint. However, it is a weaker instrument than competition. An administrative target will be optimized at the margin because it sits against an earnings model built on growing the capex base. Reducing peaks cuts against this traditional earnings model.

5. Conclusion

PJM Question 2 asked what supplemental paths states should explore.

PJM spends enormous resources creating price signals. And the load serving entities that represent the customer class that has the most extreme usage during the most extreme times often do not feel any of these price signals by their shareholders. At best, receiving these price signals is delayed and full of friction. States can reduce this and creating the best sloping demand curves can become the new business model of retail.

The path described here requires no change to PJM's market design, no new procurement mechanism, and no payment to any participant. It asks states to fix four rules that currently prevent the shape of residential load from having financial consequence for anyone, and to let competitive suppliers bear the value and risk of getting it right.

The reason this belongs in a discussion about long-term market durability is that it is the only source of new capacity in PJM that can be deployed on a timescale of months, sited where load actually is, and financed by parties who lose money when it does not perform.

Further, any market reforms by PJM that do not include settlement reform will continue to fall short of unlocking economic demand side participation. And in a scarce market like we are in now, both supply AND demand need to contribute in order to lower prices.

The attached paper for a deeper dive on this topic.

Michael Lee is the Principal of Distributed Grid LLC and a former competitive retail electricity executive. He authored the attached Retail 2.0 paper for GridLab.