Ascend Analytics

MARKET INSIGHTS



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What Is Behind-the-Meter Storage Becoming More Valuable for Large Energy Users?

For commercial and industrial (C&I) customers in US power markets, behind-the-meter (BTM) battery storage is becoming increasingly attractive as rising charges for peak demand, transmission service, and generation capacity create new opportunities to reduce electricity costs. In some locations, a battery that reliably reduces consumption during peak periods can avoid substantial charges while capturing greater effective capacity value than an equivalent front-of-the-meter (FTM) resource. However, realizing value from BTM storage depends on specific utility territories, as well as when different peak charges are assessed and how effectively storage can mitigate them.

In a recent webinar, Dr. Michael Fisher, Senior Managing Director of PowerVAL™ at Ascend Analytics®, and Nate Rybin, Senior Energy Market Analytics Engineer, discussed the forces driving BTM storage adoption, the economics of demand, transmission, and capacity charge avoidance, how differences in peak timing and geography shape storage value, and how Ascend's BTM Asset Valuation solution can help value coincident peak mitigation, demand charge avoidance, and retail rate arbitrage.

Key Takeaways

- Multiple market forces are improving BTM storage economics for C&I customers. Rapid load growth is increasing capacity costs. Distribution and transmission investment continues to rise, while wholesale interconnection queues remain congested. Federal Energy Regulatory Commission (FERC) Order 2222 also creates opportunities for aggregated distributed energy resources to participate in wholesale markets.

- BTM storage that reliably discharges throughout coincident peak events can potentially reduce a customer's capacity and transmission billing determinants by the full nameplate capacity, thus capturing greater effective capacity value than FTM storage, which receives capacity accreditation based on effective load carrying capability (ELCC).

- Commercial demand charges have more than doubled since 2008: mean maximum demand charges in new US commercial tariff filings increased from approximately $7/kW in 2008 to $16/kW in 2025. BTM storage can reduce these costs by discharging during peak periods, allowing customers to lower billed demand without requiring operational changes.

- Across PJM transmission zones, annual transmission revenue requirements increased 33% between 2023 and 2026, compared with median peak load growth of approximately 2%. Seven PJM zones established their 2026 transmission peaks during winter, when extended periods of high demand can complicate accurate peak prediction.

- BTM storage can more reliably mitigate capacity charges than transmission charges in PJM because capacity peaks have historically occurred within relatively narrow summer afternoon windows. This creates opportunities for batteries with sufficient discharge duration to reduce capacity obligations, provided operators correctly anticipate peak events.

- Ascend's PowerVAL BTM Asset Valuation Solution helps developers and large energy users quantify and maximize the value of behind-the-meter storage in any US market. By combining Ascend's long-term market forecasts with utility-specific tariffs, load profiles, and optimized battery dispatch, PowerVAL evaluates the combined savings potential from demand charge reduction, coincident peak mitigation, and retail rate arbitrage.

Why Are BTM Resources Gaining Value Relative to Front-of-the-Meter Storage?

Several developments are improving the economics of BTM storage in US power markets. FERC Order 2222 creates opportunities for aggregations of distributed energy resources to participate in organized wholesale markets, although implementation remains uneven across ISOs. Accelerating load growth has put immense pressure on capacity markets and contributes to higher prices for reliable generation.

At the same time, rising utility distribution investment creates additional retail cost pressures, while congested wholesale interconnection queues make FTM development increasingly difficult. BTM projects can help large energy users avoid lengthy wholesale interconnection queues by connecting directly to a utility's distribution system, potentially bringing projects online faster.

Beyond potential interconnection advantages, BTM storage can also reduce a customer's peak billing determinants directly. C&I customers typically face three major categories of peak-power charges:

- **Demand Charges:** Set by the distribution utility, generally based on the customer's highest 15-, 30-, or 60-minute demand interval during a billing month.

- **Capacity Charges:** In PJM, determined by the customer's Peak Load Contribution (PLC), based on its average demand during the five highest RTO daily peak-load hours between June 1 and September 30.

- **Transmission Charges:** In PJM, determined by Network Service Peak Load (NSPL), reflecting customer demand during the transmission zone's peak hours. Depending on the zone, calculations may average between one and twelve peak observations.

Because these charges are determined by different peak periods, a battery's discharge may reduce one charge without affecting the others. Maximizing combined savings therefore requires coordinating dispatch across potentially competing peak windows.

BTM storage can also avoid capacity accreditation discounts applied to FTM resources. For example, a 1 MW battery discharging throughout a correctly anticipated coincident peak window can reduce a customer's capacity or transmission billing determinant by the full 1 MW, though this advantage also depends on maintaining sufficient discharge duration. In contrast, a comparable FTM battery receives credit only for its accredited capacity: in PJM, four-hour storage currently receives roughly half its nameplate capacity.

How Do Rising Demand Charges Affect BTM Storage Economics?

Mean maximum commercial demand charges have more than doubled since 2008, creating stronger incentives for C&I customers to reduce their monthly peak demand. As noted above, these charges are typically determined by a customer's highest 15-, 30-, or 60-minute demand interval, meaning that a relatively brief period of elevated consumption can materially increase a monthly electricity bill. BTM storage can reduce these costs by discharging during peak periods, allowing customers to lower billed demand without requiring operational changes.

However, the value of demand charge mitigation varies considerably by location. While most C&I tariffs have relatively modest demand charges, some utility territories impose rates several times higher than those of neighboring utilities, as shown in **Figure 1**. For developers, this creates substantial differences in project economics even for batteries serving otherwise comparable facilities.

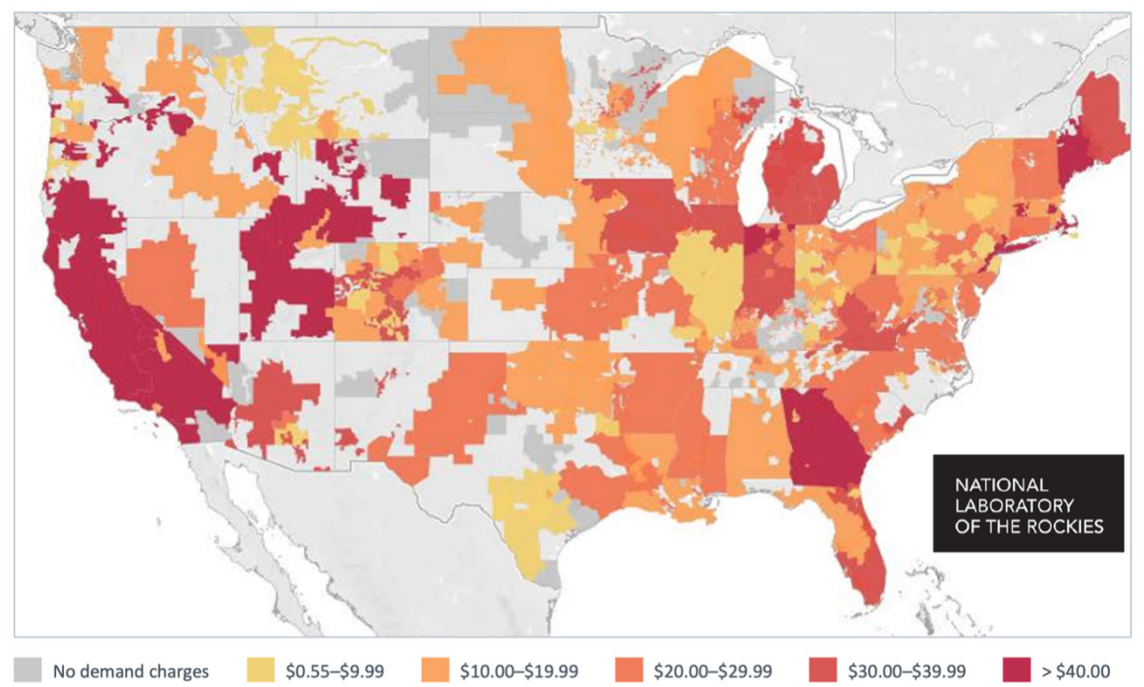


Figure 1. Maximum Peak-Period C&I Deamd Charge by Utility Service Territory, Summer Months ($/kW). *Source: National Laboratory of the Rockies.*

Thus, identifying where high demand charges coincide with load profiles that storage can effectively mitigate is central to determining which BTM projects offer the strongest economics. Facilities with pronounced, short-duration demand peaks are better positioned to benefit from battery discharge than those with sustained periods of high consumption, which may require longer-duration storage to achieve comparable reductions.

Why Are Transmission Charges Increasing, and Which Peaks Are Hardest to Predict?

Aging infrastructure, load growth, and changing generation patterns are driving major transmission expansion projects in US power markets, with overall transmission investment nearly doubling since 2015. In PJM, for example, annual transmission revenue requirements increased 33% between 2023 and 2026, while median peak load grew just 2%, pushing transmission costs higher relative to the demand being served.

For BTM storage, the opportunity to avoid these costs depends significantly on location and peak timing. Transmission charges vary widely across PJM zones, as shown in **Figure 2**, making peak mitigation far more valuable in some territories than others. However, capturing those savings can be difficult since transmission billing determinants are tied to a limited number of zone-wide peak events rather than to a customer's own peak consumption.

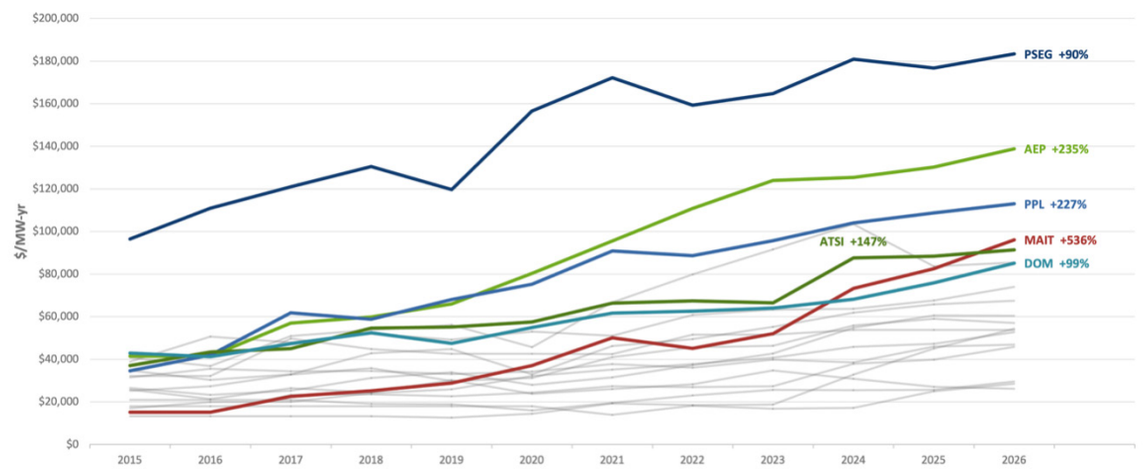


Figure 2. NITS (Network Integration Transmission Service) Rates by PJM Transmission Zone, Selected Zones Highlighted

The challenge becomes particularly pronounced in winter-peaking zones. Unlike summer peaks, which typically occur during relatively concentrated afternoon periods, winter storms can produce sustained high demand across many hours, including overnight. As shown in **Figure 3**, the extended load profile during 2022's Winter Storm Elliott contrasts with the sharper summer peak during the June 2025 heat wave, shown in **Figure 4**. This makes it harder to predict which hours will determine transmission charges and increases the risk that a battery will exhaust its stored energy before the relevant peak occurs.

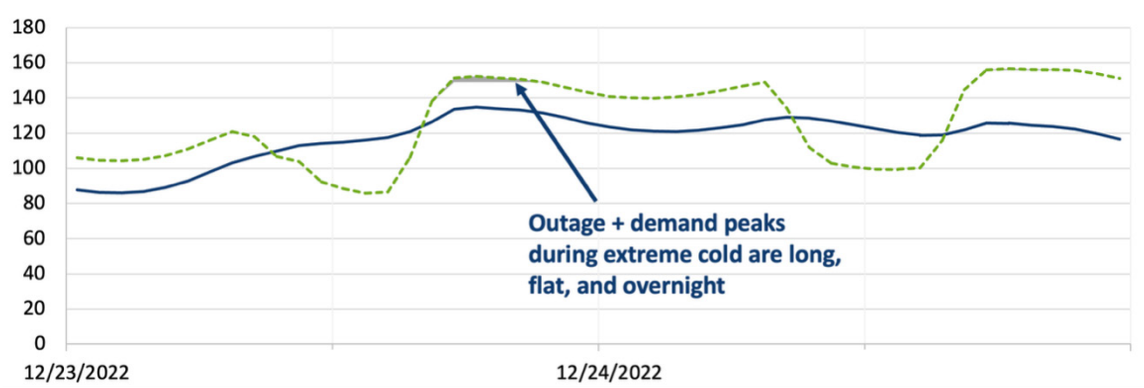


Figure 3. PJM Winter Load During Winter Storm Elliott (GW)

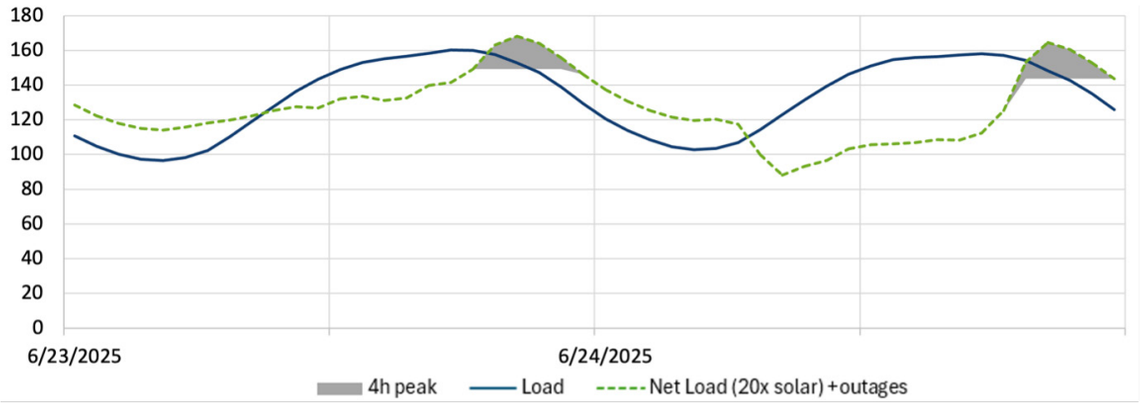


Figure 4. PJM Summer Load During 2025 Heat Wave (GW)

Consequently, the highest transmission charges do not necessarily translate into the greatest achievable storage savings. Developers must consider both the value of avoided charges and the likelihood that a battery can capture the relevant peaks, factoring in local demand patterns, seasonal peak timing, and battery duration.

Why Is PJM Capacity Charge Avoidance More Predictable?

In PJM, BTM storage is better positioned to reduce capacity charges than transmission charges because capacity peaks have historically occurred within relatively narrow, predictable summer afternoon windows. Unlike transmission peaks, which vary by zone and may occur during prolonged winter events, capacity charges are determined by five RTO-wide summer peak hours, making them easier to anticipate and target with battery discharge.

The economic incentive to capture these peaks has grown considerably as PJM's capacity market has tightened and auction prices have increased. For C&I customers, reducing consumption during these critical hours can translate into substantial avoided capacity costs, with the value of mitigation rising alongside capacity prices.

As shown in **Figure 5**, approximately 86% of PJM's coincident peak events between 2016 and 2025 occurred between 4 and 6 p.m., with a particularly strong concentration in July. This relatively predictable pattern allows batteries with sufficient discharge duration to target likely peak periods without requiring extended operation across many hours.

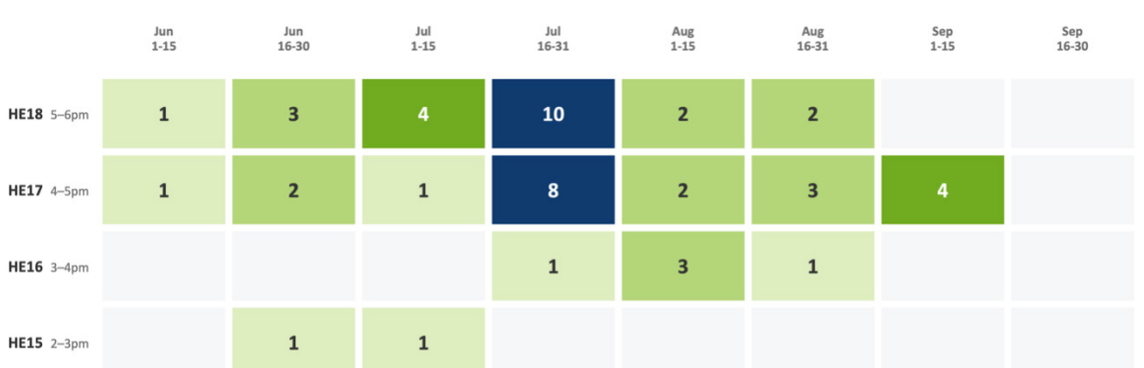


Figure 5. PJM Coincident Peak Events by Date and Hour, 2016-2025

However, realizing these savings still requires operators to identify the correct peak days and maintain sufficient battery state of charge (SOC) to cover the relevant hours. The distinction between predictable summer capacity peaks and more uncertain transmission peaks makes it essential to evaluate the two cost-avoidance opportunities separately, even when a single battery is designed to capture both.

Interested in Learning More?

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The company's offerings enable decision makers in power development and supply procurement to maximize the value of planning, operating, and managing risk for renewable, storage, and other assets. From real-time to 30-year horizons, their forecasts and insights are at the foundation of over $50 billion in project financing assessments.

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