ecobee

Grid Resiliency Report

Prepared for ecobee
By Demand Side Analytics, LLC
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Table of Contents

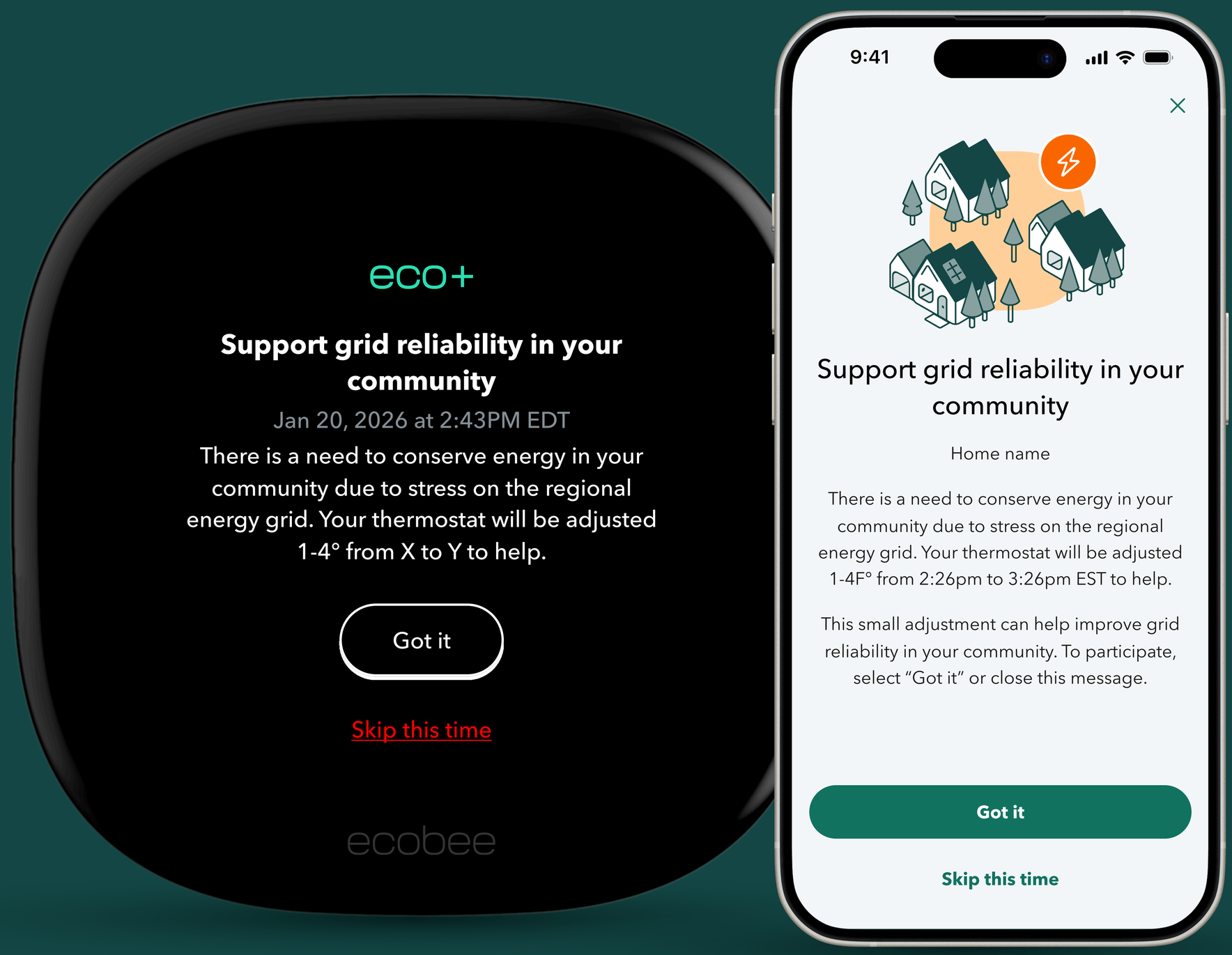
Executive Summary

The ecobee Grid Resiliency (GR) service allows utilities and energy partners to automatically enroll ecobee devices into their GR program to unlock additional capacity when the grid needs it most. The service operates through eco+, a thermostat optimization platform designed to improve residential heating, ventilation, and air conditioning (HVAC) performance and maintain occupant comfort. The GR service uses the eco+ "Community Energy Savings" (CES) feature to provide critical capacity for extreme grid stress support. When critical grid conditions arise and reliability could be at risk, the GR service reduces HVAC load by temporarily adjusting temperature setpoints for ecobee users who have CES enabled. This shifts energy use away from peak periods to help stabilize the grid.

The concept of GR originated from ecobee customer insights. Research showed that most surveyed users were interested in supporting their community during critical events, especially if participation could happen automatically without requiring them to take an active role. Customers appreciated the ability to help without needing to opt in manually or even be at home.

A key advantage of GR is that customers do not need to take any action with their utility to participate. In territories where GR is deployed, eligible devices are automatically enrolled and transparently notified of the service. Thereafter, when a grid reliability event occurs, ecobee sends alerts to enrolled devices and adjusts temperature setpoints to provide critical capacity. Customers enrolled in a GR program are customers with eco+ and the CES feature enabled that have not yet enrolled in a Demand Response (DR) program. Figure 1 shows the advance notification that customers receive through the ecobee mobile app and thermostat display prior to a critical capacity event.

Figure 1: Pre-Event Experience

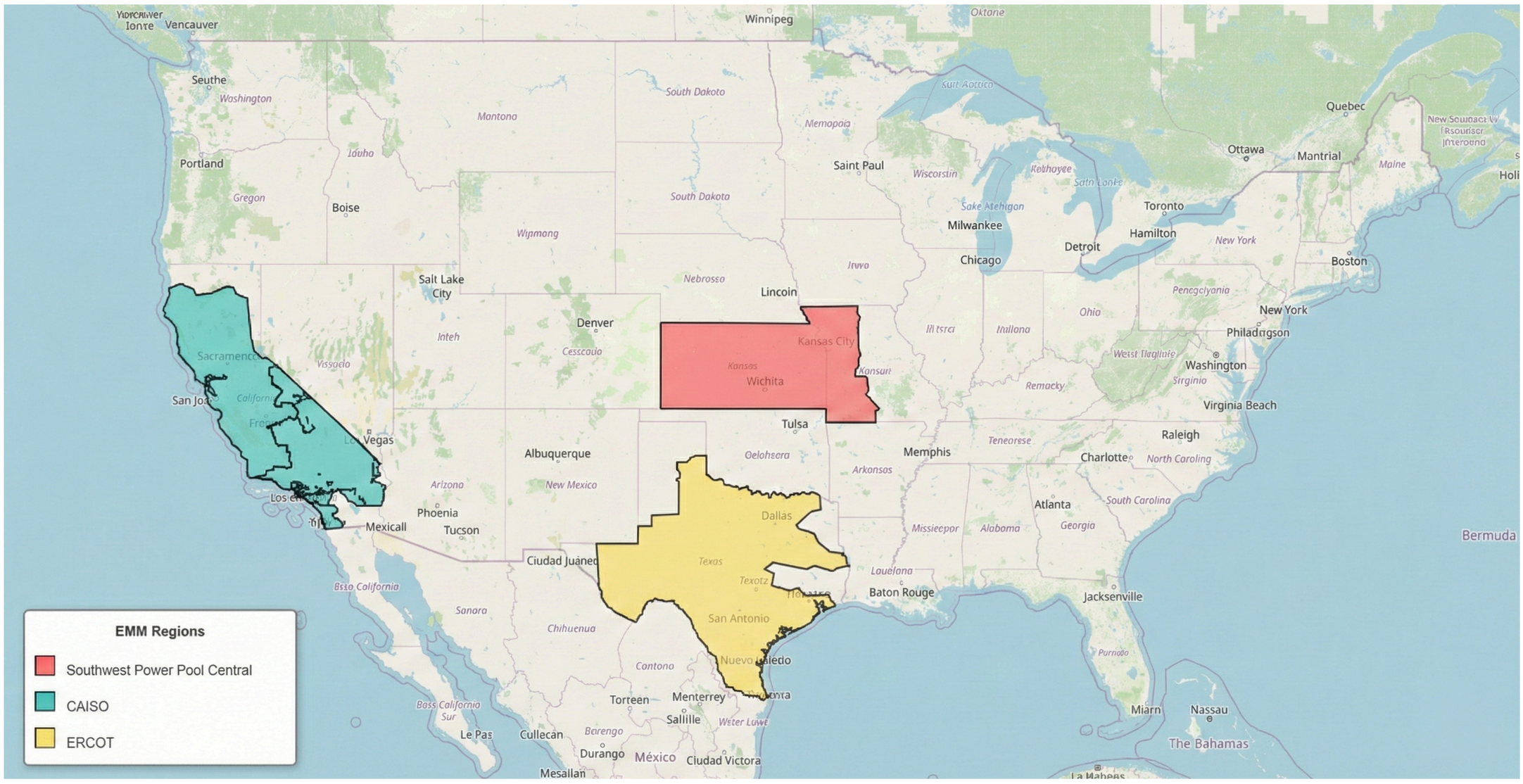


Customers retain full control of their comfort before and during an event and can opt out at any time using the mobile app, thermostat display, or by manually changing their setpoint. During summer 2025, ecobee deployed GR in several areas of the United States. The grid or market integration mechanism varied by jurisdiction, but each deployment was at scale with over 143,000 devices called on over the season. ecobee retained Demand Side Analytics (DSA) to analyze the load impacts of the summer 2025 GR events and review the settlement methods used in each jurisdiction to value GR and similar resource types.

Summer 2025 Deployment Results

In 2025, ecobee deployed its Grid Resiliency service across three major markets with varying implementation approaches. The markets covered geographies in the CAISO, ERCOT, and SPP (Central) Independent System Operator territory. In total, 11 events were called over summer 2025 with an average peak load reduction of 0.65 kW per device, an average maximum kW reduction of 1.01 kW per device and a total of 108 MW of load shift capability demonstrated across the three markets.

Figure 2: Grid Resiliency Deployment by Market



Each market represented a diverse mix of customers with different operating conditions including geography, weather, retail electric rates, and customer composition. Table 1 shows average device participation and performance across all markets and events. The maximum per-device reduction is the largest single hour impact across the summer. In all three markets, this was observed during the first hour of dispatch during an event. Analyzing the performance of multiple GR events among these large populations of devices allows us to make strong inferences about the capability of GR as a reliable critical capacity resource elsewhere on the grid.

Table 1: Deployment Summary by Market

Market	Average Devices	Average Event Duration (Hours)	Average per-device kW Reduction	Maximum per-device kW Reduction
CAISO[1]	61,209	4:00	0.21	0.46
ERCOT	55,059	2:06	1.05	1.56
SPP	16,358	2:00	1.00	1.25
Total[2]	**132,626**	**2:58**	**0.65**	**1.01**

1. Accreditation is based on estimated performance at extreme weather. At CAISO planning conditions, we estimate the GR per-device capability at approximately 0.5 kW average and 1.0 kW maximum
2. The average and maximum values are weighted calculations across markets by the number of devices

The ecobee GR service demonstrated substantial capacity provision across all three markets, with performance variations reflecting deployment frequency and distinct market operating characteristics as illustrated in Figure 3, Figure 4 and Figure 5.

Figure 3: Example Grid Resiliency Event Results for CAISO

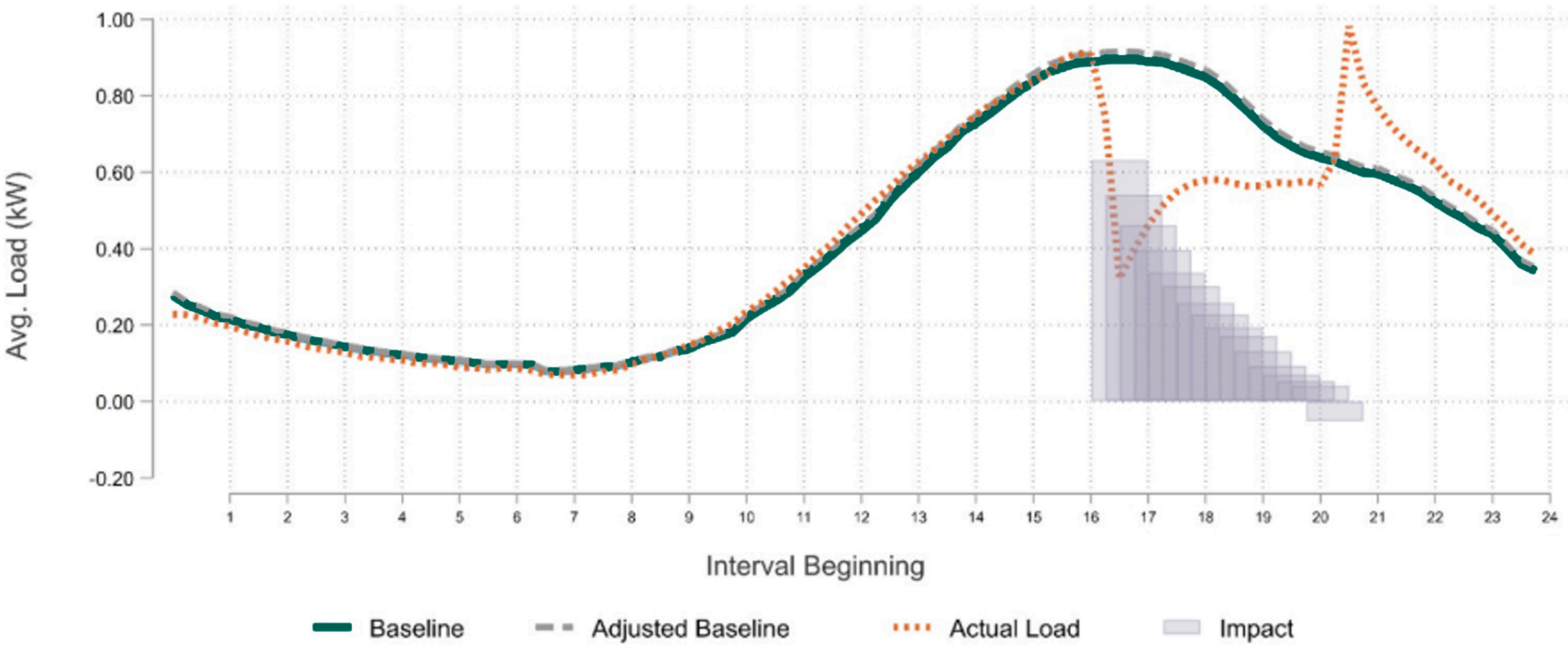


Figure 4: Example Grid Resiliency Event Results for ERCOT

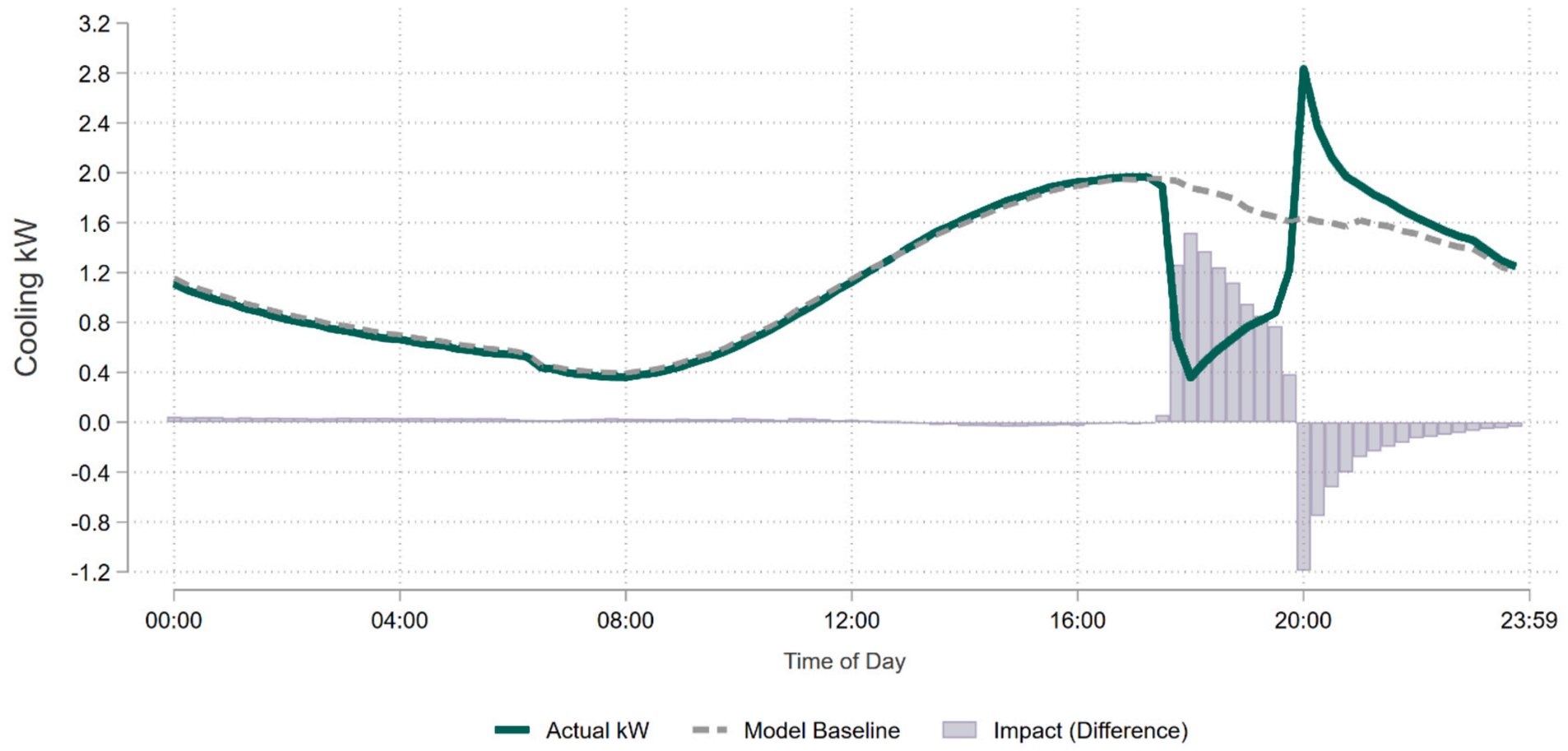
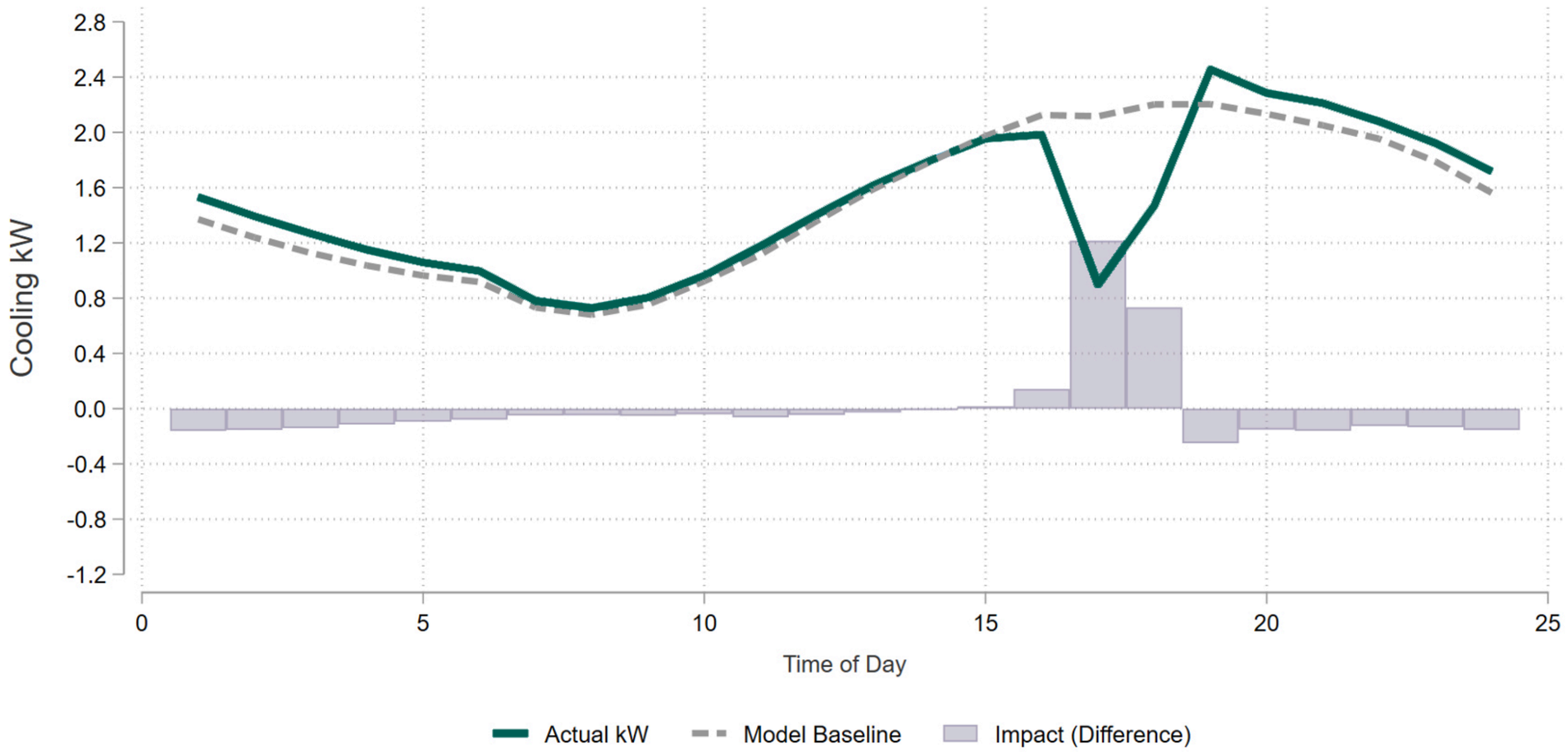


Figure 5: Example Grid Resiliency Event Results for SPP

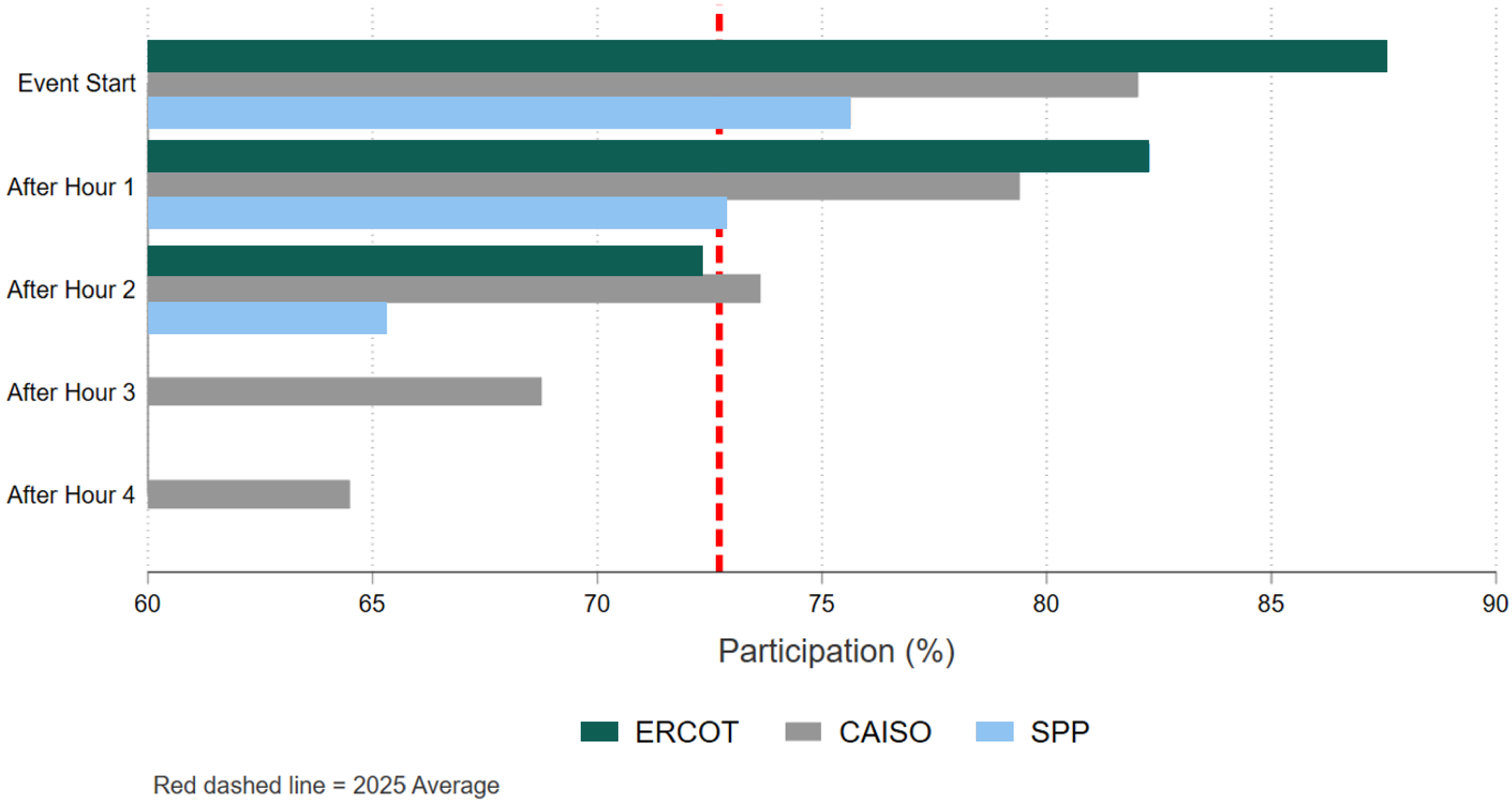


Events in the ERCOT territory spanned June through September and achieved average per-device impacts ranging from 0.58 kW to 1.26 kW. SPP's July deployment achieved comparable per-device performance of 1.00 kW across 16,358 devices, validating the service's effectiveness under typical summer stress conditions. CAISO's events produced lower per-device impacts, ranging from 0.18 kW to0.24 kW per-device, however, these deployments occurred at cooler temperatures and operated for an extended four-hour dispatch window compared to shorter durations in events in other markets. The weather-normalized per-device impacts used to assess performance for the two California events were above 0.5 kW[1]. The consistency of per-device performance across diverse geographic markets and operational conditions demonstrates GR as a valuable, viable, and reliable critical capacity resource.

Across all markets, GR reaches a substantial number of devices and sees strong participation during events. Participation rates start at or above 80% and two-thirds of devices remain participating by event end. Figure 6 shows the average participation rates by market and event hours. The red dashed line represents the overall 2025 seasonal average participation rate of 72.71% across all event hours and markets. The pattern of gradually declining participation is typical of utility thermostat programs. Even in the longer California events, participation rates remain high across all event hours, demonstrating that participants remain engaged with the service and committed to doing their part to help ensure grid reliability. These results validate GR as an effective critical capacity resource, with automatic enrollment and low opt-out rates leading to large numbers of activated devices.

[1] The program employs region-specific average air conditioner capacity assumptions for converting runtime datato demand estimates. For CAISO territory, a conservative assumption of 2.5 kW is applied assuming an averageAC size of 2.5 tons and efficiency of 1 kW per ton, while ERCOT uses 3.61 kW and SPP uses 3.0 kW.

Figure 6: Event Participation by Market



Key Findings

The evaluation across CAISO, ERCOT, and SPP markets reveal weather conditions, event duration, and AC size as the key predictors of per-device reductions. Table 2 outlines several insights that emerged from this technology assessment, highlighting GR's effectiveness as a critical capacity resource. These findings provide a foundation for understanding GR's scalability and operational capability across different territories, operating conditions, and grid integration mechanisms.

Table 2: Key Research Questions Answered

Key Question		Finding
1	What is the per-device impact during GR events	**Summer 2025 per-device performance was substantial across all deployments, averaging 0.65 kW/device, with variance observed by market and event conditions.** ERCOT achieved an average of 1.05 kW per device across events. SPP achieved 1.00 kW per device on average. CAISO achieved 0.21 kW per device during its four-hour events. Notably, Hour 1 impacts were consistently the strongest across markets, with performance declining over subsequent event hours, which is a typical pattern for thermostat-based programs.
2	What is the total impact of the GR Service during events?	**Summer 2025 demand reductions were substantial across all three markets totaling over 108 MW in aggregate.** ERCOT events delivered up to 78.1 MW per event with an average of 58.19 MW. SPP events delivered 16.36 MW in aggregate and CAISO's events delivered 14.01 MW. Across all markets and events, the ecobee Grid Resiliency service showed consistent capability to deliver meaningful peak load reductions.
3	What is the expected impact of the GR service at system peak conditions?	**The performance of the GR service is clearly load-following and delivers larger impacts at extreme conditions when the grid is most constrained.** The two CAISO events were called on relatively mild days. In the CAISO program, weather-dependent resources are evaluated based on their estimated capability at the peaking conditions used for system planning. The estimated capability under these conditions in the CAISO region was over 0.5 kW per device and 30 MW in aggregate for a four-hour event
4	How does GR perform across different markets?	**Performance varies across different markets based on customer characteristics, deployment strategy, number of devices, and temperature/weather conditions.** ERCOT emerged as the highest-performing market, achieving an average per-device impact of 1.26 kW during the July 30th event. SPP's July 28 event demonstrated comparable per-device performance at 1.00 kW, validating effectiveness under typical summer stress. CAISO's September 16 event produced lower per-device impacts at 0.24 kW but was dispatched during mild weather conditions for an extended period compared to other market events and used a very conservative connected load assumption.
5	How does the GR service performance differ during different weather conditions?	**Performance is strongly influenced by weather. There is a clear relationship where higher outdoor air temperatures lead to greater demand reductions.** Given extreme grid stress is also strongly influenced by weather, GR's performance demonstrates strong alignment to providing critical capacity for grid reliability. For example, the July 30 ERCOT event at 94.4 degrees Fahrenheit achieved the highest per-device impact at 1.26 kW, while the September 25 event at 79.6 degrees Fahrenheit produced the lowest at 0.58 kW. Within different individual events, Hour 1 impacts showed the strongest temperature sensitivity, while any subsequent hours showed reduced impacts as cooling load diminished.
6	As an automatic enrollment service, how is attrition at the event level?	Participation rates demonstrated typical thermostat program decay patterns, with initial engagement starting very high at the beginning of events and declining as events continued. This pattern was consistent across all markets, though the rate and magnitude of decline varied depending on market and event duration. Despite the gradual decline, **most of the customers activated at the beginning of an event participated throughout the remainder of the event.**

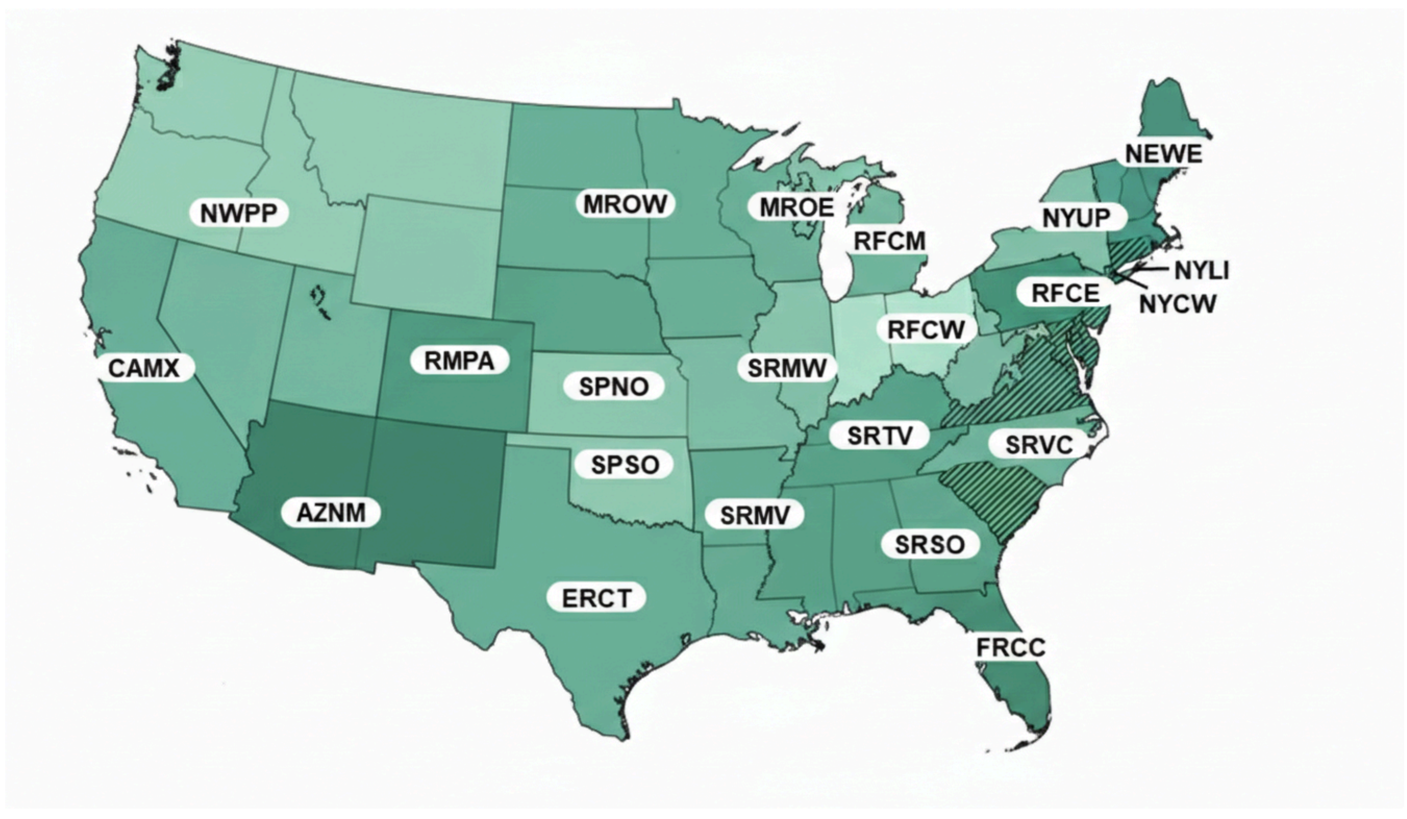
Estimated Capability of Grid Resiliency by Region

This analysis explored the performance of the GR service in ERCOT, CAISO, and SPP Central. Based on the observed demand reductions during summer 2025 and the number of ecobee devices with the CES feature enabled who are not currently enrolled in a DR program, we estimate the total capability of the GR service in North America at approximately 2.8 GW. Figure 7 shows the regions of the US grid as specified by eGRID[2] and Table 3 shows the estimated capability. We assume an average capability of approximately 0.8 kW per thermostat with region-specific adjustments for climate and an 8% line loss factor.

Table 3: Estimated Capability of a Two-Hour GR Event by Region

Region	MW Capability
CAMX	195
NWPP	154
AZNM	136
RMPA	62
MRO (MROW+MORE)	68
SPP (SPNO + SPSO	42
ERCOT	271
SERC W (SRMW + SRMV)	89
SERC E (SRTV + SRSO + SRVC)	558
RFC (RFCW + RFCM + RFCE)	569
NPCC (NYCW + NYLI + NYUP + NEWE)	176
FRCC	265
Canada	215
Total	**2,800**

Figure 7: Map of US eGRID Regions



[2]The Emissions & Generation Resource Integrated Database (eGRID) is an publicly available U.S. Environmental Protection Agency database which divides the U.S. into subregions to track power emissions and generation.