



Battery Storage Pilot Program

Quarterly Evaluation Report: Q4 2021

Prepared for:

Liberty Utilities



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Reference No.: 208249
February 14, 2022

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Background

Guidehouse prepared this report as part of its evaluation of Liberty Utilities' (Liberty's) Battery Storage Pilot Program (pilot) and the report reflects data and progress from October 1, 2021 through December 31, 2021 (Q4 2021). Throughout the duration of the pilot, Guidehouse is providing quarterly updates regarding key metrics and insights with a primary focus on peak demand reduction performance.

The pilot is being executed in two phases. In Phase 1, Liberty is deploying two Tesla Powerwall 2 batteries at each of the 100 participating residential customers' homes. Liberty will own and install the batteries and customers can participate by paying either an upfront fee or a monthly payment for 10 years. Phase 1 began in November 2020 and will proceed through August 2022. Phase 2 is planned to begin in September 2022 and proceed through November 2023 (36 months from the beginning of Phase 1). Phase 2 will introduce additional Tesla Powerwall 2 batteries (up to 500 total) and may also include a Bring Your Own Device program with up to 2,500 kW of additional capacity.

Liberty is dispatching batteries to take full advantage of coincident peak demand reduction during forecasted coincident peak demand conditions.¹ At all other times, participant batteries will be dispatched automatically to deliver additional participant value through time-of-use (TOU) bill savings.² To enable a minimum amount of available energy for backup power in case of an outage, 20% of the battery energy is held in reserve. The remaining energy is available for peak demand reduction and TOU bill savings.

The following sections provide updates regarding deployment progress, peak reduction performance, and customer surveys through the end of the fourth quarter of 2021.³

Deployment Progress

Figure 1 summarizes deployment progress through December 31, 2021. As of this date, Liberty has made the following progress deploying batteries to pilot participants:

- Installed new meters for all 98 participants.⁴
- Installed batteries for 93 participants (4 added in Q4).
- Commissioned batteries (given authority to connect) for 89 participants (3 added in Q4).
- Activated TOU rates for 89 participants (7 added in Q4).

For most participants, TOU rates were activated for the first billing cycle after the battery was installed (approximately 3 weeks after installation, on average). However, for 11 participants

¹ Batteries are dispatched to offset coincident peak demand charges from ISO-NE associated with Regional Network System demand, Local Network System demand, and Forward Capacity Market demand.

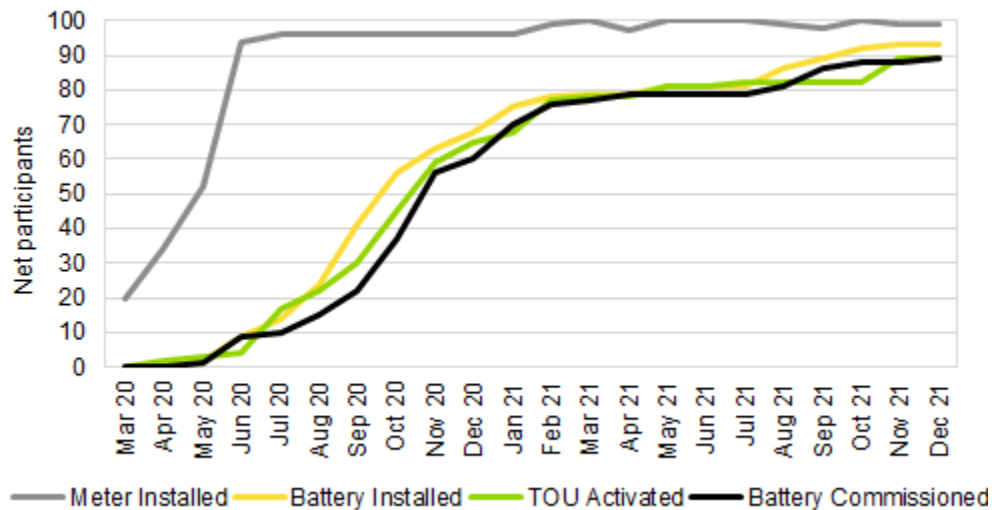
² All participants in Phase 1 are subject to seasonal TOU rates. Batteries will be discharged for TOU bill savings only during Critical Peak hours.

³ All data provided herein is preliminary and based upon availability of data at the time of report preparation.

⁴ This value (98) represents the net total meters for participants. Liberty had installed meters for 100 participants, then 5 dropped out, and 3 were added.

with solar PV systems, TOU rates were activated prior to battery installation (approximately 17 weeks before battery installation, on average) as moving those customers to the TOU provided greater bill savings during those months versus continuing service on Residential Rate D. On average, batteries were commissioned approximately 4 weeks after installation.

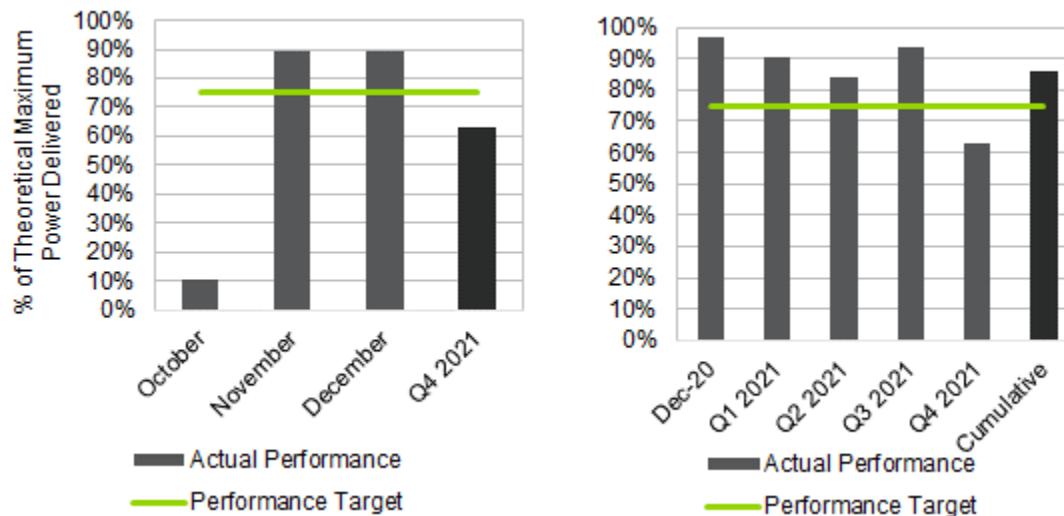
Figure 1. Cumulative Battery Deployment Progress through Q4 2021



Source: Guidehouse Analysis

Peak Demand Reduction

Figure 2 summarizes the peak reduction performance during the coincident peak hour of each month of the fourth quarter of 2021. Peak reduction performance is defined as the actual peak reduction (average kW dispatched during coincident peak hour) relative to the maximum power rating of the batteries (5 kW per battery, 10 kW per customer). As set forth in the pilot settlement agreement, the performance target is 75%. Liberty exceeded this target in two of the three coincident peak hours during Q4 2021. The performance for the fourth quarter of 2021 as a whole was approximately 63%, which is below the performance target. Figure 2 also shows the cumulative performance of the batteries during Phase I, starting with December 2020 (the first coincident peak after the start of Phase I). Cumulative performance through the end of Q4 2021 is 86%, which exceeds the performance target.

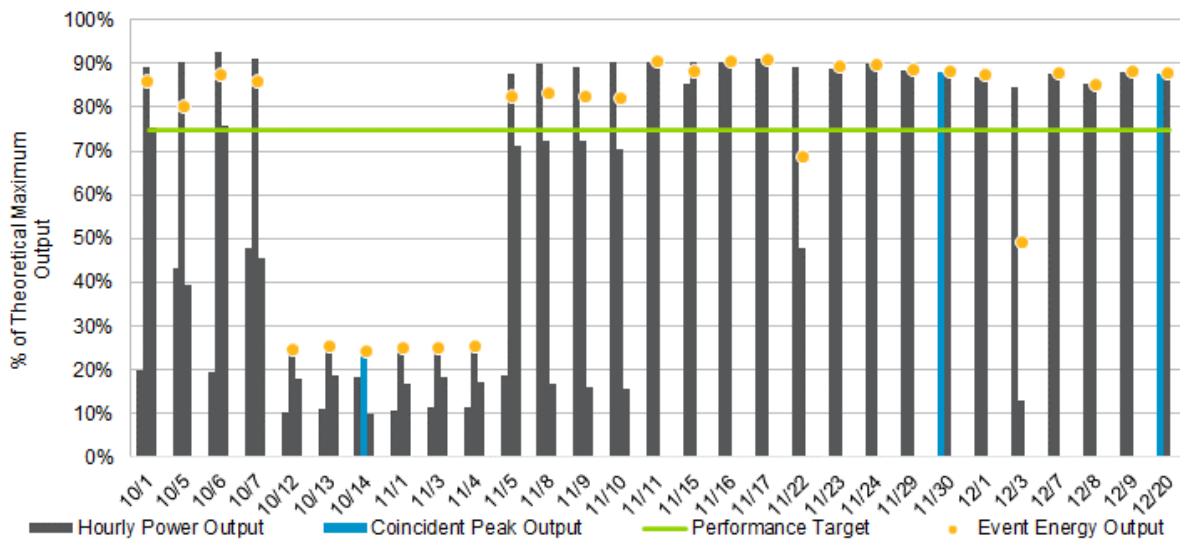
Figure 2. Coincident Peak Reduction for Q4 2021 (left), Phase I Cumulative (right)


Source: Guidehouse Analysis

To achieve the targeted coincident peak reduction, Liberty called 29 peak reduction events during Q4 2021. Of those, 15 events were 3 hours in duration, and 14 events were 2 hours in duration, yielding 73 total event hours during this period. Figure 3 shows the hourly power output (relative to total rated power output) during each of the peak reduction events of the fourth quarter of 2021. Additionally, Figure 3 shows the relative energy output during each individual event (relative to the maximum available energy during the course of the event).⁵

For all events (except the events between 12th October to 4th November 2021), power output exceeded the performance target during at least one hour of the event. Tesla reported that there was an unexpected issue with many Powerwall configurations in the Liberty fleet that limited the amount dispatched to the grid between 12th October and 4th November, resulting in lower overall performance during those events. Also, battery power output cannot exceed the target during an entire three-hour event due to limited available energy in the battery (nominal duration at maximum power is 2.2 hours).

⁵ The maximum available energy is based upon the minimum of (a) the rated power multiplied by the duration of the event and (b) the total usable energy in the batteries (10.8 kWh per battery, which is based upon 13.5 kWh rated energy capacity less 20% energy held in reserve).

Figure 3. Demand Reduction Events, Q4 2021


Source: Guidehouse Analysis

Customer Surveys

To date, the team received 65 responses to the pilot customer enrollment survey, equaling a 75% response rate. During Q4 2021, Liberty sent initial survey requests to seven participants and received four additional responses. The survey captures customer’s motivations for enrolling, satisfaction with installation process, and overall comprehension of the pilot. Guidehouse plans to field the survey until the completion of Phase 1. Results recorded through December 2021 reveal the following findings:

- More than half (51%) of participants first heard about the pilot through a Liberty bill insert or letter.
- Backup power in case of power outage was the primary motivating factor for participants to purchase a battery storage system.
- Participants were most satisfied with the professionalism of the technician.
- Almost all participants (95%) were able to correctly identify TOU rates by time of day.

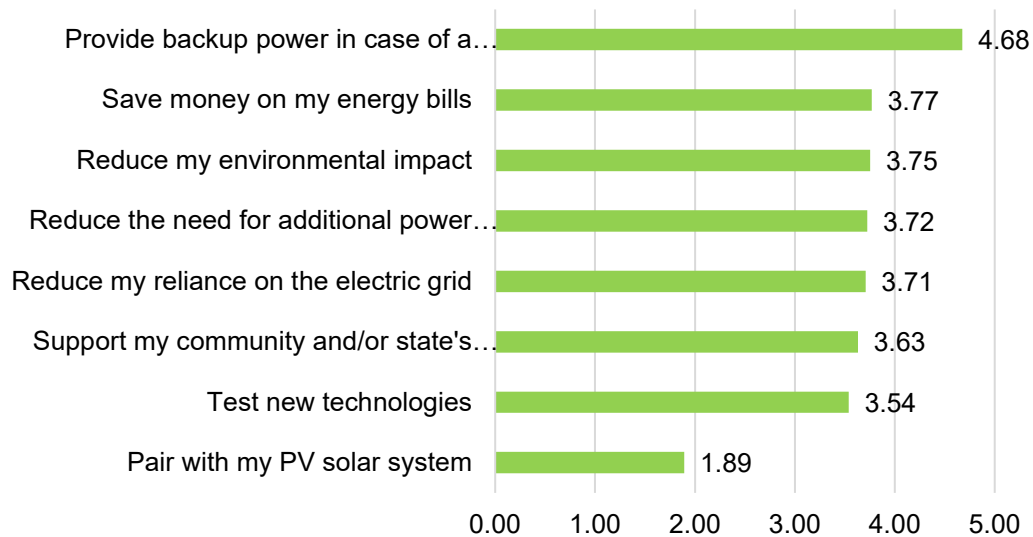
Marketing

More than half of pilot participants (51%) responded that they first heard about the pilot through a Liberty bill insert or letter. The second most popular method was the Liberty website (15%). Word of mouth (3%), social media (3%), and architect recommendations (2%) were the least common ways in which the participants learned about the pilot.

Motivation

When participants were asked to rate what factors motivated them to purchase a battery storage system (on a scale of 1-5), the highest rated factor was the ability to provide backup power in case of power outage (4.68). The second highest rated factor was to save money on energy bills (3.77), and reduce my environmental impact (3.75). The factor that motivated customers the least was the ability to pair with their PV technologies (1.89).

Figure 4. Motivations for Battery Storage Installation



Source: Guidehouse Analysis

Survey findings indicate that 37% of customers said they were considering installing a battery storage system prior to enrolling in the program. However, when asked what action the customer would have taken if the pilot did not exist, over half of respondents (54%) said they were very unlikely or unlikely (rating 1 or 2) to purchase a battery storage system without the program.

The evaluation team also asked customers if they were concerned with Liberty accessing their battery storage system. About half of respondents (47%) had no concern with the utility discharging their battery, with only 7% stating they were very concerned and 3% stating that they were not aware that discharging was part of the pilot. Customers who expressed concern stated it was due to their ability, or lack thereof, to power their home in the case of an outage.

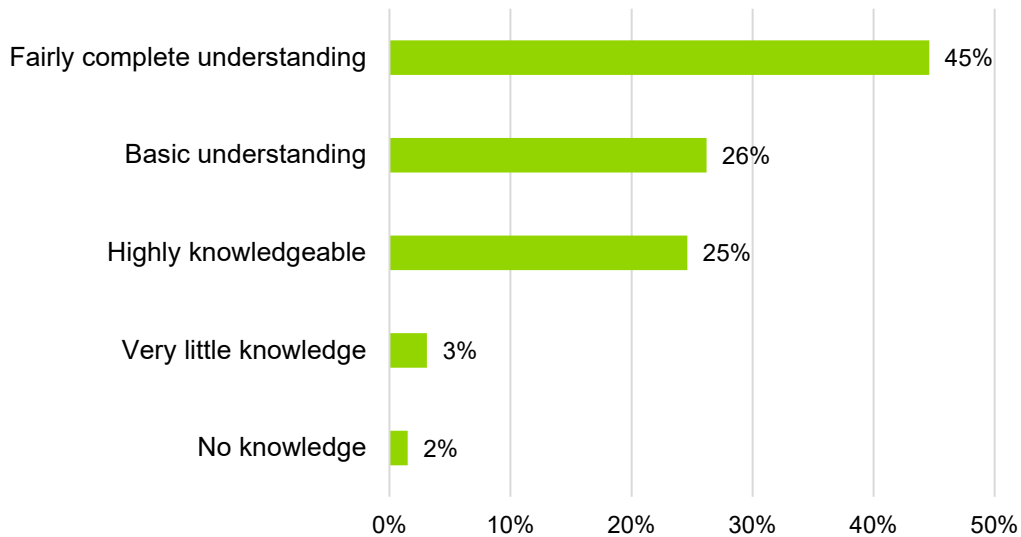
Installation Satisfaction

The team asked participants to rate their satisfaction with the installation of their battery storage system using a scale of one to five. Participants overall were very satisfied with the installation process. The highest levels of satisfaction were related to the professionalism of the technician that came to their home (4.92). Other factors that were rated include the installation process (4.62), and the ease of scheduling the installation with the technician (4.45).

Comprehension

As part of the enrollment survey, participants were asked questions about how their battery storage system charges and discharges. Nearly half of the participants (45%) said that they had a fairly complete understanding of the process, with 26% stating they had a basic understanding. Only 5% of respondents said they had no knowledge or very little knowledge about how the system charges and discharges.

Figure 5. Battery Storage Pilot Comprehension



Source: Guidehouse Analysis

Participants were also questioned on their knowledge of TOU rates. Almost all participants (95%) were able to correctly identify that TOU rates were based on the time of day that the customer uses electricity. When asked what minimum charge would remain in a customer's battery if Liberty needed to send power to the electric grid, 80% correctly responded that 20% would remain in their battery storage system.

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