Grid Action Report – June Heat Wave

Clean energy provides savings, boosts grid reliability

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Advancing the Clean Energy Future

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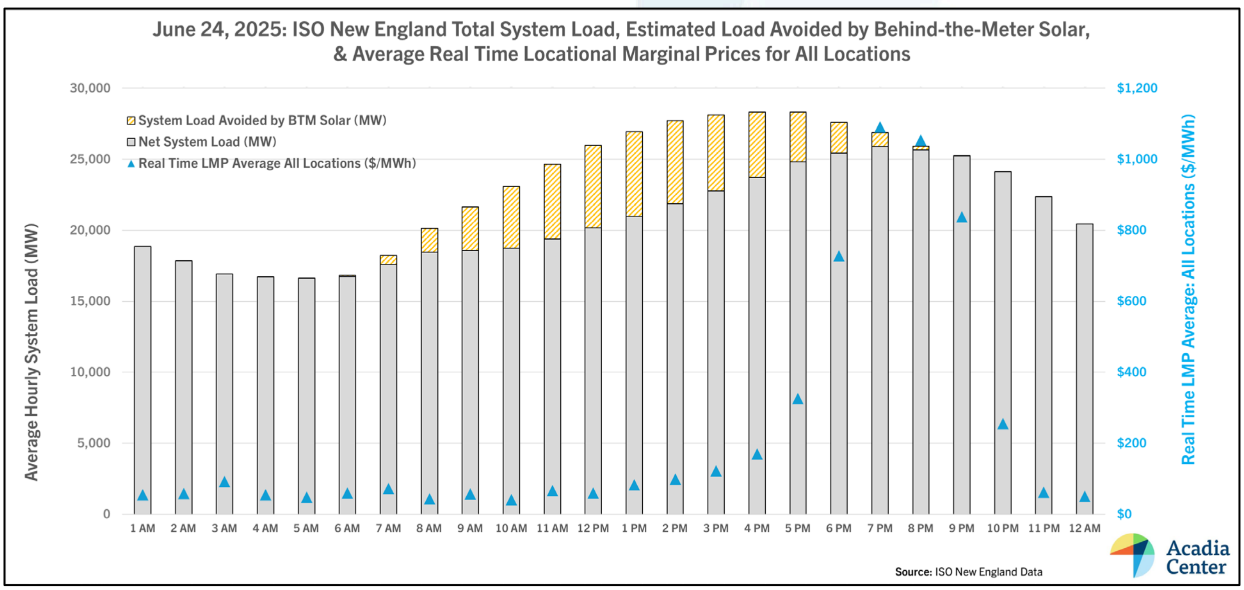
Local solar, energy efficiency, and other clean energy helped make New England's power grid more reliable and more affordable for consumers during the June 24th 100°F peak event

- As real-time wholesale electricity prices soared above $1,000 per MWh in the evening, **behind-the-meter (BTM) solar saved consumers *at least* $8.2 million** on one of the most expensive days of the year for the grid.
- Five-plus gigawatts (GW) of BTM solar helped the region's power grid ride through one of the hottest days of the year, which tested the grid's reliability with the highest peak demand in several years.
- System data reveals clear evidence for the benefits of deploying **battery energy storage** across the region to even better align periods of solar output with peaks in demand and wholesale prices.
- Nearly two gigawatts of peak demand reductions from **energy efficiency** likely helped ensure resource adequacy as well. [CELT 2024]
- Net imports from neighboring regions were relied on in all 24 hours of the day, exceeding 3 GW from 5pm-on, during the periods of highest net demand and cost – highlighting the benefits of **interregional transmission** even when neighboring systems also face system stress.
- Reckless proposals at the federal level to punish renewables and energy storage would severely constrain regions' ability to build on this approach and keep electricity reliable and affordable.

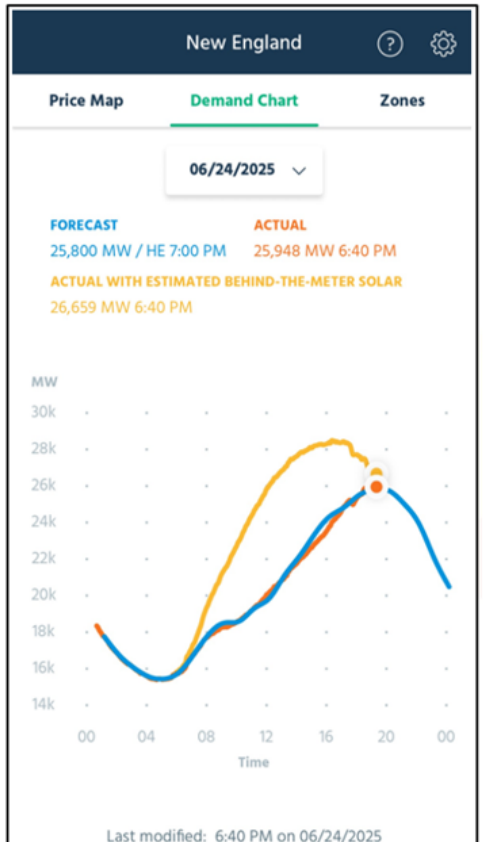
Breaking Down an Exceptionally Hot Day for the Grid



As temperatures rise each summer, use of air conditioning in homes and businesses drives increasing electricity demand. This phenomenon is true across the country and in the northeast, where the region's grid is "summer peaking" – meaning that annual peak demand occurs each year during the summer (although that is expected to change in future decades). Last week, a historic heat wave presented the latest example of this dynamic in stark terms.

On June 24, grid operator ISO New England (ISO-NE) had to issue a Power Caution and, subsequently, four escalating energy alerts due to hot, humid weather driving consumer electricity demand to a peak of 26,024 megawatts (MW) at around 6:45pm in the evening, the highest demand that ISO-NE experienced in over a decade. [Hot weather updates: Week of June 23, 2025 - ISO Newswire] Wholesale electricity prices soared above $1,000 per MWh during this peak period, compared to $44 per MWh on average during 2024.

June 24 ISO-NE Demand Chart: Forecast vs. Actual



Source: ISO To Go app

The 26,024 MW (net) peak demand figure does not reflect contributions from BTM solar.[1] Taking the amount of demand served by BTM solar into account, gross demand peaked according to ISO-NE at approximately 28,460 MW at 3:40 p.m. This exceeded ISO-NE's highest ever demand peak – 28,130 MW – recorded on August 2, 2006. [Key Grid and Market Stats] Absent BTM solar, ISO-NE would have exceeded its 19-year-old peak demand record.

At 3:40 p.m., when gross demand (which *includes* estimated contributions of BTM solar) peaked at 28,460 MW, ISO-NE reported that the power plants it dispatched were serving approximately 24,020 MWs of demand. BTM solar therefore shaved approximately 4,400 MW of demand from the gross peak. It is noteworthy that the 28,460 MW gross demand peak, reached at 3:40 p.m., exceeded ISO New England's 26,024 net peak, reached more than two hours later at 6:50 p.m.by ~2,400 MW. BTM solar both delayed the time of the system peak (to a time of day with slightly cooler temperatures) and significantly reduced it. BTM solar therefore made vital contributions to system reliability on a critically high-demand day, when ISO-NE was already issuing escalating alerts. Even at the time of the 6:59 p.m. net peak, BTM solar was still producing roughly 600 MWs of power, serving load and suppressing demand. Had the net peak actually reached the same level as the gross peak, ISO-NE would have had to implement additional contingency measures to avoid costly reliability impacts.

Economically, the substantial amount of BTM solar on the grid saved consumers in the ISO-NE area ***at least* $8.2 million – and potentially more than twice that sum (see below)** – in avoided wholesale costs on one day, which is one of several ways in which BTM solar save customers money. This $8.2M figure is a conservative estimate derived by multiplying the average day-ahead locational marginal price (LMP) across the ISO-NE region by the

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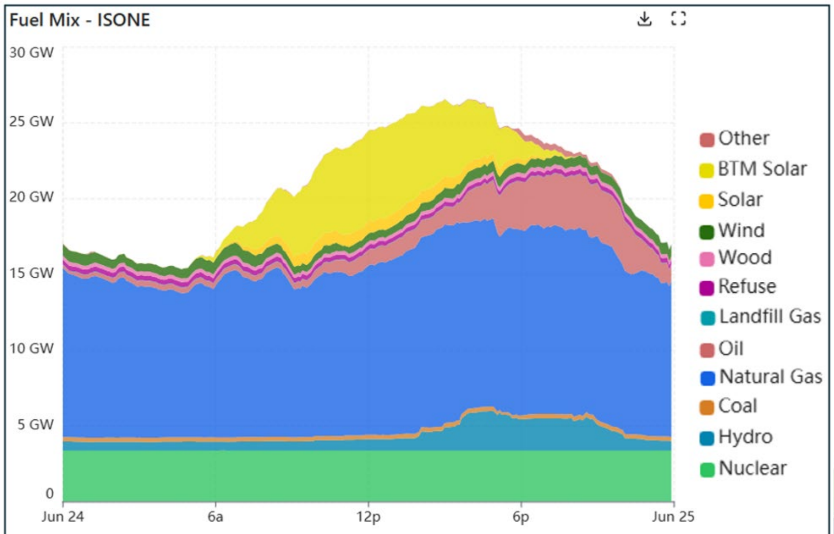
[1] There are 860 MW of utility-scale solar in New England actively participating in ISO-NE markets. These facilities can be seen and dispatched by ISO New England. As of December 2024, by contrast, there were 7,634 MW of BTM solar installed throughout the region, most with capacities calculated in kW, with others reaching several MWs in size. All BTM solar is less than 5 MW. https://www.iso-ne.com/static-assets/documents/100022/2025_final_pv_forecast.pdf.

average BTM solar capacity (MW) estimated by ISO-NE to be online in a given hour.[2] This savings estimate does not include any avoided transmission, distribution, capacity market, and other energy system costs.

June 24 ISO-NE Fuel Mix

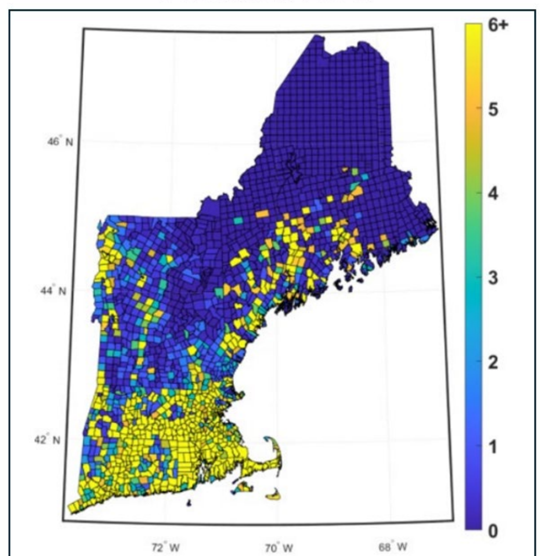


Source: gridstatus.io

BTM solar also depresses wholesale prices by decreasing overall demand on the system. This – similar to energy efficiency, not pictured here – saves customers money when it allows a cheaper marginal power plant to set prices in wholesale energy market auctions, in either the real time or the day-ahead markets. Averaged to the regional level, the hourly price for a megawatt-hour (MWh) of electricity peaked at $1,091.29 between 6 and 7pm, approximately 6.5 times higher than it was at the 3:40 p.m. gross peak, when regional LMPs averaged $169.95. When BTM solar was producing nearly 6,000 MW of power – its maximum output level – the regional hourly LMP price was $82.82.

To examine the benefits of price suppression, day-ahead prices in low- or no-solar hours can be used to roughly estimate a counterfactual scenario in which this same day had occurred without production from BTM solar. For hours with significant solar production (8am – 6pm), this approach estimates the counterfactual LMP for each hour by substituting the day ahead LMP for the no- or low-solar hour (1am – 7am, or 7pm – midnight) with the most similar total load. So, for example, total gross load for the hour ending at noon was 25,979 MW with day-ahead LMP average of $83.33; and, total net load for the hour ending at 7pm was nearly identical (25,898 MW), with a day-ahead LMP average of $465.35. This counterfactual estimate methodology assumes the LMP for the hour ending at noon is $465.35.

New England Installed DER PV Capacity as of December 2024



Source: ISO-NE

Under this alternative approach, BTM solar avoided **as much as roughly $19.4 million in costs** on this single day by suppressing the overall price of wholesale electricity. The majority of these BTM solar resources receive compensation from policies such as net metering, but LMPs during these peak periods – and therefore the associated energy market savings – by themselves far exceed retail net metering compensation levels. And, that is before accounting for the additional

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[2] Using the day-ahead LMP is more conservative than the real-time LMP, because the day-ahead price reflects the value of BTM solar in the market without internalizing any exogenous circumstances that may raise the real-time price, such as a power plant tripping offline. Savings estimates would be higher if the real-time price were utilized for this calculation.

benefits BTM solar provides by avoiding transmission, distribution, capacity, and other costs that would be needed to produce, transport, and deliver an equivalent amount of power.

There is also clear evidence that additional BTM battery energy storage would have been able to further reduce the overall cost to consumers by increasing flexibility and shifting the solar production later in the day, dampening the early evening peak prices. The figure above (at the very top of this piece) shows the correlation between actual demand served (in grey), estimated demand being served by BTM solar (in yellow), and average hourly real-time LMPs aggregated to the regional level. A brief visual inspection makes it clear that, were the BTM solar generation able to be more flexibly deployed to later hours, the high prices around net peak could have been further suppressed. Intuitively, this would entail shifting the yellow shaded areas to the right, more evenly applying BTM solar's demand suppression across the periods of highest net need. While this is a conceptual simplification, the principles bear out – a shift of this nature would more successfully align solar output with the highest periods of demand and the highest prices. California and Texas have already seen substantial reliability benefits – and price-smoothing outcomes – from increased battery capacity providing flexibility on high demand days.

Transmission Challenges and Opportunities Also on Display

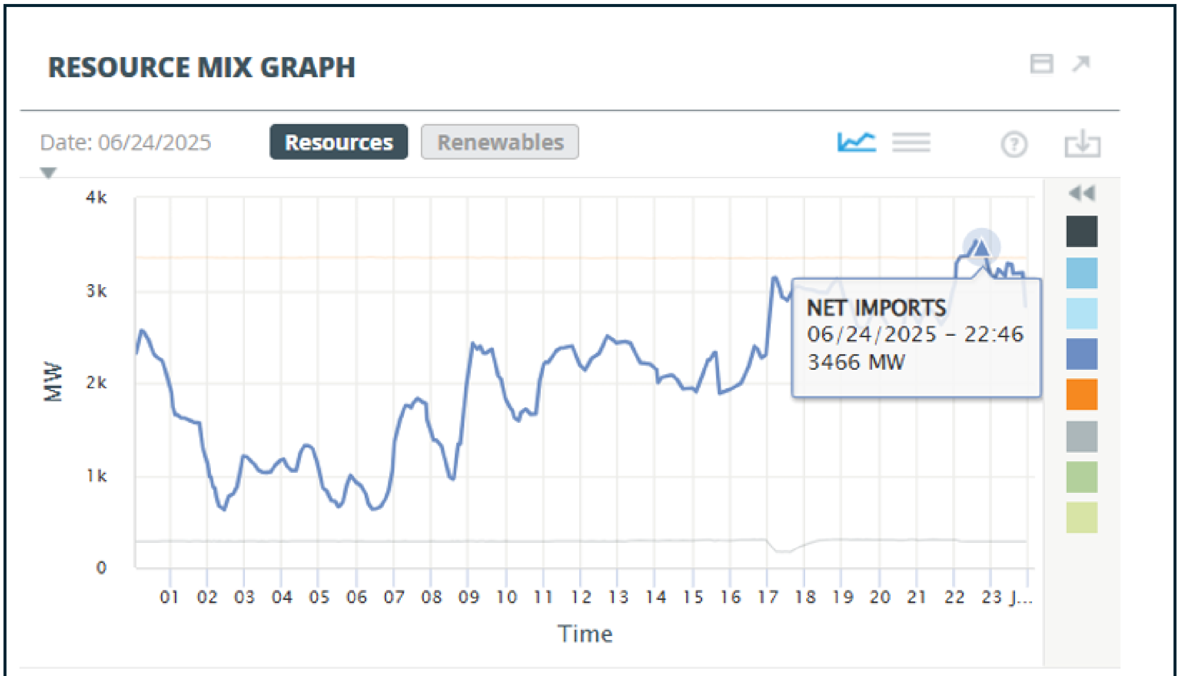
June 24 also offered several important case studies on the impacts of transmission system planning in the region, both promising and challenging. Regionally, the impacts of constraints across the North-South interface in southern Maine were very evident, especially early in the day as temperatures began to rise. Significant price separation occurred between grid zones in Maine and the rest of the region, with cheaper and often cleaner resources in Maine bottlenecked – and even curtailed in some cases –and unable to serve load and relieve prices in the rest of the region. While anecdotal, these pricing dynamics provide solid evidence for the value of the Longer-Term Transmission Planning (LTTP) process underway in New England right now, which seeks to bring forward transmission solutions to address these longstanding North-South interface constraints and realize significant economic, reliability, and emissions benefits for the grid and region.

June 24 1:10 PM ISO-NE Real Time Price Map

Source: ISO To Go app

Inter-regionally, the benefits of cooperation and electricity trade between neighboring grid regions also played a key role in ensuring reliable grid operations during the heat wave. New England relied on net imports from neighboring regions (such as Québec, New Brunswick, and New York) in all 24 hours of the day on June 24. These net imports exceeded 3 GW – comparable to the level of output from the region's nuclear power plants – from 5pm on, during the periods of highest net demand and cost, when contingencies were being called by ISO-NE. This level of contribution highlights the significant benefits of interregional transmission for grid reliability (and affordability), with mutual aid from neighboring regions coming to the rescue even when they were facing system stress. There were also anecdotal reports that certain Hydro-Quebec reservoirs had to release excess water due to unexpectedly heavy rainfall received the day before, indicating that further transmission capacity could have potentially allowed for greater supportive trade.

June 24 ISO-NE Total Net Imports



Source: ISO Express

Taken together, the June 24 heat wave event was a clear example of a successful portfolio-based approach, using multiple complementary clean energy resources – solar, energy efficiency, energy storage, transmission imports, and beyond – to help ensure resource adequacy for the grid and relieve extreme prices for the region's consumers. Unless further thwarted by counterproductive federal proposals, the northeast will see an increasingly diversified clean energy portfolio called upon to meet similar peak demand events in the years ahead, minimizing the reliance on aging, inefficient fossil fuel power plants to serve peak demand.