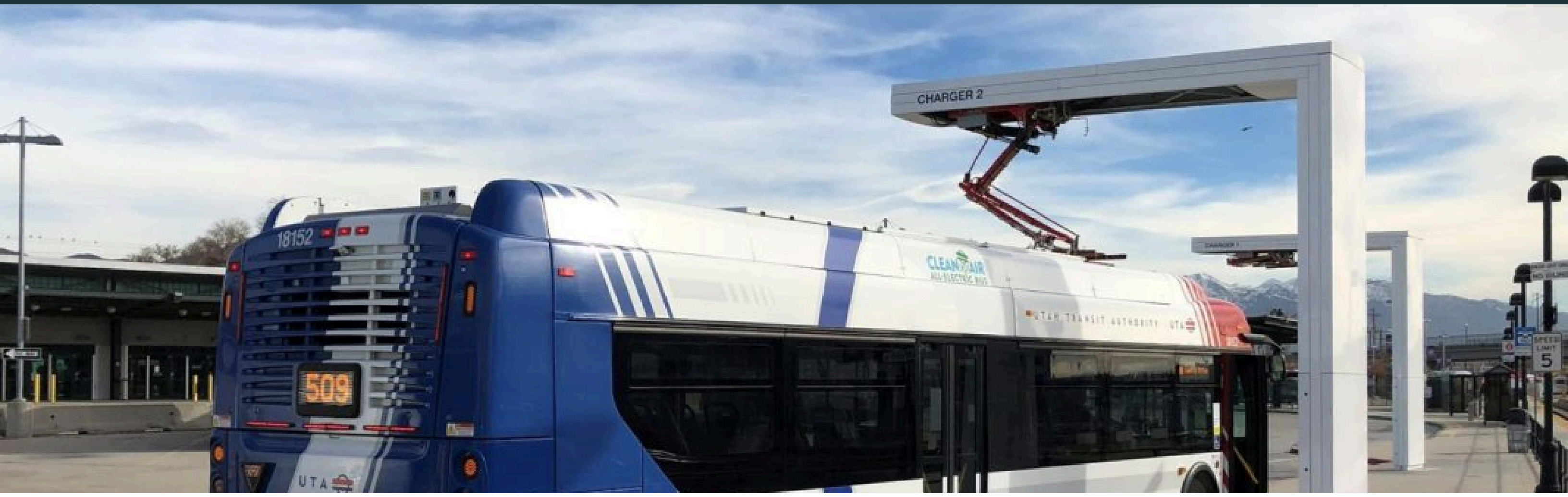
Energy Storage Support for Electric Transit Bus Charging

UTAH STATE UNIVERSITY ASPIRE FOUNDATION



Executive Summary

This report evaluates whether stationary storage can reduce the long-run cost of serving Utah Transit Authority's (UTA's) existing operations at five sites, including depot, on-route pantograph, and mixed charging sites. The analysis uses measured January through March 2026 charging demand and optimizes storage sizing and dispatch across a sweep of tariff, storage-cost, and battery-performance assumptions. The report focuses on current charging operations; vehicle-aware smart energy management and future service changes are left as future work rather than included in the storage optimization.

The report is structured in four main sections: Section 1 summarizes the analytical approach and identifies the five UTA locations considered. Section 2 describes how charging records are converted into site demand, how storage dispatch and utility bills are modeled and optimized, and how the scenario sweep is structured. Section 3 shares the results of the analysis including the measured demand patterns in Section 3.1, and the optimized storage and cost results in Section 3.2. Section 3.2.8 discusses how Schedule 6A and Schedule 6 change the storage value proposition, and Section 4 provides the decision-oriented recommendations.

The central finding is that stationary storage is not financially compelling under the 2026 quoted storage prices and supplier-specified battery performance. At the quoted price and performance, no evaluated site reduces net present cost by installing storage. Battery storage can become attractive under more favorable battery pricing or higher battery power capability, with SLC Depot District showing the strongest modeled opportunity. Even there, the benefit depends on pricing substantially lower than the quoted battery cost, and the modeled savings are moderate relative to the implementation effort required.

Flywheels are not recommended for near-term pursuit at these sites. At the quoted flywheel price, flywheels are not selected in the evaluated scenarios. They

only appear in limited sensitivity cases with substantially lower flywheel pricing and under the tariff structure that rewards demand reduction more strongly, but has higher overall pricing. This indicates that flywheels would need major price reductions or a separate operational value stream before they would justify further procurement effort.

The key recommendation is to avoid stationary storage procurement under the 2026 quoted pricing and performance assumptions, while continuing to monitor battery pricing and available battery power capability. If batteries with 1 C performance can be obtained for less than $1M/MWh there are significant opportunities for savings. The more promising near-term path is vehicle-aware smart energy management. In this context, vehicle-aware smart energy management means managing site demand with information about each vehicle's dwell time, energy need, and charging flexibility, then reshaping charging within those existing operating constraints. Several sites still have low energy utilization and brief high charging-demand intervals, but Schedule 6A provides a relatively weak financial reward for reducing those peaks with dedicated storage hardware. Software-based charging controls may be able to reduce the same billing peaks by spreading individual charging events across available dwell periods instead of delivering short high-power bursts, without adding stationary storage capital cost. Future analysis should therefore quantify the potential value of vehicle-aware smart energy management and compare those control-only savings against the storage cases evaluated in this report.

1 Storage-Supported Sites

This report evaluates whether on-site storage can cost-effectively reduce utility bills for UTA's existing depot, on-route pantograph, and mixed charging operations. This analysis considers only the current operations and charging as they are with no modifications to behavior. Potential savings from vehicle-aware smart energy management or future service expansions are outside the scope of this report and will be evaluated in future analysis.

Considering these sites is important because the evaluated locations include overnight depot operations, on-route pantograph charging, and one mixed site with both charger types. High-power pantograph chargers can produce large, brief demand peaks even when total energy consumption is moderate, while depot sites can concentrate charging around pull-in and layover periods. Mixed sites can combine both operating patterns, so their storage value depends on the timing and overlap of each charging use. Those load shapes can strongly affect utility bills through demand charges or, in the case of Schedule 6A, a tiered energy charge based on peak demand. A storage-supported site can charge during lower-demand or off-peak periods and discharge during high-power or on-peak charging events, reducing the billing demand seen by the utility and shifting some grid consumption from on-peak to off-peak periods while preserving the charging service delivered to buses.

The sections that follow therefore treat storage as an operational and financial tool within UTA's current duty cycles. Section 2.1 describes how measured charging activity is converted into site load profiles, Section 2.2 describes how storage dispatch and utility charges are evaluated together, and Section 2.3 describes the storage and utility scenarios that were considered.

1.1 Sites Considered

The sites considered in this report are UTA charging locations with sufficient measured charging activity to evaluate storage against actual operating patterns. These sites include depot, on-route pantograph, and mixed charging locations where the timing of charging events, rather than total

Table 1: UTA sites considered in the storage-support analysis.

Site	Site category	Map
Mount Ogden Depot Chargers	Depot	Figure 2
Ogden FrontRunner Pantographs	On-route pantograph	Figure 3
SLC Depot District	Depot	Figure 4
SLC FrontRunner Central Station	On-route pantograph	Figure 5
SLC Orange Street	Mixed	Figure 6

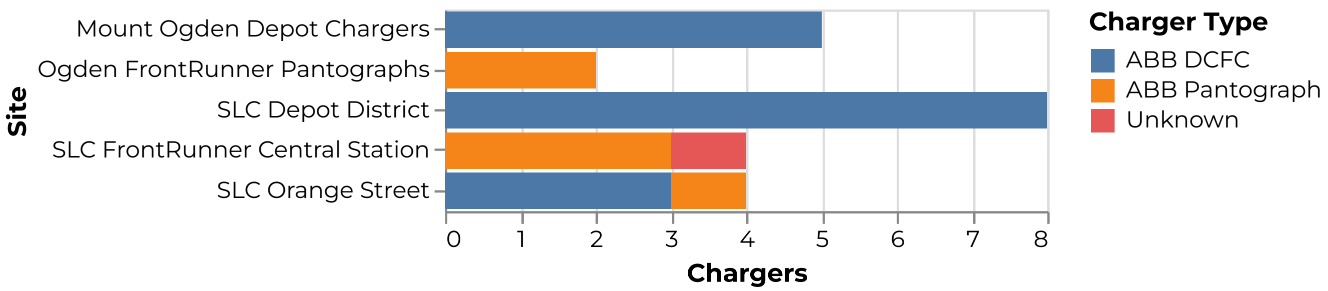


Figure 1: Charger count by site and charger type for the five evaluated UTA sites.

energy use alone, can determine whether storage creates meaningful bill savings.

The five UTA sites for the storage-support analysis are listed alphabetically in Table 1 and shown in Figure 2 through Figure 6. They include three Salt Lake City locations and two Ogden locations, with depot, on-route pantograph, and mixed charging contexts. This mix is useful because storage value depends on the shape of the charging load: a depot site may have clustered charging during pull-in or layover periods, an on-route pantograph site may have brief schedule-driven charging events that create large billing peaks, and a mixed site may show characteristics of both.

Figure 1 summarizes the number of chargers at each evaluated site by charger type. Detailed charger-count, connector-count, and rated-output metadata are included in the site-specific subsections in Section 3.1.

Mount Ogden Depot Chargers

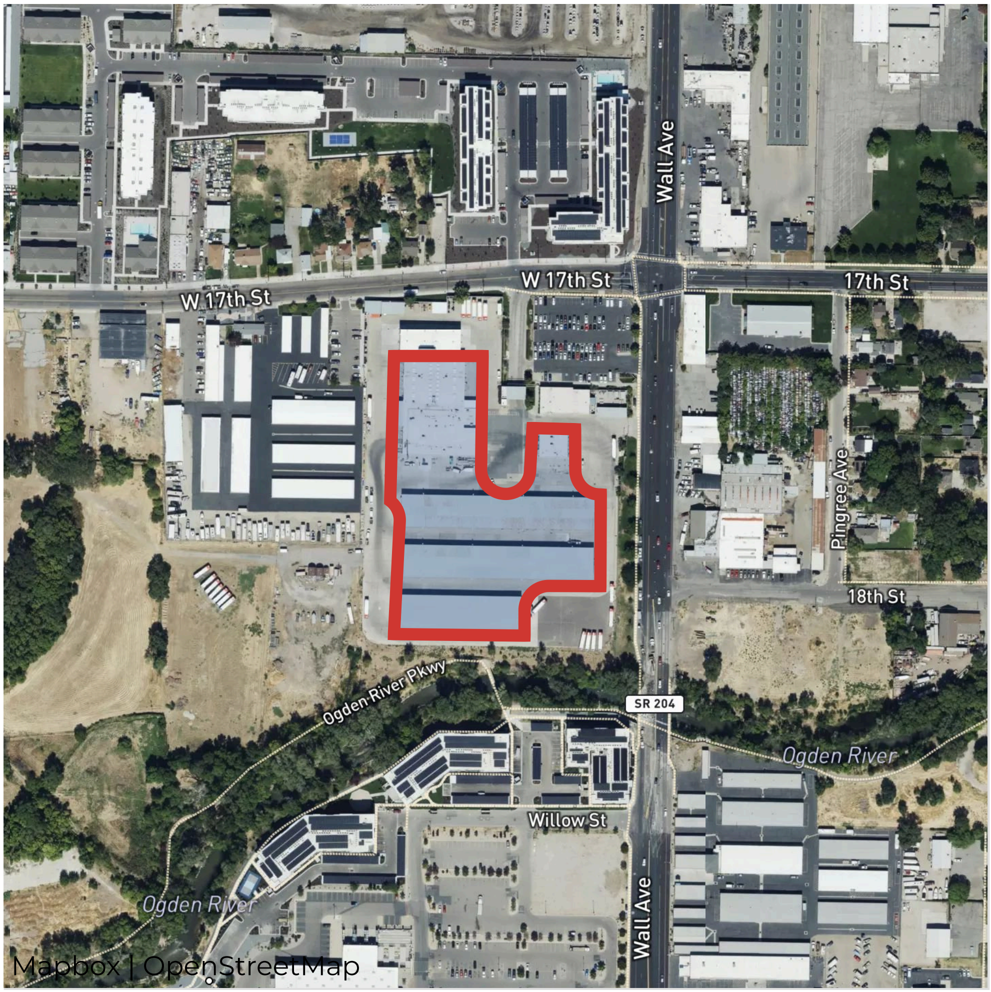


Figure 2: Mount Ogden Depot Chargers depot site map.

Ogden FrontRunner Pantographs

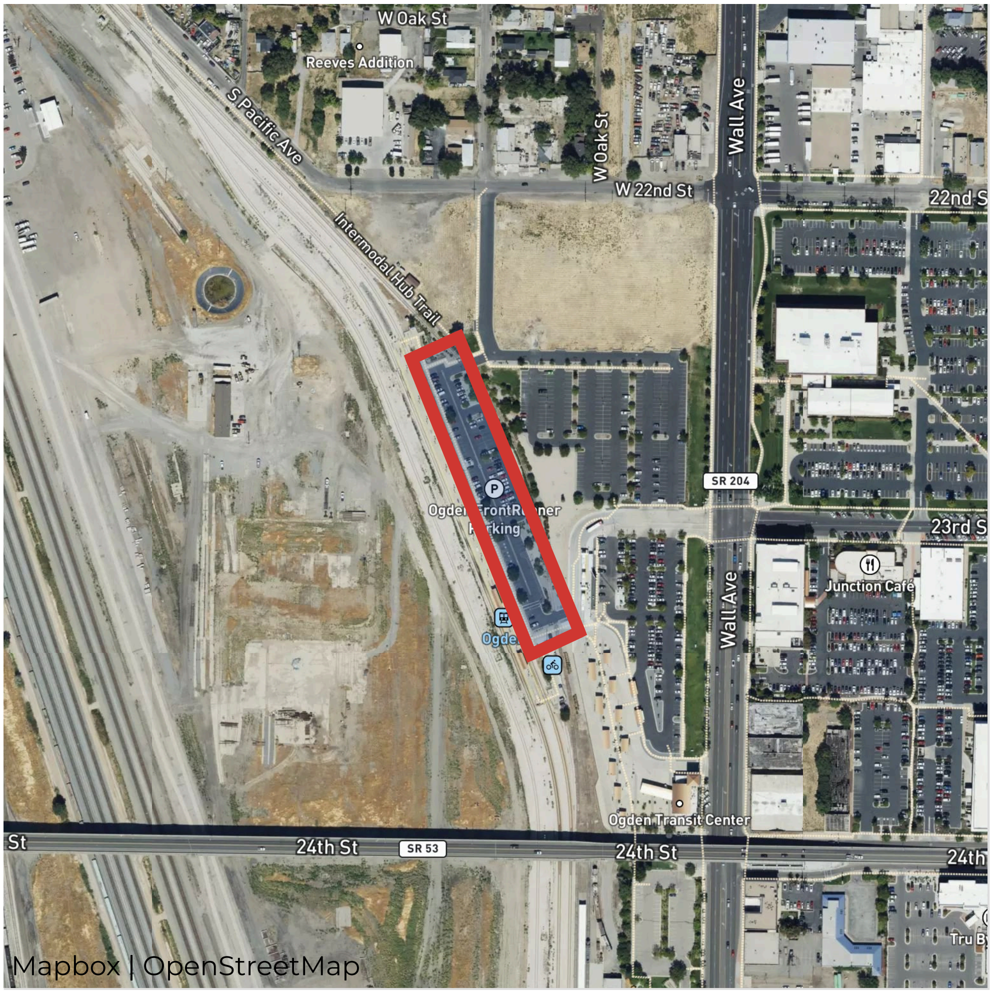


Figure 3: Ogden FrontRunner Pantographs on-route pantograph site map.

SLC Depot District

Figure 4: SLC Depot District depot site map.

SLC FrontRunner Central Station

Figure 5: SLC FrontRunner Central Station on-route pantograph site map.

SLC Orange Street

Figure 6: SLC Orange Street mixed charging site map.

2 Methodology

2.1 Site Demand

Site demand was constructed from measured OCPP meter values at each UTA location. The OCPP records include cumulative meter reads at the start of a charging session, approximately every one minute during the session, and at the end of the session. Each meter record was first associated with a site through its charger location, and the analysis retained the charger and connector identifiers so that charging activity could be reconstructed at the plug level before being summed to the site level. All timestamps were converted to Mountain Time so that the resulting load profiles align with local operating schedules and utility billing periods.

The source meter data reports cumulative imported active energy for each charger connector. Because the storage analysis requires a time-varying power demand rather than a cumulative energy register, the cumulative readings were converted into interval energy and average interval power. For each site, charger, and connector, the cumulative energy values were sorted in time and evaluated on a regular 15-second grid. Within each 15-second interval, the maximum cumulative energy reading was used as the interval endpoint. Missing readings were filled by interpolation so that short telemetry gaps did not break the load profile. If a cumulative register reset or rollover was detected, the interval energy was calculated from the minimum reading in that interval rather than from the previous interval endpoint.

For the financial analysis, January through March 2026 charging data was used for each evaluated site, and the 15-second site load profiles were aggregated to 15-minute intervals. This aggregation was used because Rocky Mountain Power computes billing demand over 15-minute demand intervals, so more granular time steps are unnecessary and add computational demand. Energy was summed within each 15-minute bucket, and the corresponding average power was calculated. This step intentionally evaluates storage against billing-aligned demand rather than instantaneous sub-minute peaks, which keeps the modeled demand charges consistent with the tariff treatment described in Section 2.2 and Section 3.2.8.

2.2 Financial Modeling

The financial modeling framework evaluates whether adding on-site storage reduces the long-run cost of serving UTA's observed charging demand. Each site is represented as a set of energy systems connected through a common electrical bus: the utility grid, the measured charging demand, and candidate storage devices. Within that framework, the model chooses the amount of storage to install and the time-varying storage dispatch needed to serve the 15-minute charging load described in Section 2.1.

The model does not treat storage as an isolated capital purchase. Storage only has value if its operating behavior reduces utility costs enough to justify its installed cost, operations and maintenance cost, losses, and future replacement costs. In practical terms, the model is comparing two coupled effects: installing more storage increases project cost, but it can reduce demand charges and other tariff-driven utility charges by charging during lower-demand or off-peak intervals and discharging during charging peaks or on-peak periods.

The objective is a net-present-value calculation expressed as net-present-cost, since the site cash flows considered here are costs rather than revenues. The annual discount rate is 7%, so future utility bills remain material to the decision while still being discounted relative to near-term costs.

In simplified form, the objective can be written as

$$\min_{\substack{E_s, E_{s,0}, E^{\mathrm{ch}}_{s,t}, E^{\mathrm{dis}}_{s,t} \\ \forall\, s \in \mathcal{S}, t \in \mathcal{T}}} \mathrm{NPC} = C_{\mathrm{capex}} + \sum_m \alpha_m \left(C_{\mathrm{utility},m} + C_{\mathrm{om},m} + C_{\mathrm{replacement},m} \right), \tag{1}$$

where E_s is the installed energy capacity of storage technology s, $E_{s,0}$ is the starting stored energy for storage technology s, and $E^{\mathrm{ch}}_{s,t}$ and $E^{\mathrm{dis}}_{s,t}$ are the charging and discharging energy, respectively, for storage technology s in interval t. C_{capex} is the initial installed storage cost, $C_{\mathrm{utility},m}$ is the utility bill in month m, $C_{\mathrm{om},m}$ is operations and maintenance cost in month m, $C_{\mathrm{replacement},m}$ represents component replacement costs assigned to month m, and α_m is the discount factor for month m. The storage capital-cost term can be represented schematically as

$$C_{\mathrm{capex}} = \sum_{s \in \mathcal{S}} c_s E_s, \tag{2}$$

where $\mathcal{S}$ is the set of storage technologies considered, c_s is the installed cost per unit of storage energy capacity for technology s, and E_s is the installed storage energy capacity. C_{om} and $C_{replacement}$ are similarly proportional to E_s. The discount factor is

$$\alpha_m = \frac{1}{(1+i)^{m/12}}, \tag{3}$$

with $i = 0.07$ for the 7% annual discount rate used in this report. This monthly formulation keeps the utility-bill calculation aligned with the monthly billing periods used in the tariff model.

The unit-cost results in Section 3.2 use the same net-present-cost basis. They divide the full discounted cost of the modeled case by the discounted charging energy delivered over the modeled system lifetime. The numerator includes storage capital cost, storage operations and maintenance, replacement costs, and utility bills; the denominator is the net-present energy delivered to buses. The resulting dollars per kWh therefore represents an amortized all-in cost of serving the charging load, not only a utility energy charge or only the cost of storage hardware.

Utility costs are calculated from the grid energy required after storage dispatch. For each month, tariff costs include the energy charges, demand charges, and fixed customer charges that apply under the selected Rocky Mountain Power schedule. The demand-charge component is driven by the highest billing-interval grid import during the relevant billing period. In simplified form,

$$P_{\text{grid},t} = \frac{E_{\text{grid},t}}{\Delta t}, \tag{4}$$

and

$$P_{\text{peak},m} = \max_{t \in T} P_{\text{grid},t}, \tag{5}$$

where $E_{\text{grid},t}$ is grid energy imported in interval t, Δt is the 15-minute interval duration, and $P_{\text{peak},m}$ is the monthly billing peak. When a tariff distinguishes on-peak, off-peak, or overall demand periods, the same calculation is applied within the applicable time windows.

The principal operational constraint is energy balance. In each time interval, grid energy plus storage discharge must equal charging demand plus storage charging:

$$E_{\text{grid},t} + \sum_{s \in \mathcal{S}} E_{s,t}^{\text{dis}} = E_{\text{demand},t} + \sum_{s \in \mathcal{S}} E_{s,t}^{\text{ch}}. \tag{6}$$

Storage operation is then limited by each technology's energy capacity, charge rate, discharge rate, efficiency, and allowable state of charge. The charge and discharge limits can be written as

$$0 \le E_{s,t}^{\text{ch}} \le \rho_s^{\text{ch}} E_s \Delta t, \tag{7}$$

$$0 \le E_{s,t}^{\text{dis}} \le \rho_s^{\text{dis}} E_s \Delta t, \tag{8}$$

where ρ_s^{ch} and ρ_s^{dis} are the charge and discharge rate limits for storage technology s. The allowable stored-energy range is

$$\underline{\sigma}_s E_s \le E_{s,t} \le \overline{\sigma}_s E_s, \tag{9}$$

where $\underline{\sigma}_s$ and $\overline{\sigma}_s$ define the minimum and maximum allowable state of charge. The starting stored energy $E_{s,0}$ is subject to the same state-of-charge limits, and the storage state thereafter evolves according to

$$E_{s,t+1} = E_{s,t} + \eta_s^{\text{ch}} E_{s,t}^{\text{ch}} - \frac{1}{\eta_s^{\text{dis}}} E_{s,t}^{\text{dis}}, \tag{10}$$

where η_s^{ch} and η_s^{dis} are charge and discharge efficiencies. In this formulation, $E_{s,t}$ is an implied state variable defined by the initial condition $E_{s,0}$ and the charging and discharging sequence. The model also enforces equality between the starting and ending stored energy for each storage technology over the optimization horizon, so the solution cannot create value by borrowing net energy from outside the modeled period. These constraints ensure that the model can only reduce billing demand by operating storage within physically feasible limits.

2.2.1 Schedule 6A Approximation

UTA currently operates its charging stations on Rocky Mountain Power Schedule 6A, which requires special treatment in the optimization. Unlike Schedule 6, Schedule 6A does not express its grid-capacity cost as a simple linear demand charge. Instead, the first 50 kWh per kW of monthly billing demand is charged at a higher energy rate, with energy beyond that threshold charged at a lower additional-energy rate and off-peak energy receiving a credit. In simplified form, the exact Schedule 6A first-block energy quantity is the lesser of monthly grid energy and the threshold quantity defined by 50 kWh per kW of monthly billing demand.

Because both monthly grid energy and monthly peak demand are affected by storage dispatch, this lesser-of relationship makes the exact Schedule 6A bill neither linear nor convex in the storage-dispatch decision variables. To keep the storage sizing and dispatch problem within a convex optimization framework, Schedule 6A is modeled with a conservative linear approximation. The approximation assumes that each modeled month exceeds the 50 kWh per kW threshold, converts the higher first-block energy charge into an equivalent demand-related charge proportional to monthly billing peak, and applies the incremental energy rates to interval energy.

This approximation would be conservative for months that do not actually exceed 50 kWh per kW of monthly billing demand. In those months, the actual tariff would charge the higher first-block rate only on the energy consumed, while

Table 2: Rate schedule values used in the scenario sweep.

Rate schedule	Role in the scenario sweep
Rocky Mountain Power Schedule 6A	Current UTA site schedule and primary reference case
Rocky Mountain Power Schedule 6	Comparative schedule used to test how a different demand-charge structure changes the storage value proposition

Table 3: Battery installed-cost values used in the scenario sweep.

Battery installed cost [$/kWh]	Implied installed cost [$/kW][1]	Scenario interpretation
600	1 C: 600 1/2 C: 1,200	Discounted price previously used for other installations
1,000	1 C: 1,000 1/2 C: 2,000	Middle-ground price commonly seen in other project contexts
1,325	1 C: 1,325 1/2 C: 2,650	High-cost case based on the supplier quote received for this analysis

the approximation charges the full demand-equivalent block implied by the monthly billing peak. For the sites and scenarios evaluated here, this threshold condition does not occur: all observed site-months and all modeled storage-dispatch scenario-months exceed 50 kWh per kW, with the lowest evaluated value at 63.4 kWh per kW. The Schedule 6A no-storage baseline used in Section 3.2 is computed with the same approximation.

2.3 Scenario Design

The scenario sweep was designed to test whether storage is selected only under a narrow set of favorable assumptions, or whether storage remains attractive across plausible tariff, cost, and performance conditions. The same scenario grid was evaluated for each UTA site listed in Table 1. Within each site, storage capacity and dispatch were optimized for every combination of rate schedule, battery installed cost, flywheel installed cost, and battery C-rate.

The sweep used a full-factorial structure with 36 combinations per site: two rate schedules, three battery cost assumptions, three flywheel cost assumptions, and two battery C-rate assumptions. The scenario dimensions and their values are shown in Table 2 through Table 5. Other core assumptions, including the January through March 2026 operating period, the 15-minute billing interval representation, and the 7% annual discount rate, were held fixed so that the scenario comparisons isolate the tariff and storage-technology assumptions.

The rate-schedule sweep in Table 2 compares the current tariff treatment against a similar commercial tariff alternative. Schedule 6A is included because it is the schedule the sites are currently using, so it represents the practical baseline for near-term UTA operations. Schedule 6 is included to test whether a stronger demand-charge signal changes the storage paradigm. This distinction matters because storage economics depend on how much value the tariff assigns to reducing short-duration peaks: if a tariff makes low-utilization peak capacity relatively inexpensive, storage has less financial room to recover its installed cost; if a tariff penalizes peak demand more directly, storage may become more attractive.

The battery cost range in Table 3 spans from an optimistic but previously observed installation price to a conservative supplier-quoted price. The 600 $/kWh case represents the low-cost end, based on discounted pricing used in prior installations. The 1,000 $/kWh case provides a middle-ground assumption that is consistent with prices observed in other situations. The 1,325 $/kWh case

Table 4: Flywheel installed-cost values used in the scenario sweep.

Flywheel installed cost [$/kWh]	Implied installed cost [$/kW][1]	Scenario interpretation
5,200	650	Exploratory lower-cost flywheel case
8,800	1,100	Exploratory intermediate flywheel cost case
9,650	1,206	High-cost case based on the supplier quote received for this analysis

Table 5: Battery C-rate values used in the scenario sweep.

Battery C-rate	Approximate rated-power interpretation
1/2 C	Battery can charge or discharge at 1/2 kW per kWh of installed energy capacity, corresponding to roughly a 2-hour device at rated power
1 C	Battery can charge or discharge at 1 kW per kWh of installed energy capacity, corresponding to roughly a 1-hour device at rated power

is the high-cost case and reflects the quote received for the storage package considered here. Together, these values test whether storage value depends on unusually low battery pricing or remains beneficial under the higher quoted cost.

The flywheel cost range in Table 4 is more exploratory than the battery cost range. The 9,650 $/kWh case reflects the quoted price for the flywheel option. The 5,200 and 8,800 $/kWh cases are included to show how the results would change under different flywheel pricing scenarios. These lower-cost cases therefore serve as price-sensitivity tests, allowing the analysis to distinguish a technology that is not selected at current quoted pricing from one that would remain uneconomic even under materially lower installed costs.

The battery C-rate sweep in Table 5 changes the peak charge and discharge capability available from each unit of installed battery energy capacity. Battery energy capacity itself is not fixed in the scenario design; it is an optimized result. The low C-rate case reflects the capability specified by the supplier for the battery option considered in this analysis. The high C-rate case represents a performance level seen in other commercial battery packs. This comparison tests whether the sites require only energy capacity, or whether the economics depend on batteries that can deliver more peak power per installed kWh.

3 Results

3.1 Site Demand

The measured charging demand differs substantially across the five sites analyzed, both in total energy and in when that energy is delivered. Figure 7 summarizes total charging energy by site and separates energy delivered during the Schedule 6A weekday evening on-peak window from energy delivered outside that window. Figure 8 shows the same information as a share of each site's total measured energy.

The highest-energy sites over the January through March 2026 analysis period are SLC FrontRunner Central Station, Mount Ogden Depot Chargers, and Ogden FrontRunner Pantographs. SLC Orange Street has the lowest total measured energy among the five sites. The on-peak share also varies meaningfully by site. Mount Ogden Depot Chargers has relatively little energy in the weekday evening on-peak window,

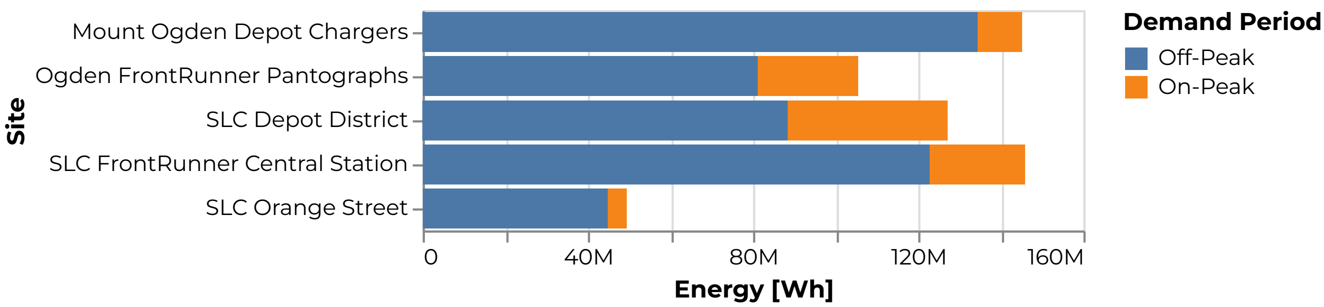


Figure 7: Aggregate charging energy by site for January through March 2026, separated into Schedule 6A on-peak and off-peak energy. Observed holidays and weekends are treated as off-peak.

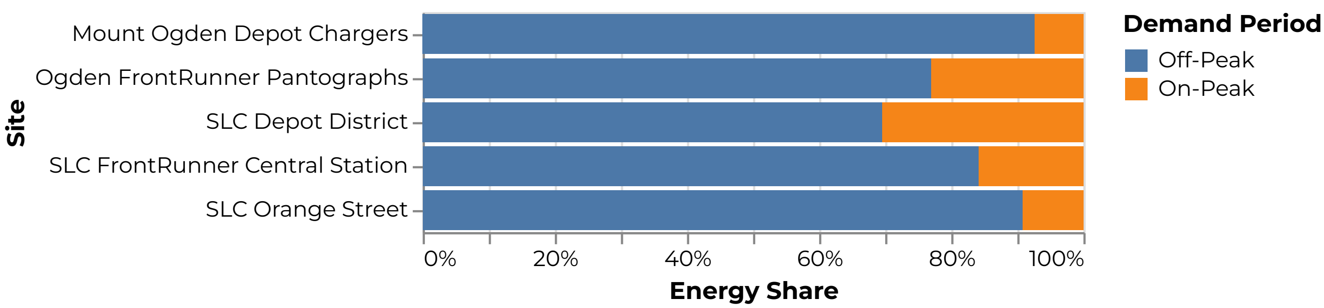


Figure 8: Share of January through March 2026 charging energy by site delivered during Schedule 6A on-peak and off-peak periods. Observed holidays and weekends are treated as off-peak.

while SLC Depot District and Ogden FrontRunner Pantographs have much larger on-peak shares. These differences are driven partly by operational schedule differences across on-route pantograph, overnight depot, and mixed charging locations. This matters for storage because the value of shifting load depends not only on total energy, but also on whether charging coincides with costly tariff periods and with site-level demand peaks.

The site-specific hourly profiles in Section 3.1.1 through Section 3.1.5 show how different the operational patterns are across sites. Each figure sums measured charging energy by hour of day across the January through March 2026 analysis period. These charts should be interpreted as demand-shape summaries rather than maximum-power plots: the storage optimization uses billing-aligned 15-minute load profiles, while the hourly figures make the daily operating pattern easier to compare across sites. In figures that separate on-peak and off-peak charging, some off-peak energy can appear during hours that are normally in the weekday on-peak window because observed holidays and weekends are off-peak under the Schedule 6A calendar.

Section 3.1.6 adds a separate meter-aggregation sensitivity case for the adjacent SLC Depot District and SLC FrontRunner Central Station locations. That case is not a sixth physical site in Table 1; it represents the combined load that would be seen if those two existing meters were evaluated together.

Each site subsection also includes a load-profile summary table. The tables show energy, energy share, peak demand, and energy utilization after aggregation to 15-minute billing intervals. Energy utilization is calculated as energy delivered in each row divided by the energy that would have been delivered if the site held that row's peak demand for every interval in that period; the total row gives the site-wide energy utilization over January through March 2026.

3.1.1 Mount Ogden Depot Chargers

The Mount Ogden Depot is dominated by overnight charging, with the largest energy de-

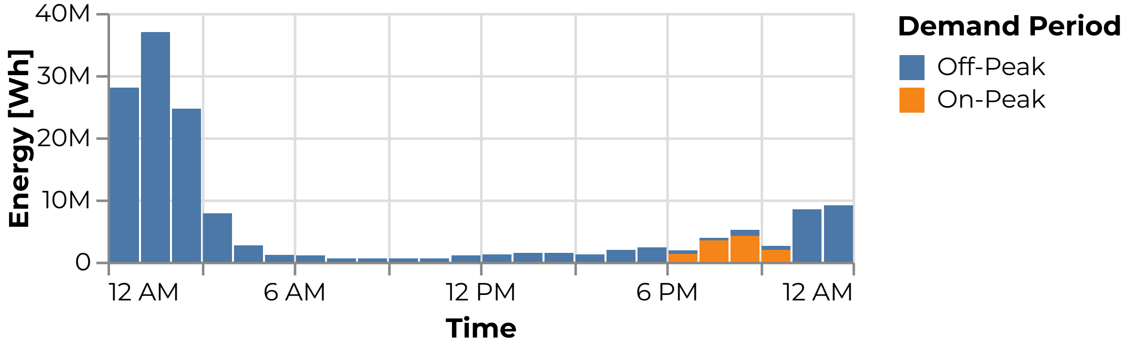


Figure 9: Hourly charging energy profile for Mount Ogden Depot Chargers, January through March 2026. Off-peak energy shown during weekday on-peak hours comes from charging on weekends and observed holidays.

Table 6: Charger hardware summary for Mount Ogden Depot Chargers.

Type	Rating [kW]	Aggregate [kW]	Chargers	Connectors
DCFC	150	750	5	15
Total		750	5	15

Table 7: Billing-aligned 15-minute load-profile metrics for Mount Ogden Depot Chargers, January-March 2026. On-peak uses the Schedule 6A weekday 6:00-10:00 p.m. window, excluding observed holidays.

Demand period	Energy [MWh]	Energy share	Peak demand [kW]	Utilization
On-Peak	10.72	7.4%	437	10.05%
Off-Peak	134.39	92.6%	715	9.82%
Total	145.11	100.0%	715	9.40%

livery concentrated shortly after midnight, as shown in Figure 9. That shape is characteristic of depot operations where vehicles return and charge outside the daytime service period. The charger hardware summary in Table 6 provides the site-level charger and connector context for this demand profile, and the billing-aligned 15-minute metrics in Table 7 show the site's energy distribution, peak demand, and utilization over January through March 2026.

From a storage perspective, this site has substantial total energy but comparatively low exposure to the Schedule 6A weekday evening on-peak window. At the same time, the site has a very high peak relative to its overall demand level. Based on the demand shape alone, this creates potential for storage to charge across broader lower-demand periods and discharge during the site's highest charging-demand intervals, reducing the billing peak and lowering peak-demand charges even though those charging-demand peaks are not primarily in the tariff on-peak period.

3.1.2 Ogden FrontRunner Pantographs

Ogden FrontRunner Pantographs shows a broad daytime and evening operating profile, with substantial charging from late morning through the evening on-peak period, as shown in Figure 10. The charger hardware context for the site is summarized in Table 8, while the billing-aligned demand metrics in Table 9 show how the measured energy and peak demand divide between on-peak and off-peak periods.

This type of profile can create value for storage in two ways: by reducing high-power pantograph peaks and by shifting a portion of evening on-peak energy away from the grid.

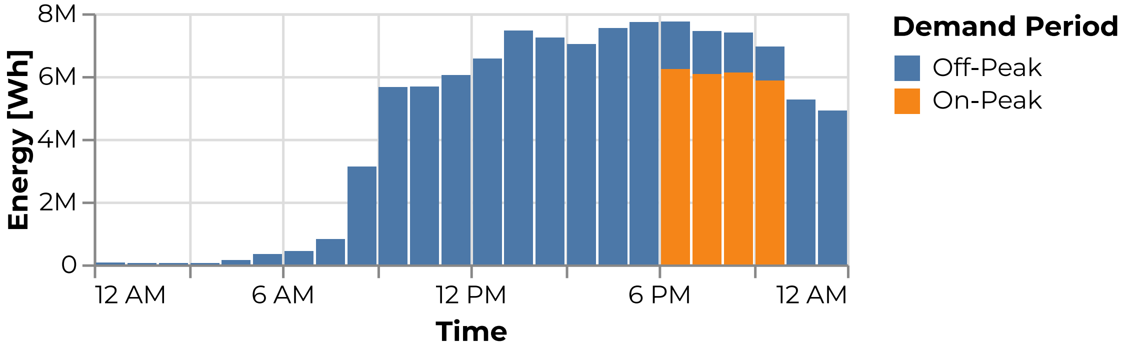


Figure 10: Hourly charging energy profile for Ogden FrontRunner Pantographs, January through March 2026. Off-peak energy shown during weekday on-peak hours comes from charging on weekends and observed holidays.

Table 8: Charger hardware summary for Ogden FrontRunner Pantographs.

Type	Rating [kW]	Aggregate [kW]	Chargers	Connectors
Pantograph	250	500	2	2
Total		500	2	2

Table 9: Billing-aligned 15-minute load-profile metrics for Ogden FrontRunner Pantographs, January-March 2026. On-peak uses the Schedule 6A weekday 6:00-10:00 p.m. window, excluding observed holidays.

Demand period	Energy [MWh]	Energy share	Peak demand [kW]	Utilization
On-Peak	24.25	23.0%	161	61.73%
Off-Peak	81.19	77.0%	200	21.18%
Total	105.44	100.0%	200	24.40%

3.1.3 SLC Depot District

SLC Depot District has both overnight charging and a pronounced evening charging block, as shown in Figure 11. The site hardware summary in Table 10 gives the charger and connector context for that operating pattern, and the billing-aligned metrics in Table 11 quantify the resulting on-peak energy share, peak demand, and utilization.

The evening concentration is important because it overlaps the Schedule 6A weekday on-peak window and therefore creates a stronger tariff-driven reason to evaluate storage dispatch, even before considering individual 15-minute billing peaks.

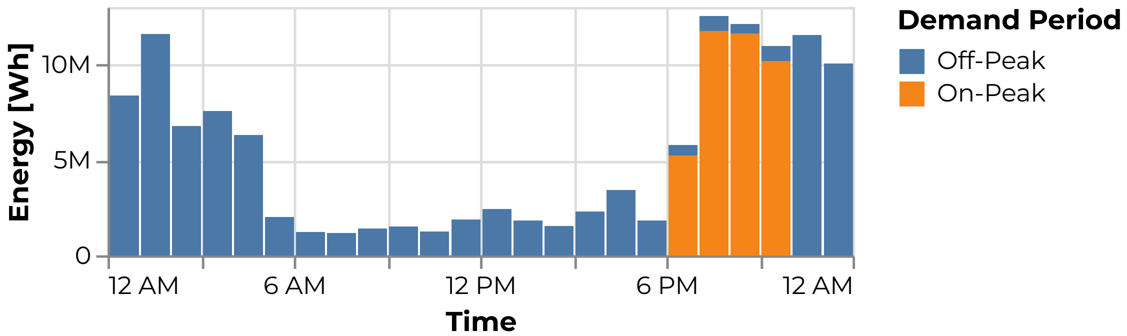


Figure 11: Hourly charging energy profile for SLC Depot District, January through March 2026. Off-peak energy shown during weekday on-peak hours comes from charging on weekends and observed holidays.

Table 10: Charger hardware summary for SLC Depot District.

Type	Rating [kW]	Aggregate [kW]	Chargers	Connectors
DCFC	150	1,200	8	24
Total		1,200	8	24

Table 11: Billing-aligned 15-minute load-profile metrics for SLC Depot District, January-March 2026. On-peak uses the Schedule 6A weekday 6:00-10:00 p.m. window, excluding observed holidays.

Demand period	Energy [MWh]	Energy share	Peak demand [kW]	Utilization
On-Peak	38.73	30.5%	501	31.68%
Off-Peak	88.39	69.5%	660	7.00%
Total	127.12	100.0%	660	8.92%

3.1.4 SLC FrontRunner Central Station

SLC FrontRunner Central Station has the largest measured energy of the evaluated sites, with charging spread across the daytime service period and continuing into the evening, as shown in Figure 12. The hardware context in Table 12 shows the mix of known pantograph chargers and one charger row with incomplete metadata, while the billing-aligned metrics in Table 13 summarize the site's energy share, peak demand, and utilization by demand period.

The site therefore combines high total energy with recurring high-use hours, making the timing and duration of peaks especially important for the financial results.

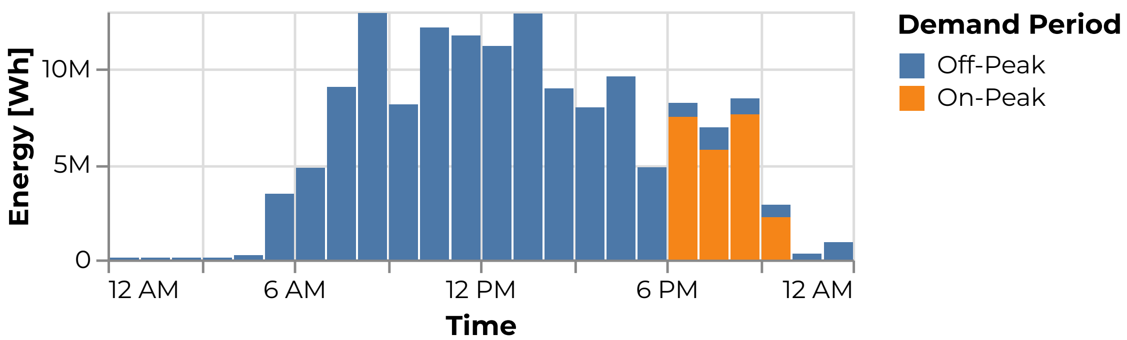


Figure 12: Hourly charging energy profile for SLC FrontRunner Central Station, January through March 2026. Off-peak energy shown during weekday on-peak hours comes from charging on weekends and observed holidays.

Table 12: Charger hardware summary for SLC FrontRunner Central Station.[2]

Type	Rating [kW]	Aggregate [kW]	Chargers	Connectors
Pantograph	250	500	2	2
Pantograph	300	300	1	1
Unknown	Unknown	Unknown	1	0
Total		800	4	3

Table 13: Billing-aligned 15-minute load-profile metrics for SLC FrontRunner Central Station, January-March 2026. On-peak uses the Schedule 6A weekday 6:00-10:00 p.m. window, excluding observed holidays.

Demand period	Energy [MWh]	Energy share	Peak demand [kW]	Utilization
On-Peak	23.08	15.8%	407	23.27%
Off-Peak	122.81	84.2%	426	15.04%
Total	145.89	100.0%	426	15.85%

3.1.5 SLC Orange Street

SLC Orange Street is the mixed site in Table 1, with both DCFC and pantograph hardware summarized in Table 14. Its total energy footprint is smaller than the other evaluated sites, but its charging is still distributed across the daytime and evening hours, as shown in Figure 13. The billing-aligned metrics in Table 15 show the corresponding energy share, peak demand, and utilization by demand period.

Lower total energy reduces the absolute opportunity for bill savings, yet the presence of evening charging means that storage can still be relevant if demand peaks are large enough relative to the site's energy throughput.

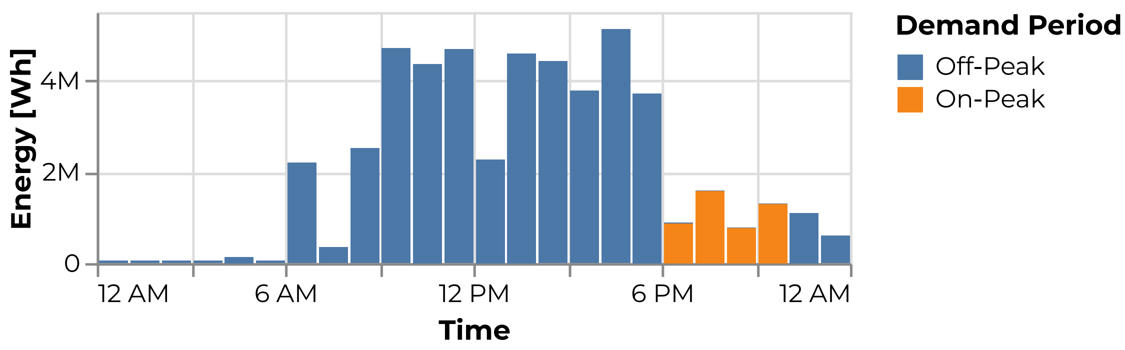


Figure 13: Hourly charging energy profile for SLC Orange Street, January through March 2026. Off-peak energy shown during weekday on-peak hours comes from charging on weekends and observed holidays.

Table 14: Charger hardware summary for SLC Orange Street.

Type	Rating [kW]	Aggregate [kW]	Chargers	Connectors
DCFC	150	450	3	9
Pantograph	275	275	1	1
Total		725	4	10

Table 15: Billing-aligned 15-minute load-profile metrics for SLC Orange Street, January-March 2026. On-peak uses the Schedule 6A weekday 6:00-10:00 p.m. window, excluding observed holidays.

Demand period	Energy [MWh]	Energy share	Peak demand [kW]	Utilization
On-Peak	4.52	9.2%	210	8.81%
Off-Peak	44.86	90.8%	213	11.01%
Total	49.38	100.0%	213	10.75%

3.1.6 Merged SLC Central Station

Merged SLC Central Station is a meter-aggregation sensitivity case that combines the measured SLC Depot District and SLC FrontRunner Central Station loads, as shown in Figure 14. The combined hardware context in Table 16 includes the chargers from both source locations, and the billing-aligned metrics in Table 17 summarize the aggregate load profile that would be evaluated under a shared meter. The merged profile delivers 273 MWh from January through March 2026 and reaches a 15-minute billing demand of 725 kW, so the evaluated winter/spring baseline remains below the 1 MW threshold relevant to Schedule 6 and Schedule 6A evaluation even before storage dispatch, smart energy management, or other operational adjustments.

This case is included to test whether the two adjacent Salt Lake City locations would perform better as a combined billing and storage-control problem than as two separate Schedule 6A no-storage sites. It is therefore treated as a standalone sensitivity case rather than included in the five-site physical-site summaries.

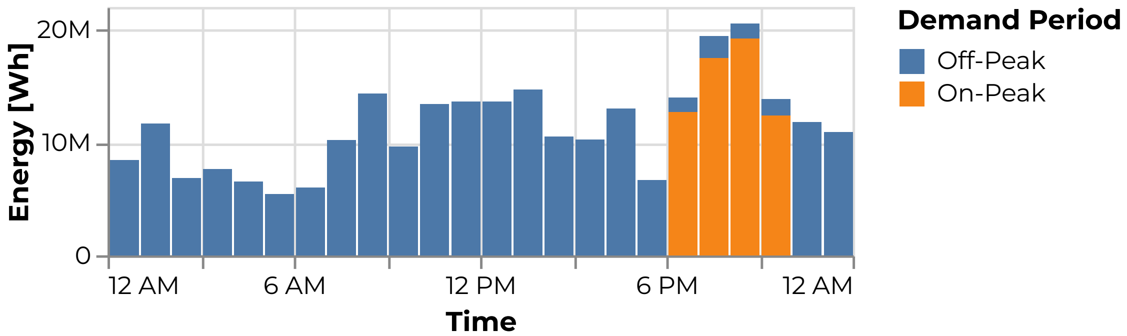


Figure 14: Hourly charging energy profile for Merged SLC Central Station, January through March 2026. Off-peak energy shown during weekday on-peak hours comes from charging on weekends and observed holidays.

Table 16: Combined charger hardware summary for Merged SLC Central Station.

Type	Rating [kW]	Aggregate [kW]	Chargers	Connectors
DCFC	150	1,200	8	24
Pantograph	250	500	2	2
Pantograph	300	300	1	1
Unknown	Unknown	Unknown	1	0
Total		2,000	12	27

Table 17: Billing-aligned 15-minute load-profile metrics for Merged SLC Central Station, January-March 2026. On-peak uses the Schedule 6A weekday 6:00-10:00 p.m. window, excluding observed holidays.

Demand period	Energy [MWh]	Energy share	Peak demand [kW]	Utilization
On-Peak	61.81	22.6%	725	34.92%
Off-Peak	211.20	77.4%	660	16.72%
Total	273.01	100.0%	725	17.43%

3.2 Financial Modeling

The financial results summarize the full scenario sweep described in Section 2.3 for the five UTA charging sites. The figures in this section report optimized storage selection and cost outcomes, with unit-cost results expressed as net present cost normalized by net present charging energy served over the system lifetime.

This section is organized to move from portfolio-level patterns to site-specific interpretation. Section 3.2.1 shows how often storage is selected across the scenario grid, which technology is selected, and how the range of net-present-cost (NPC) outcomes compares against the Schedule 6A no-storage baseline. The site-level results in Section 3.2.2 through Section 3.2.6 then show the same core charts for each charging location: total unit cost, selected battery energy capacity, NPC improvement relative to the Schedule 6A no-storage baseline, peak demand reduction, and Schedule 6A on-peak energy reduction. Section 3.2.7 adds a standalone meter-aggregation sensitivity case for Merged SLC Central Station; it is not included in the five-site aggregate figures. Positive NPC improvement means savings relative to the baseline; in the NPC improvement heatmaps, blue indicates better financial outcomes and red indicates worse outcomes. Section 3.2.8 synthesizes the tariff findings across sites, leaving the detailed site-by-site tariff observations in the individual subsections.

3.2.1 Aggregate Financial Results

The aggregate financial results show whether storage is selected broadly across the portfolio or only under isolated favorable assumptions. Under Schedule 6A, storage is selected in 60 of 90 site-scenario results, and all of those selected systems are batteries. Under Schedule 6, storage is selected in 77 of 90 site-scenario results, with batteries selected in 74 cases and flywheels selected in four cases, including one mixed battery/flywheel case. Flywheels are selected only under Schedule 6 and only when the lowest flywheel cost is assumed.

The any-storage count in Figure 15 shows three broad regimes. First, storage is not selected at any site when the quoted high battery cost, quoted flywheel cost, and 1/2 C battery performance are combined. Second, storage is selected broadly when battery cost is low or when 1 C battery performance is available. Third, the middle battery-cost case is tariff-sensitive: at 1/2 C, Schedule 6A does not select any storage, while Schedule 6 selects batteries at all five sites.

Figure 16 and Figure 17 make the technology split explicit. The storage opportunity identified by the sweep is principally a battery opportunity. At the quoted flywheel price, flywheels are not selected in the evaluated scenarios. When flywheels do appear in the lower-cost sensitivity cases, the selections are limited and occur only under the tariff structure that places stronger value on reducing billing demand.

The NPC improvement ranges in Figure 18 show that SLC Depot District and Mount Ogden Depot Chargers are the most financially sensitive sites in absolute dollar terms. SLC Depot District has the largest upside in favorable battery cases, reaching roughly $400k of improvement under Schedule 6A and roughly $340k under Schedule 6. Mount Ogden Depot Chargers has a large Schedule 6 range, but the Schedule 6 cases in Figure 18 have higher NPC than the Schedule 6A no-storage baseline, indicating that the tariff difference can outweigh the storage benefit at that site. SLC FrontRunner Central Station also shows a material range, while Ogden FrontRunner Pantographs and SLC Orange Street have smaller absolute financial swings because their evaluated charging energy and peak-reduction opportunities are smaller.

[3] Storage systems near these sizes may or may not be commercially available for a given procurement, while systems materially below these thresholds are unlikely to be practical. The thresholds are used to remove tiny optimized selections that would not be feasible while still retaining marginal cases for decision-maker review.

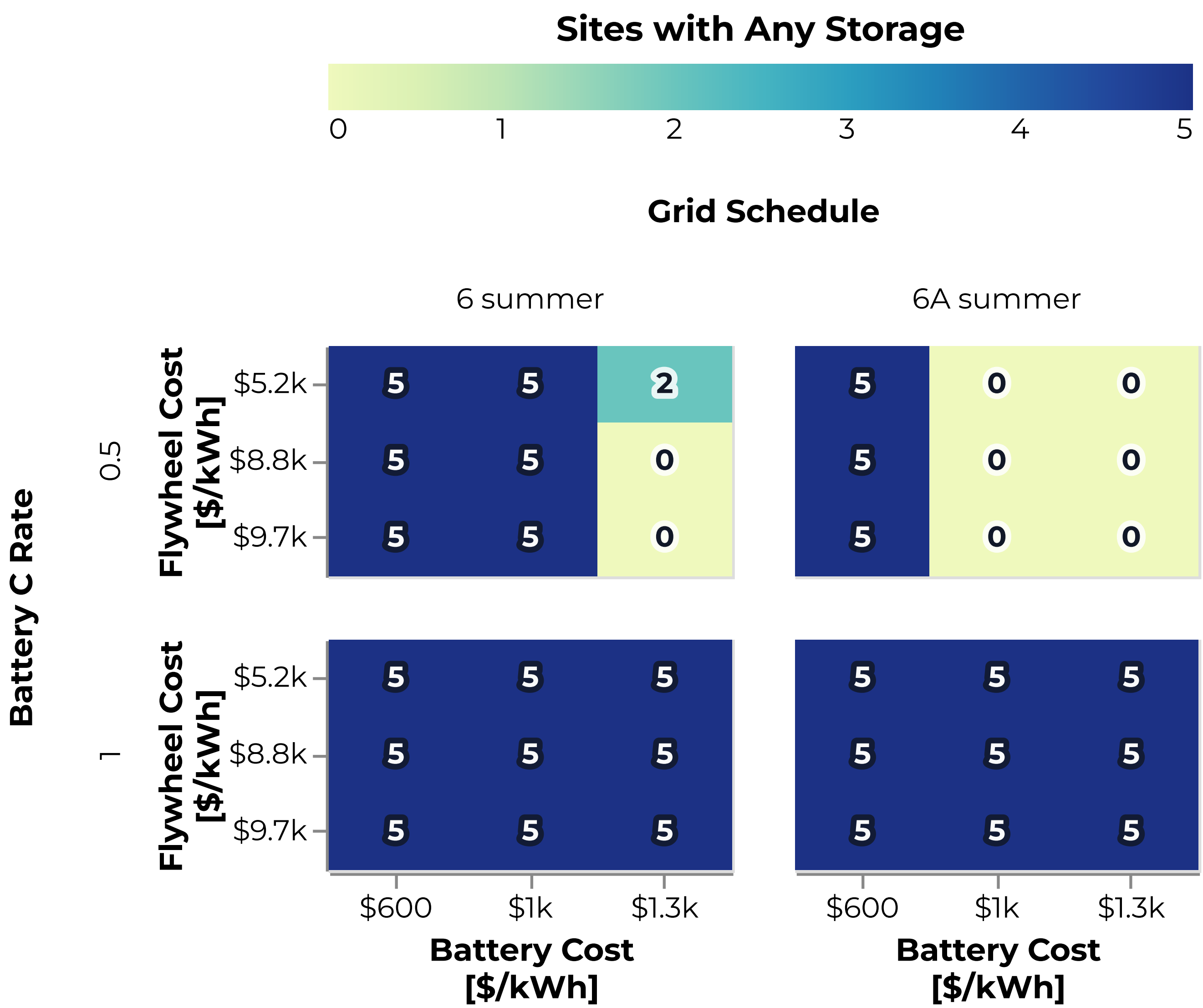


Figure 15: Number of evaluated UTA sites for which any storage is selected in each scenario combination. The storage count uses selected battery power of at least 50 kW or selected flywheel power of at least 80 kW, corresponding to 10 kWh.[3]

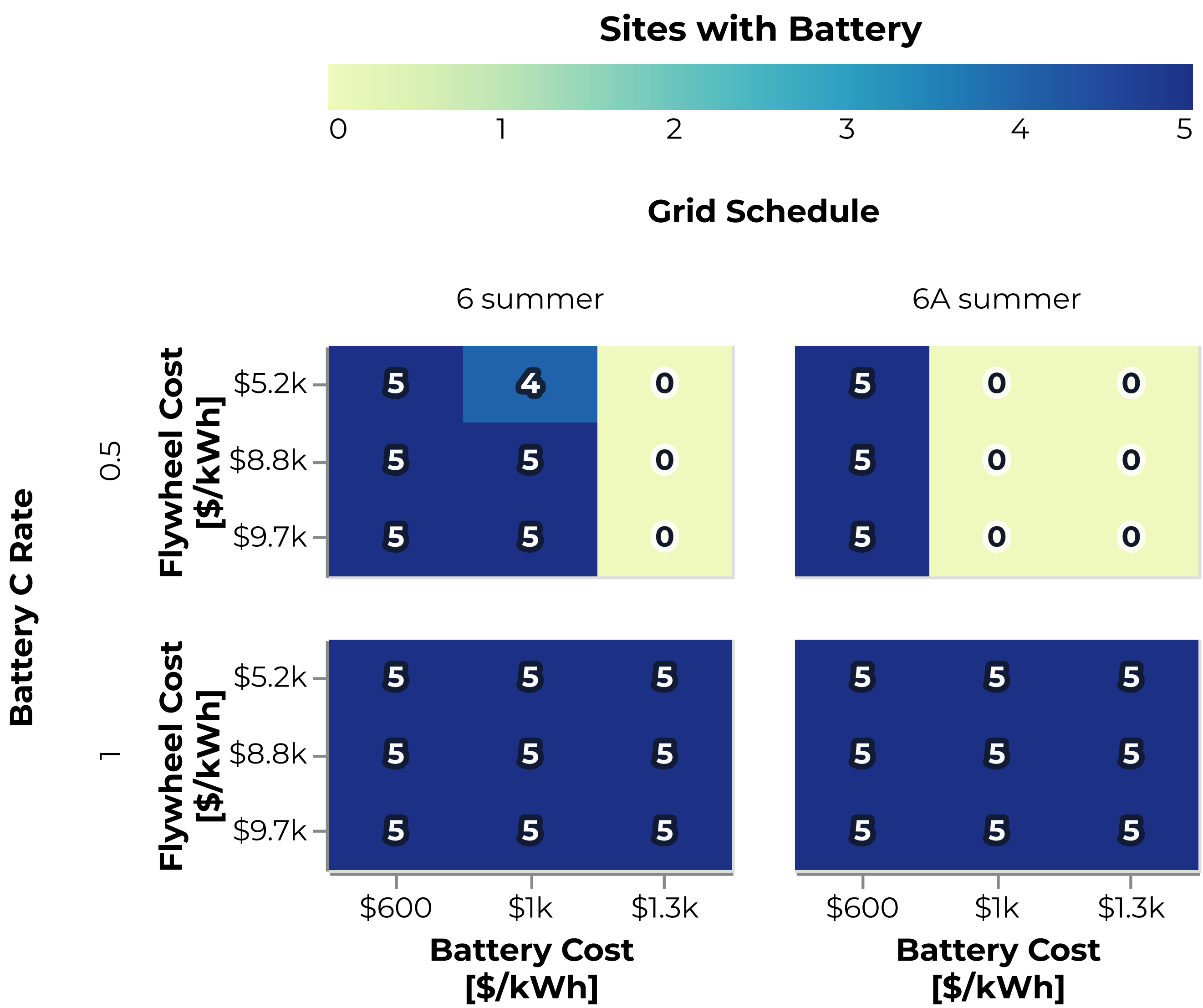


Figure 16: Number of evaluated UTA sites for which battery storage is selected in each scenario combination. Battery selections are counted when selected battery power is at least 50 kW.

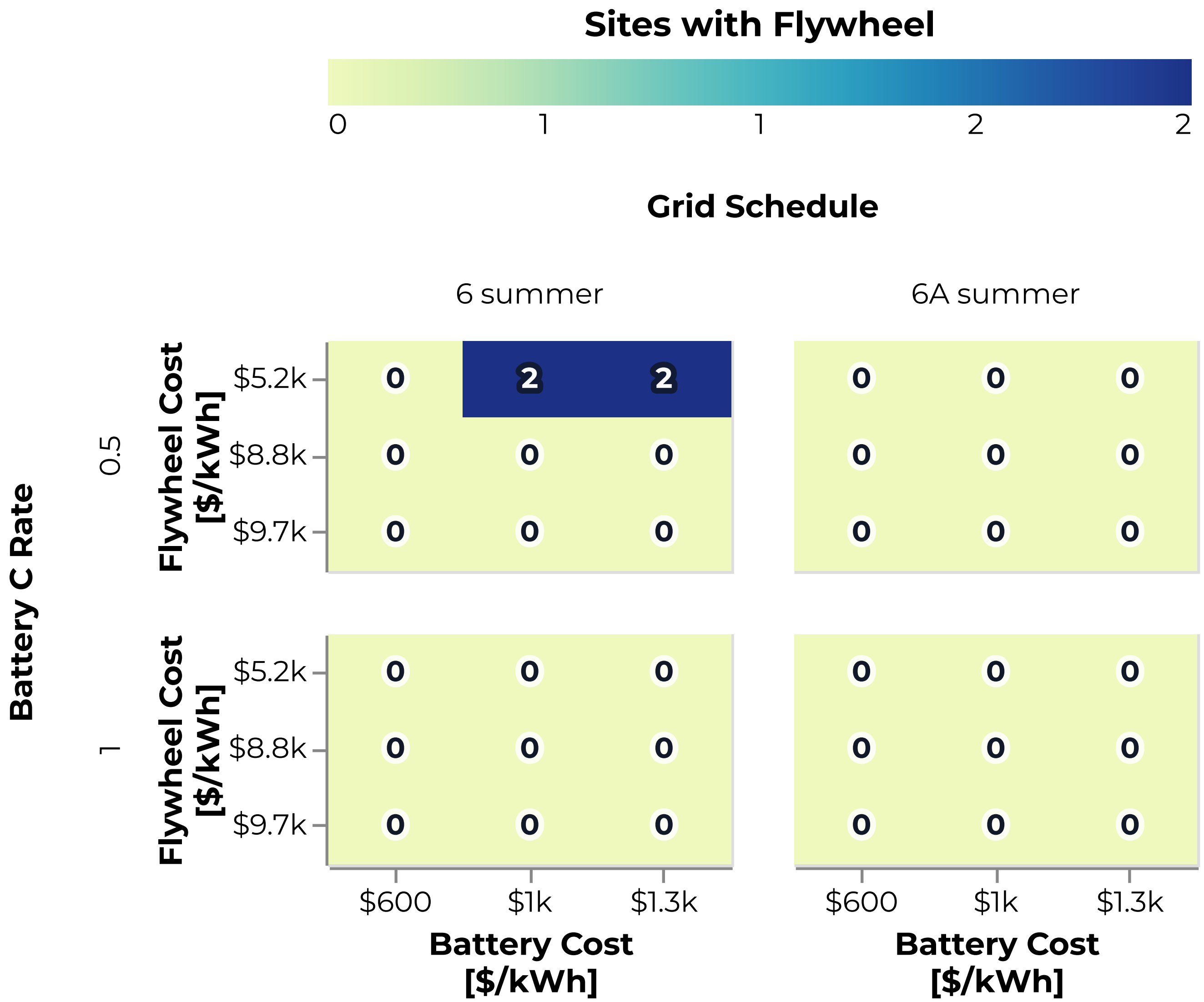


Figure 17: Number of evaluated UTA sites for which flywheel storage is selected in each scenario combination. Flywheel selections are counted when selected flywheel energy is at least 10 kWh.

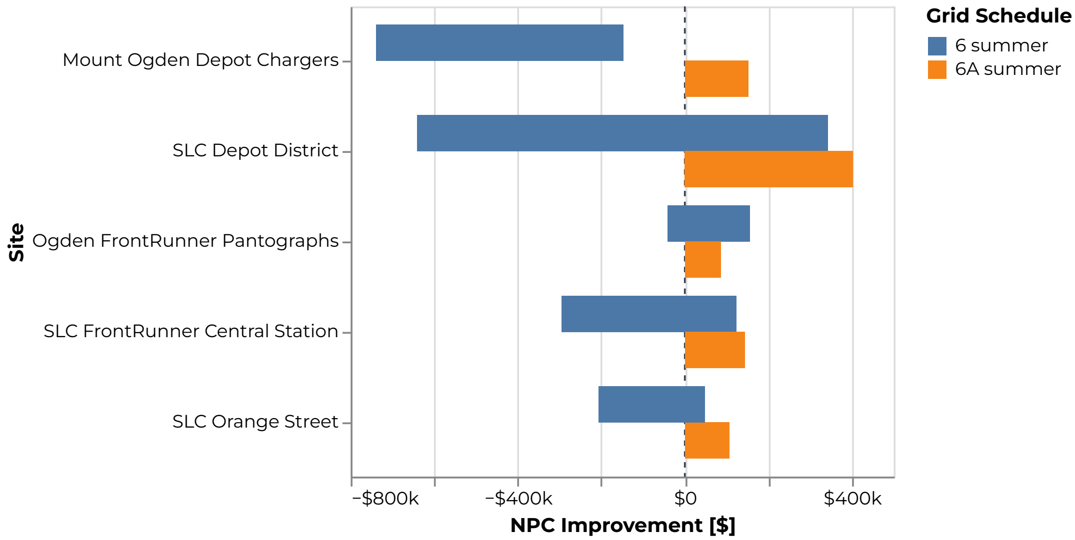


Figure 18: Range in optimized net-present-cost improvement across the scenario sweep by site and rate schedule over the modeled system lifetime, relative to the Schedule 6A no-storage baseline and using January through March 2026 charging profiles. Positive values are savings; blue is better and red is worse.

3.2.2 Mount Ogden Depot Chargers

Mount Ogden has one of the clearest storage-sizing responses among the sites, consistent with the demand shape described in Section 3.1.1. Under Schedule 6, the low-cost battery scenario selects approximately 1.1 MWh of battery storage at both C rates, indicating that the required peak-shaving power for the highest charging-demand intervals is less than 550 kW. Under Schedule 6A, the optimized storage size is smaller in the best-performing case, with about 170 kWh selected at 1 C and about 720 kWh selected at 1/2 C. Even at this site, however, storage is not selected at the quoted prices unless the higher battery discharge-performance case is available.

The unit-cost results in Figure 19 reflect Mount Ogden's high peaks relative to utilization, producing a high cost of charging across scenarios. Figure 19 also highlights the challenges of installing storage under Schedule 6A. Even after more than 700 kWh of battery storage is selected in the low-cost, 1/2 C case, the unit cost changes only modestly relative to the no-storage cases. Under Schedule 6, by contrast, the unit cost falls by more than 20% when a large, low-cost battery is selected. The NPC improvement results in Figure 21 show the tariff distinction directly: storage can significantly improve the Schedule 6 outcome, but the Schedule 6 cases still have higher NPC than the Schedule 6A no-storage baseline.

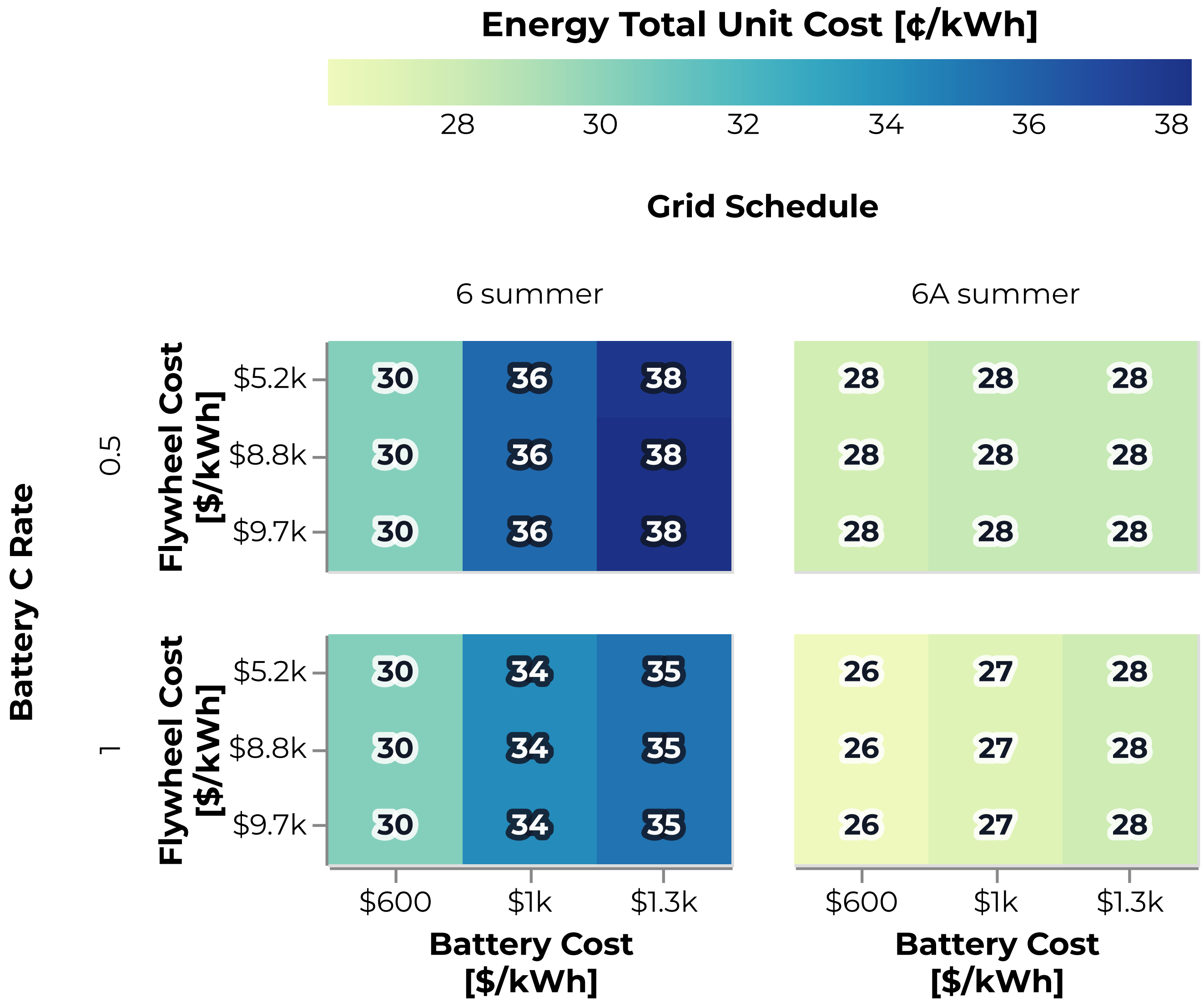


Figure 19: Total unit cost across the Mount Ogden Depot Chargers scenario sweep.

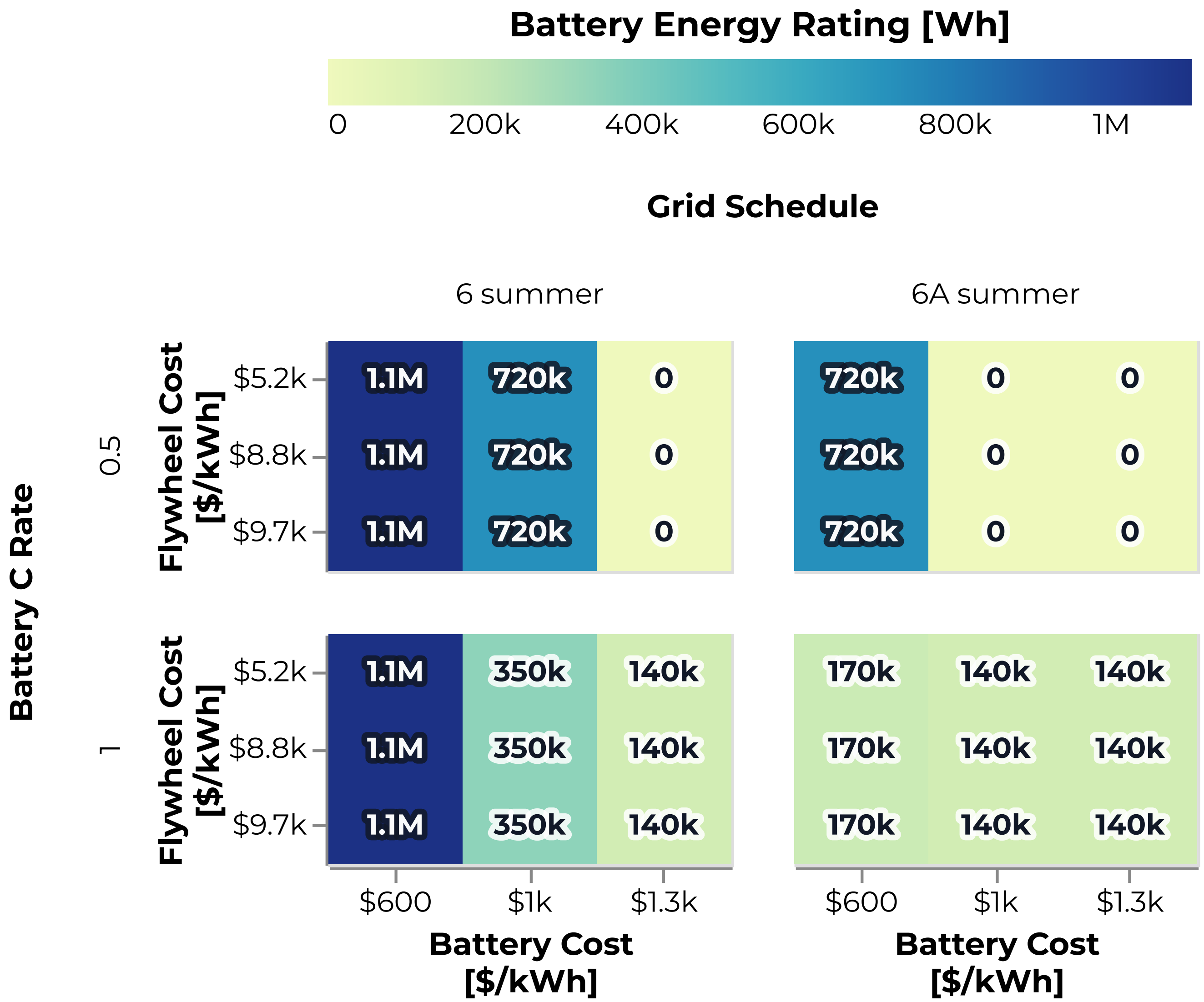


Figure 20: Selected battery energy capacity across the Mount Ogden Depot Chargers scenario sweep.

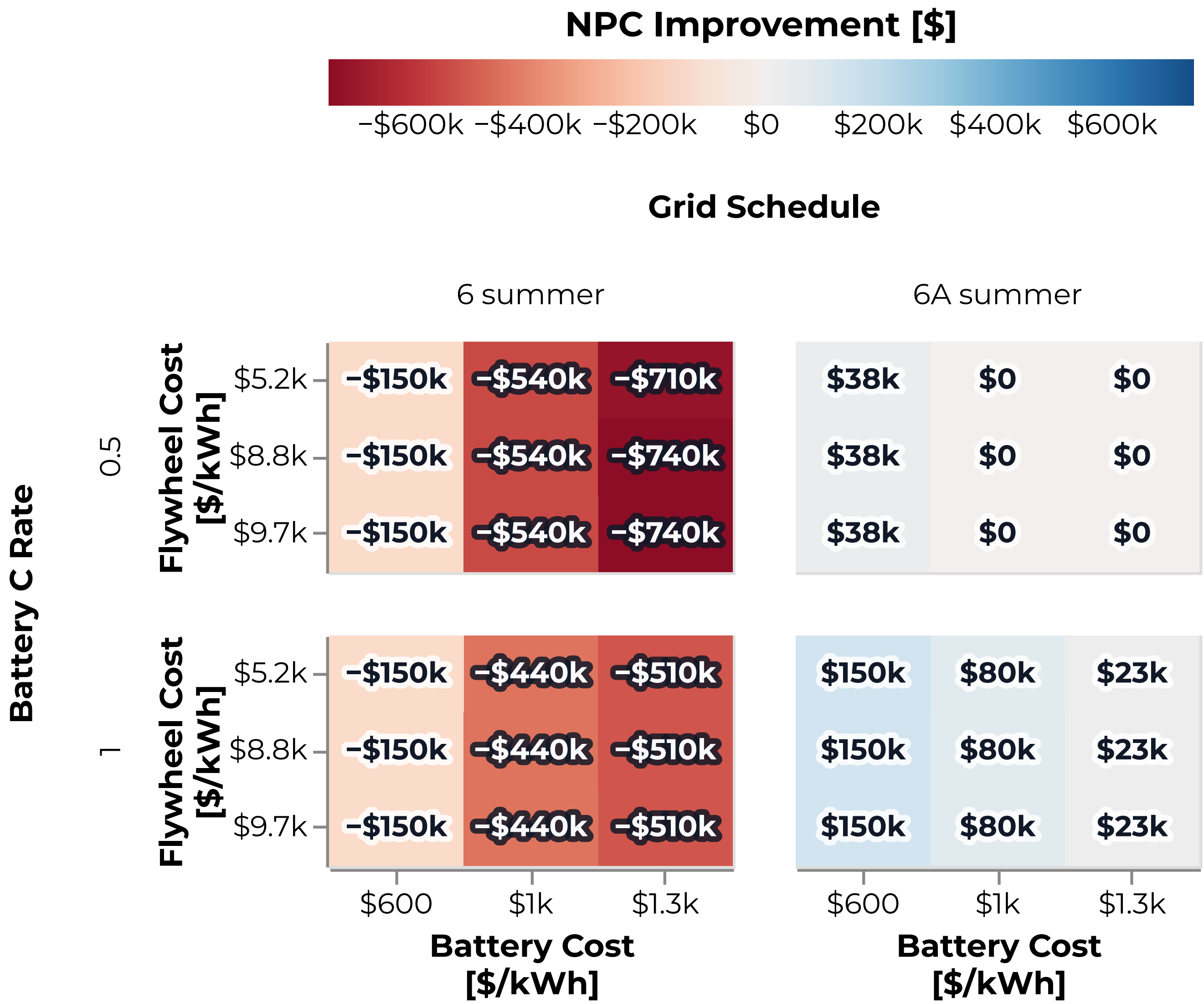


Figure 21: Optimized net-present-cost improvement for Mount Ogden Depot Chargers over the modeled system lifetime relative to the Schedule 6A no-storage baseline, using January through March 2026 charging profiles. Positive values are savings; blue is better and red is worse.

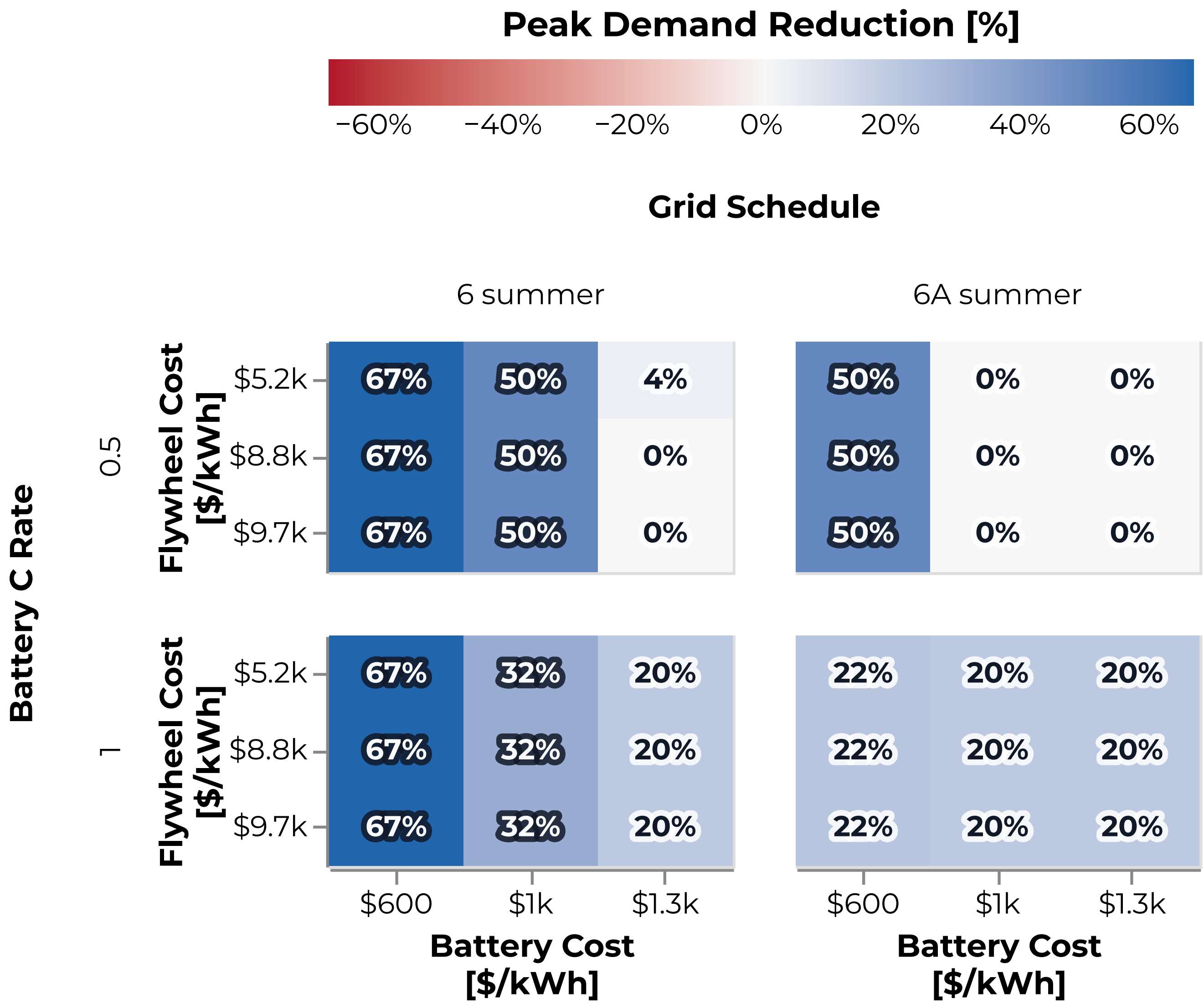


Figure 22: Peak demand reduction for Mount Ogden Depot Chargers relative to the measured January through March 2026 load-profile baseline.

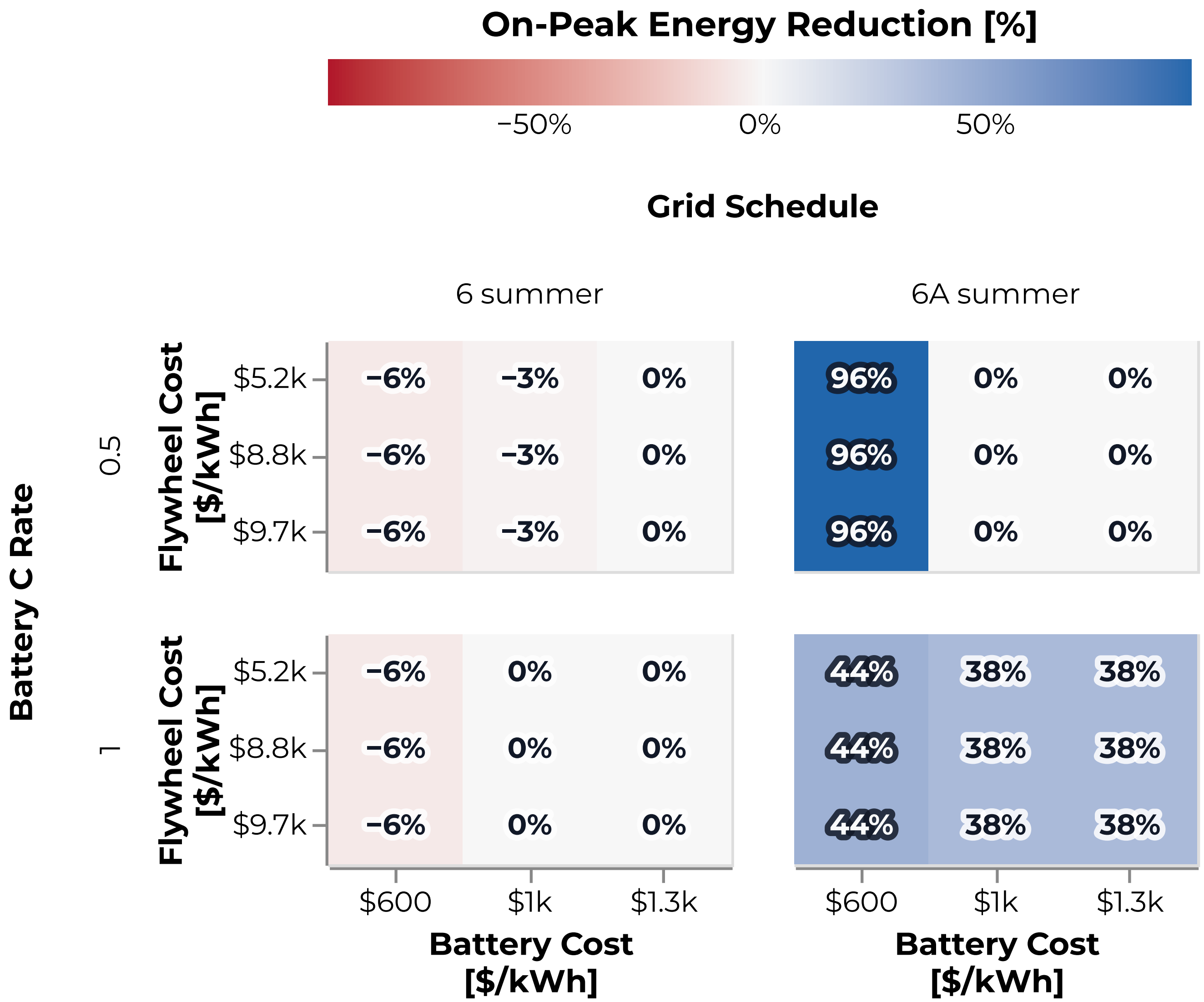


Figure 23: Schedule 6A weekday evening on-peak energy reduction for Mount Ogden Depot Chargers relative to the measured January through March 2026 load-profile baseline, with observed holidays treated as off-peak.

3.2.3 Ogden FrontRunner Pantographs

Ogden FrontRunner Pantographs has the lowest unit-cost results among the sites considered. The selected battery sizes in Figure 25 are comparatively modest: the best-performing 1 C cases select about 80 kWh, while the low-cost, 1/2 C cases select roughly 160 to 180 kWh depending on the tariff. This pattern suggests that the site benefits from storage, but does not require the larger battery capacities seen at the depot sites.

The flywheel result in Figure 26 is narrow, appearing only under Schedule 6 and only at the lowest flywheel cost assumption. At the quoted flywheel cost, the optimized result shifts away from flywheels. The NPC improvement chart in Figure 27 shows that the most favorable cases improve on the Schedule 6A no-storage baseline by roughly $160k, while the least favorable Schedule 6 cases have slightly higher NPC than that baseline. The main financial conclusion for this site is therefore battery-oriented, with flywheels appearing only as a low-cost sensitivity result.

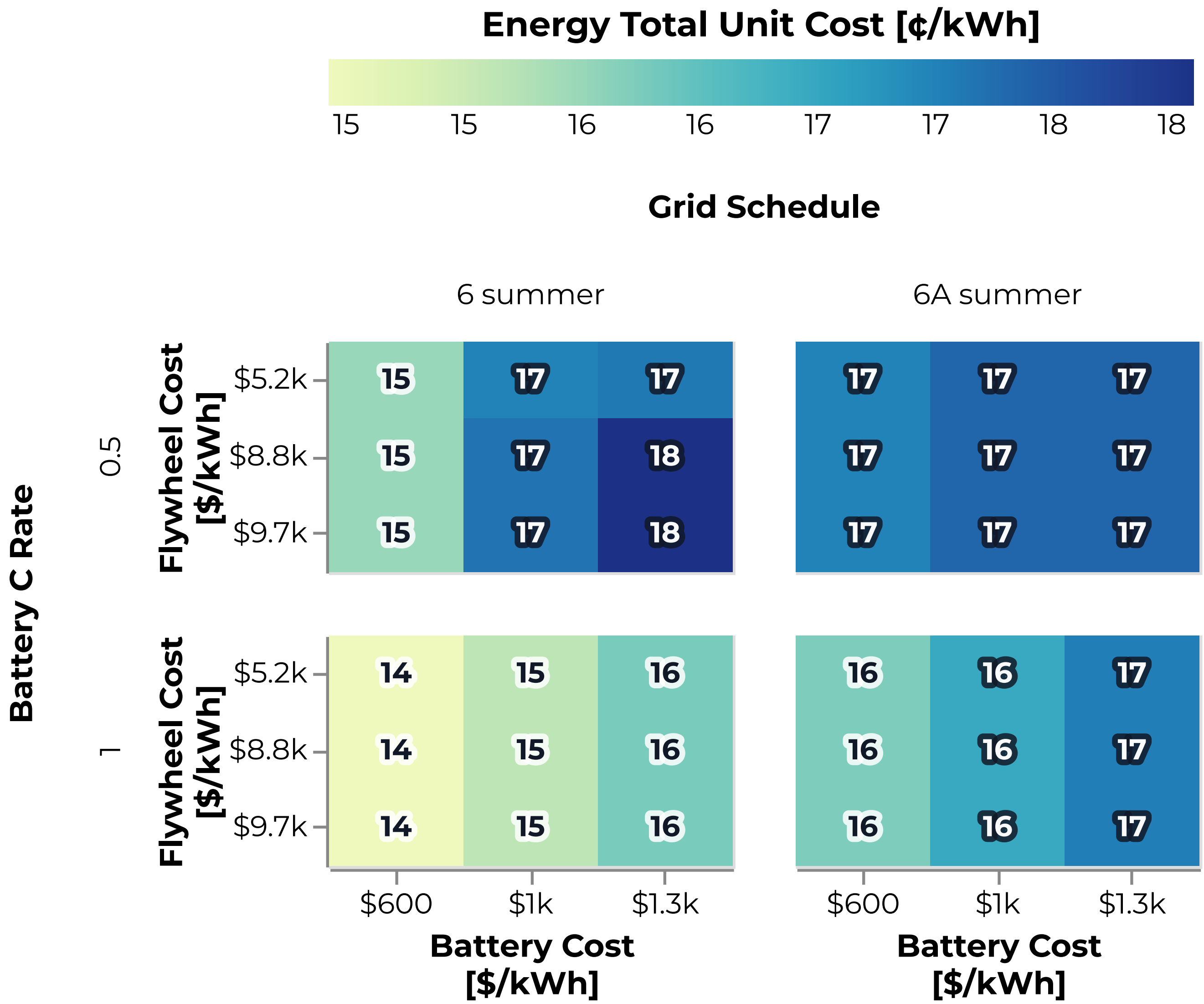


Figure 24: Total unit cost across the Ogden FrontRunner Pantographs scenario sweep.

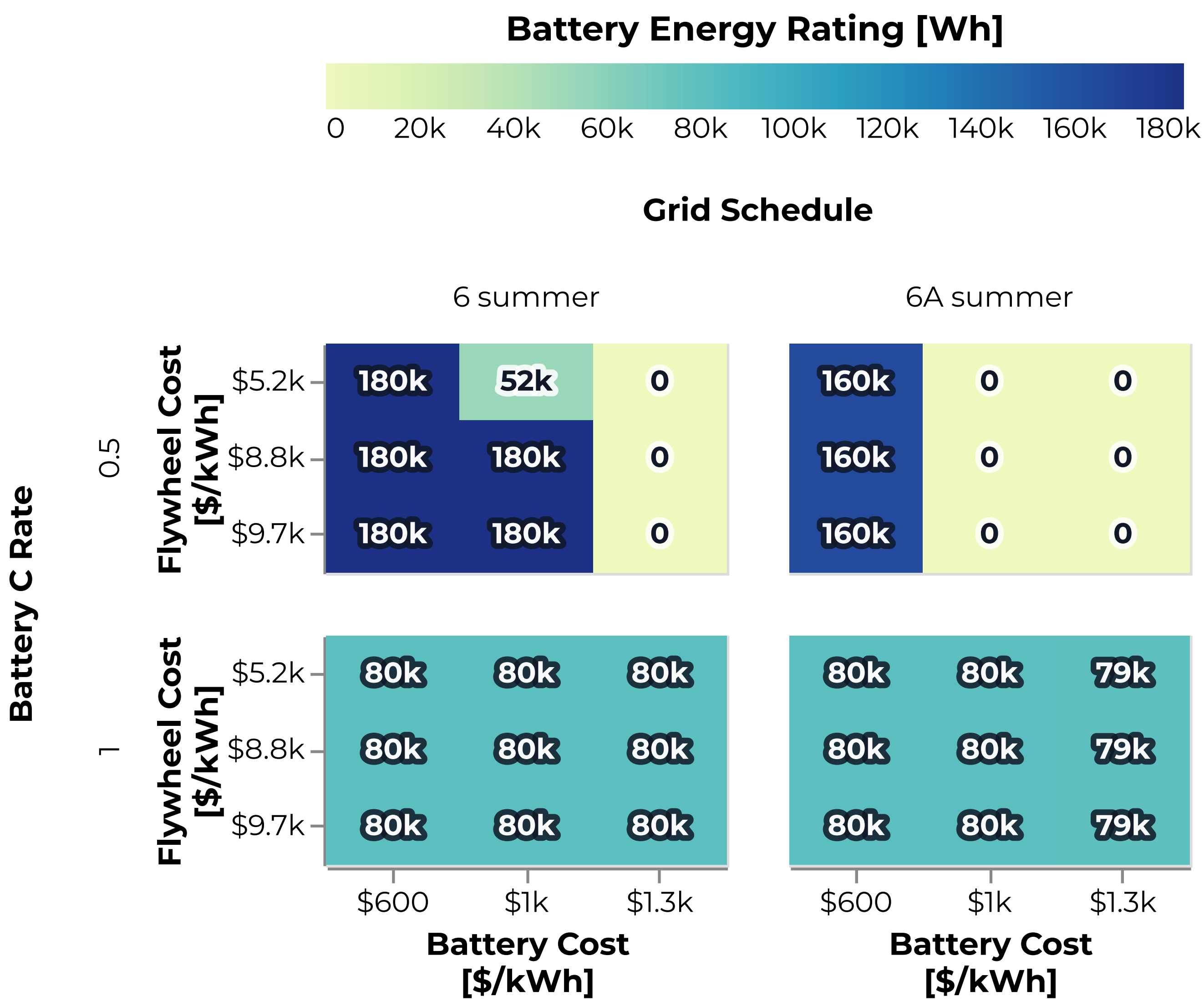


Figure 25: Selected battery energy capacity across the Ogden FrontRunner Pantographs scenario sweep.

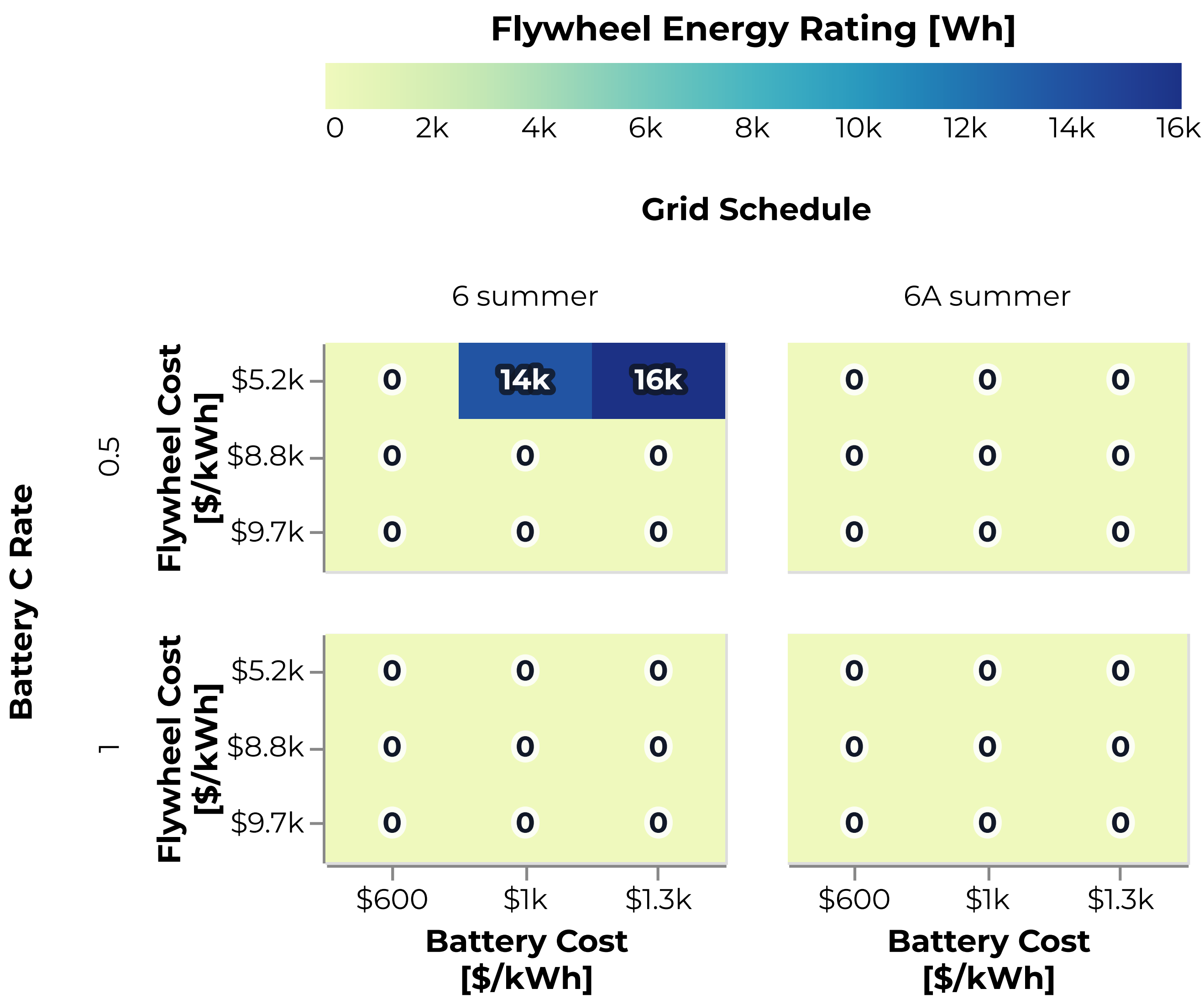


Figure 26: Selected flywheel energy capacity across the Ogden FrontRunner Pantographs scenario sweep.

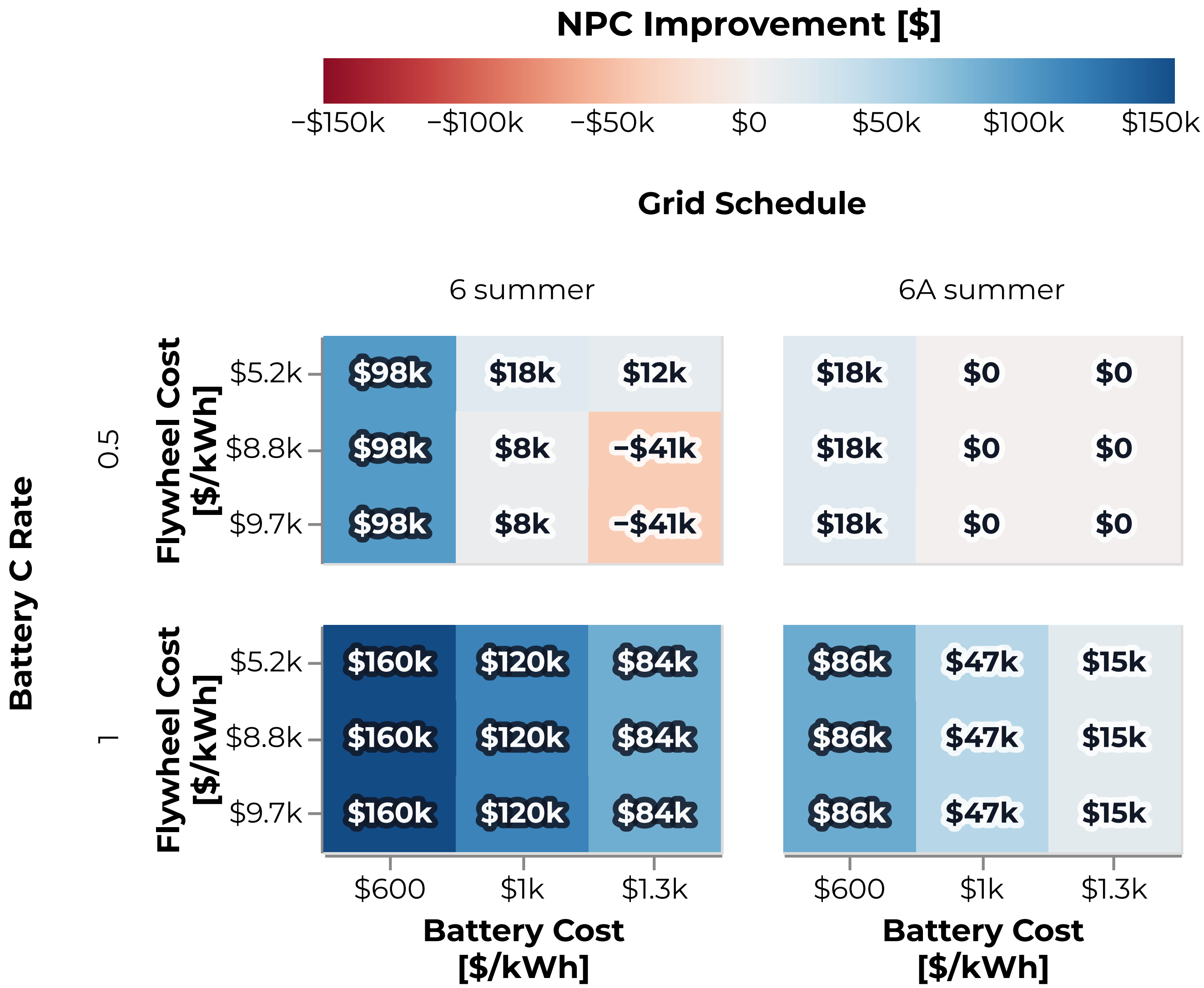


Figure 27: Optimized net-present-cost improvement for Ogden FrontRunner Pantographs over the modeled system lifetime relative to the Schedule 6A no-storage baseline, using January through March 2026 charging profiles. Positive values are savings; blue is better and red is worse.

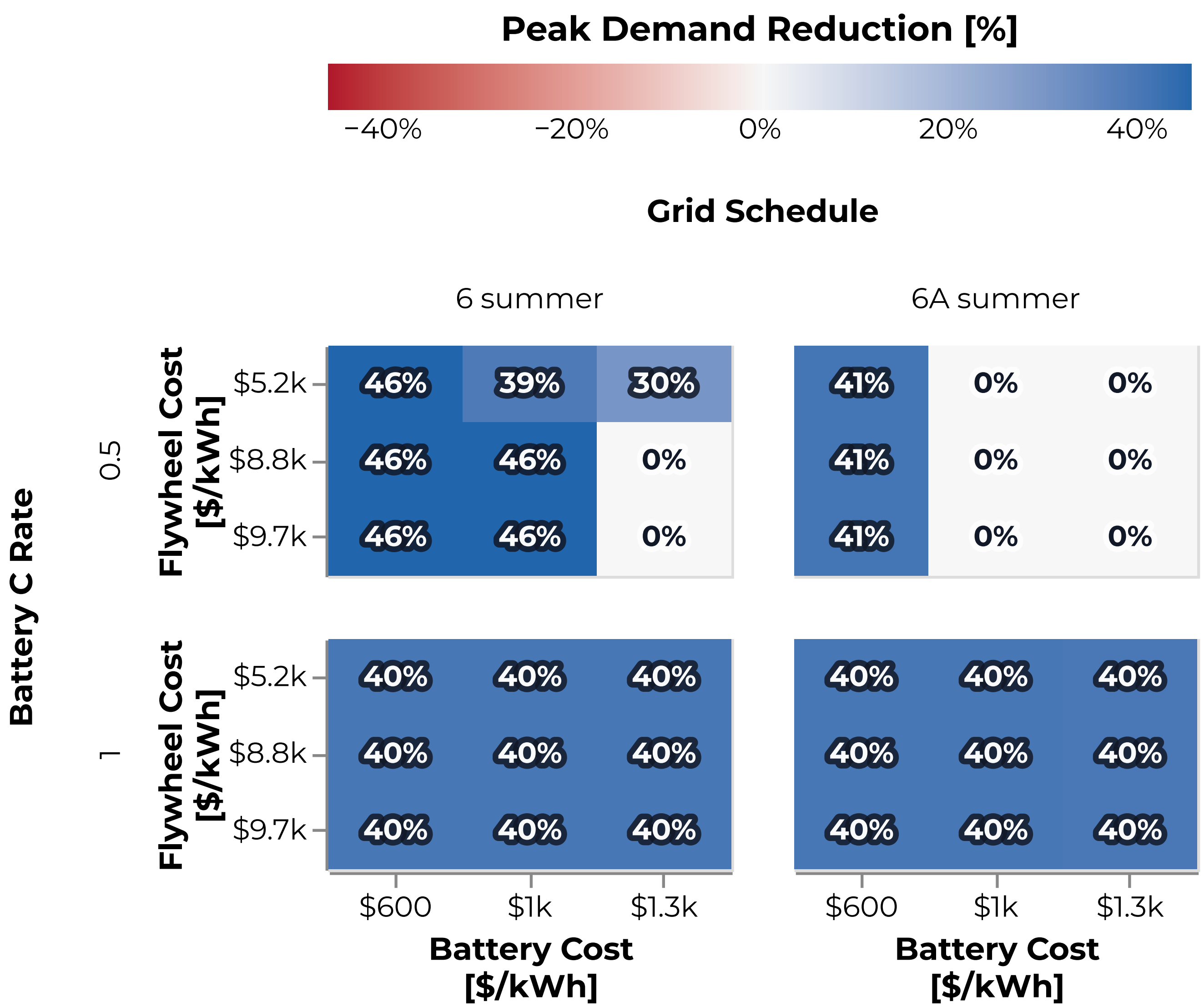


Figure 28: Peak demand reduction for Ogden FrontRunner Pantographs relative to the measured January through March 2026 load-profile baseline.

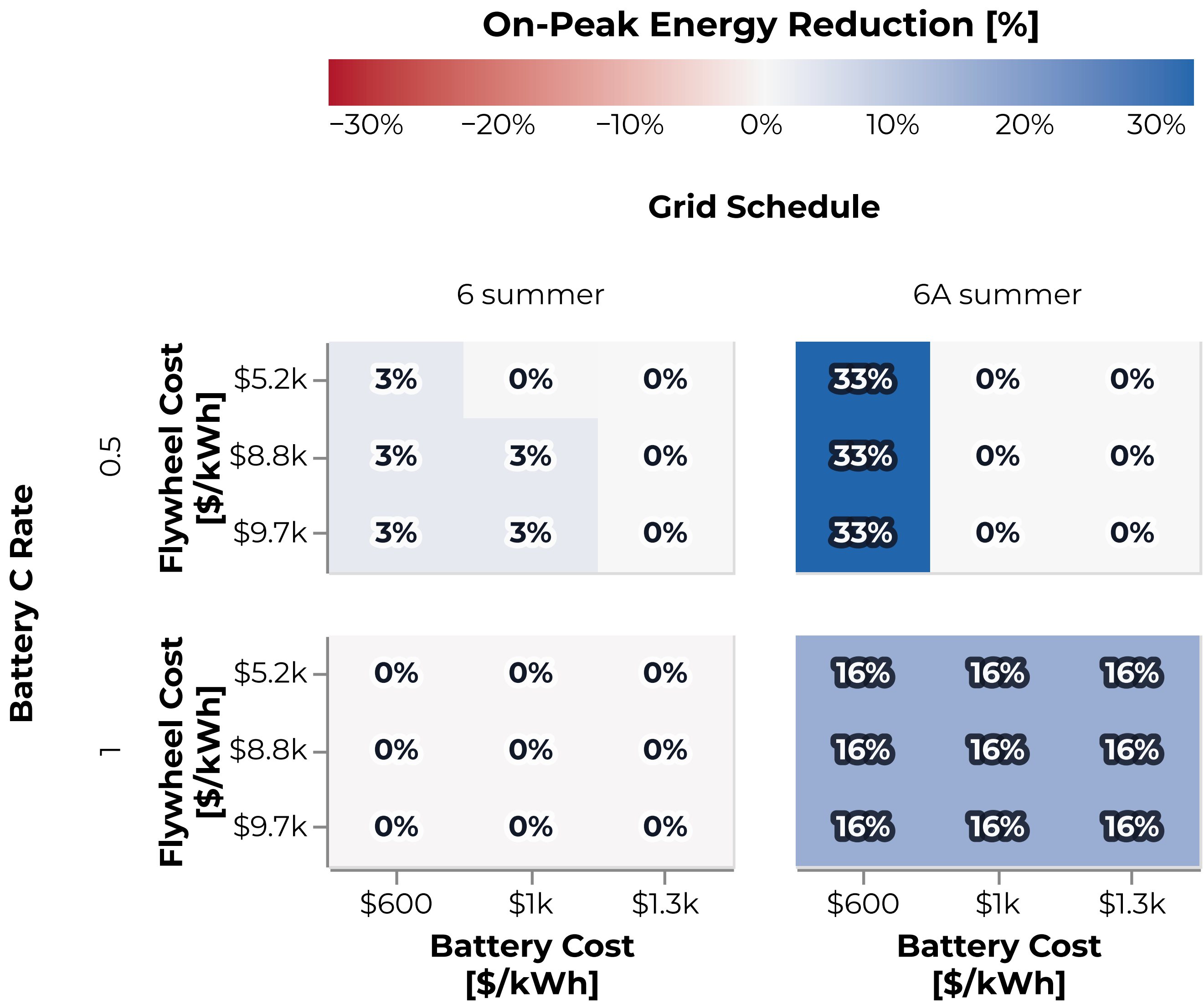


Figure 29: Schedule 6A weekday evening on-peak energy reduction for Ogden FrontRunner Pantographs relative to the measured January through March 2026 load-profile baseline, with observed holidays treated as off-peak.

3.2.4 SLC Depot District

SLC Depot District has the largest NPC range across the scenario sweep. Under Schedule 6, the low-cost, 1 C battery case selects about 490 kWh, while the low-cost, 1/2 C case selects about 990 kWh, indicating that storage sizing at this site is more power-constrained than energy-constrained. At 1/2 C, Schedule 6 also selects about 990 kWh at the middle battery cost, while Schedule 6A does not select storage at all. This makes SLC Depot District the clearest example of tariff-driven battery sizing in the site results.

The unit-cost chart in Figure 30 shows that the Schedule 6 cases can retain a higher unit cost even after a large battery is selected. Despite the larger storage investment and improved grid utilization, a Schedule 6 case can remain roughly 20% higher in unit cost than the corresponding Schedule 6A case. The NPC improvement chart in Figure 32 adds the broader context: low-cost battery cases under both tariffs can improve substantially on the Schedule 6A no-storage baseline, but quoted battery cost Schedule 6 cases also create the largest downside range in the site-level results.

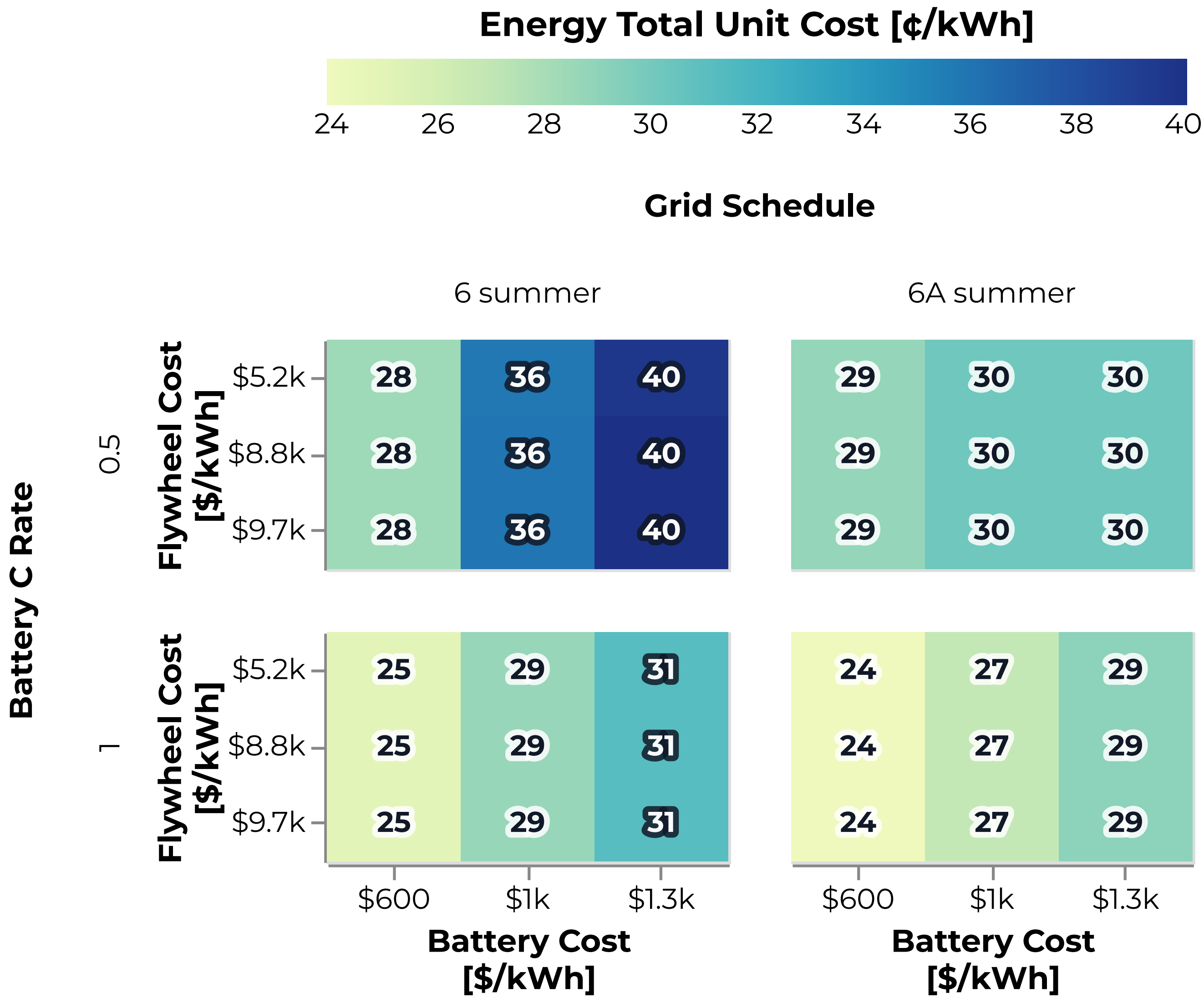


Figure 30: Total unit cost across the SLC Depot District scenario sweep.

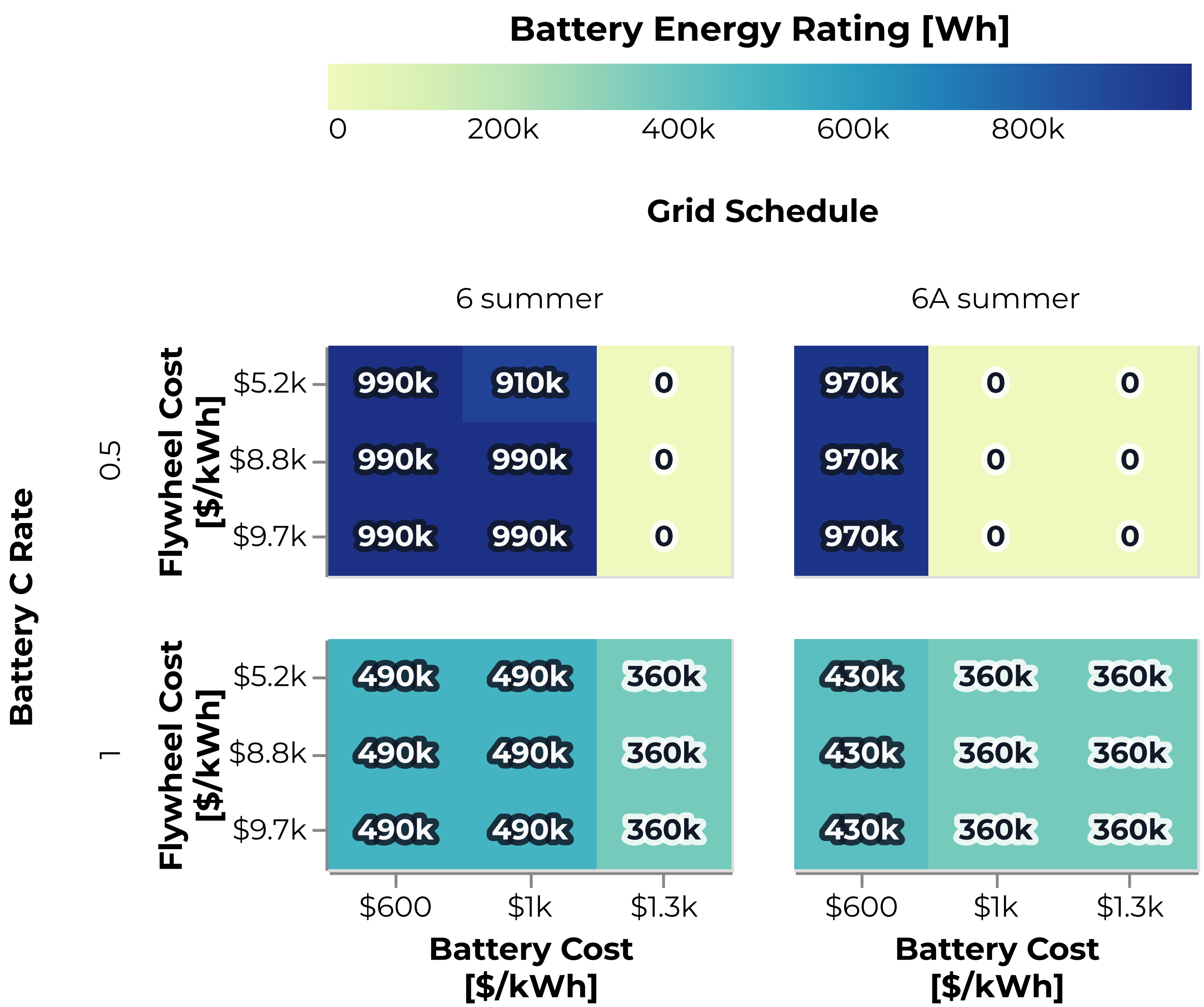


Figure 31: Selected battery energy capacity across the SLC Depot District scenario sweep.

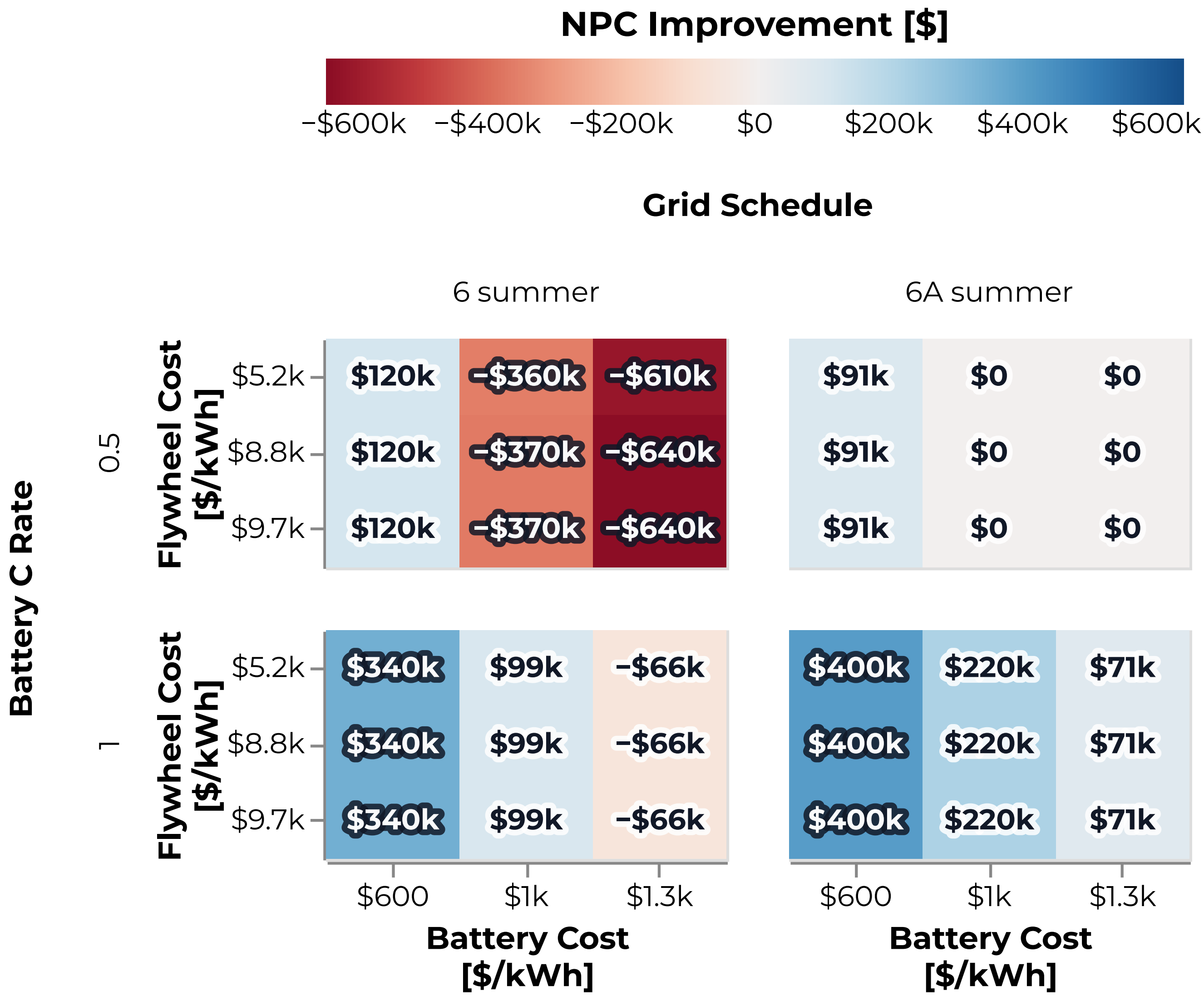


Figure 32: Optimized net-present-cost improvement for SLC Depot District over the modeled system lifetime relative to the Schedule 6A no-storage baseline, using January through March 2026 charging profiles. Positive values are savings; blue is better and red is worse.

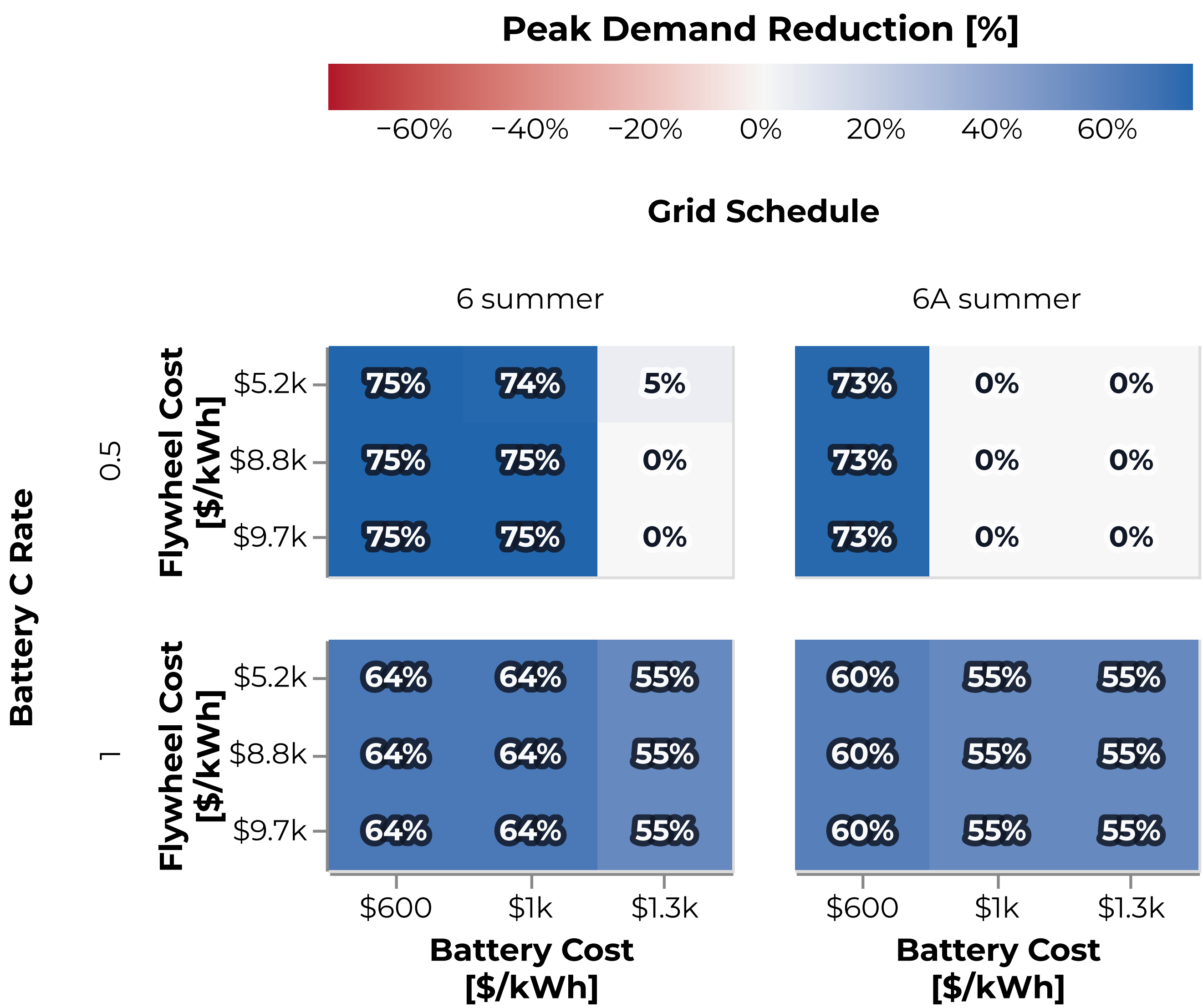


Figure 33: Peak demand reduction for SLC Depot District relative to the measured January through March 2026 load-profile baseline.

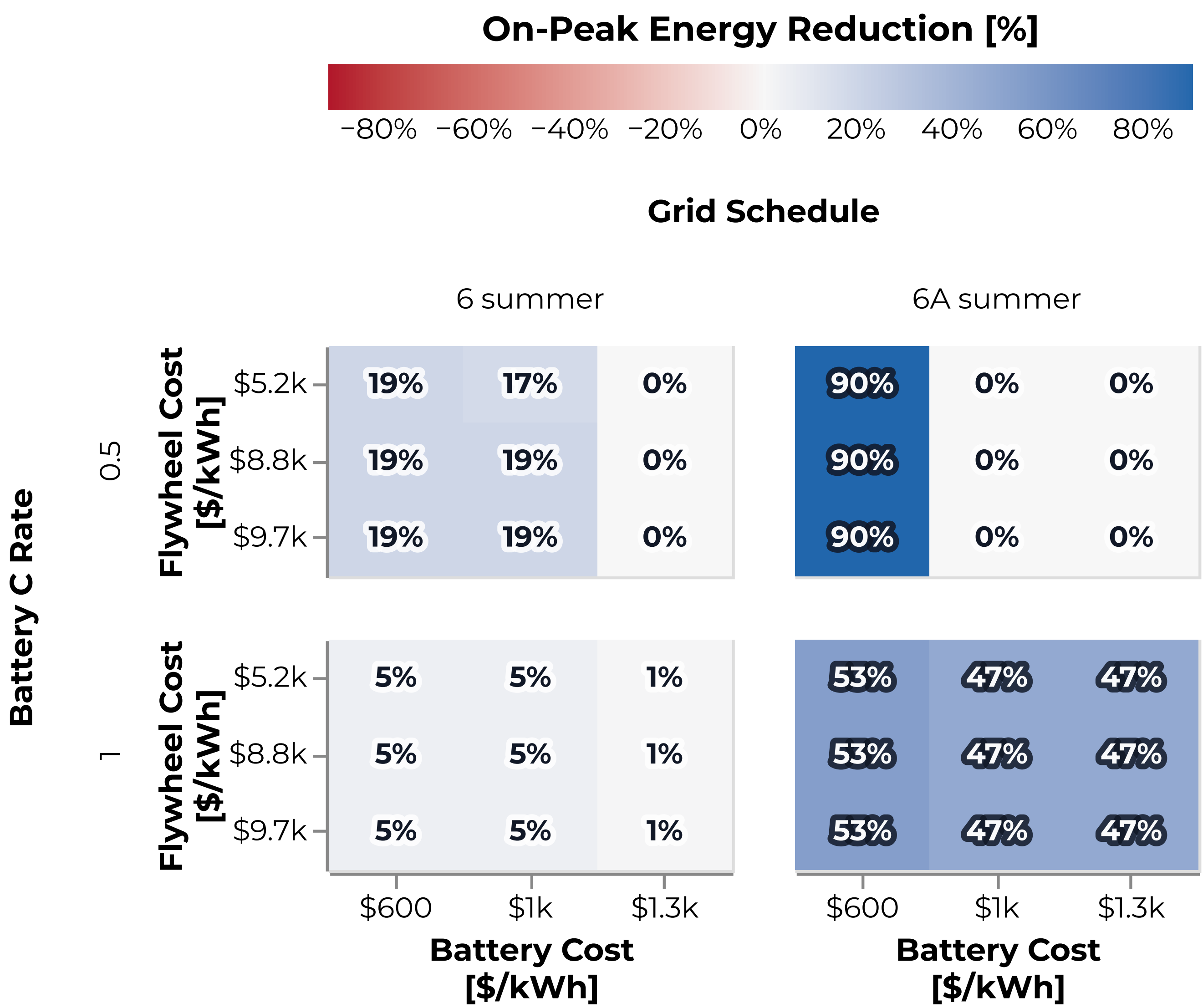


Figure 34: Schedule 6A weekday evening on-peak energy reduction for SLC Depot District relative to the measured January through March 2026 load-profile baseline, with observed holidays treated as off-peak.

3.2.5 SLC FrontRunner Central Station

SLC FrontRunner Central Station's storage sizing is consistent with the demand shape described in Section 3.1.4. The best-performing low-cost, 1 C cases select about 310 kWh under Schedule 6 and 280 kWh under Schedule 6A. Under the low-cost, 1/2 C battery assumption, selected capacity increases to roughly 490 kWh under Schedule 6 and 450 kWh under Schedule 6A.

As with SLC Depot District, the 1/2 C middle-cost case separates the two tariffs: Schedule 6 selects a battery, while Schedule 6A does not. Flywheels appear only in the low-flywheel-cost sensitivity cases under Schedule 6, as shown in Figure 37, so the practical storage result at quoted prices remains focused on battery performance and battery installed cost. The NPC improvement results in Figure 38 show moderate upside relative to the Schedule 6A no-storage baseline, but also show that unfavorable Schedule 6 cases can have materially higher NPC than that baseline.

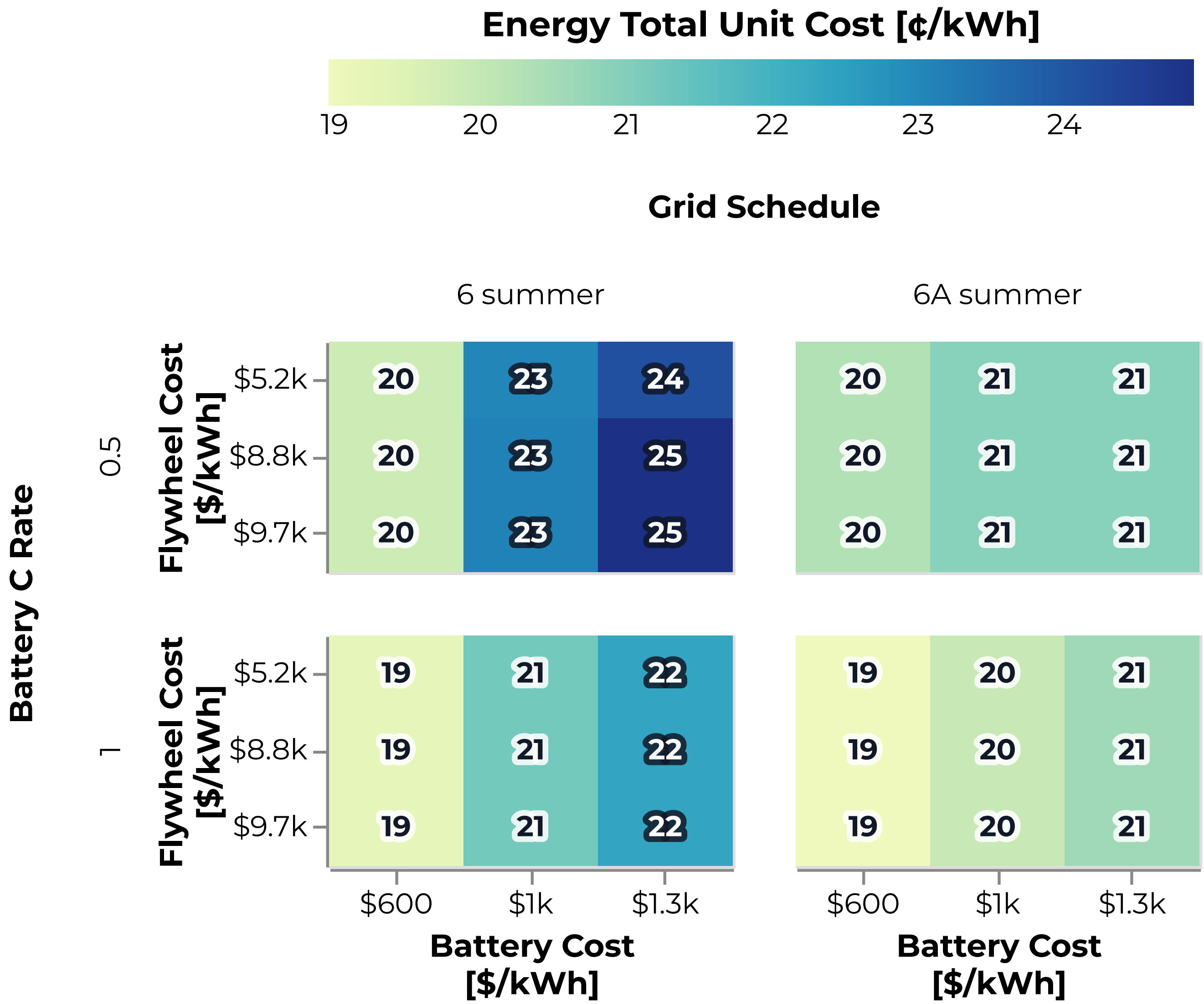


Figure 35: Total unit cost across the SLC FrontRunner Central Station scenario sweep.

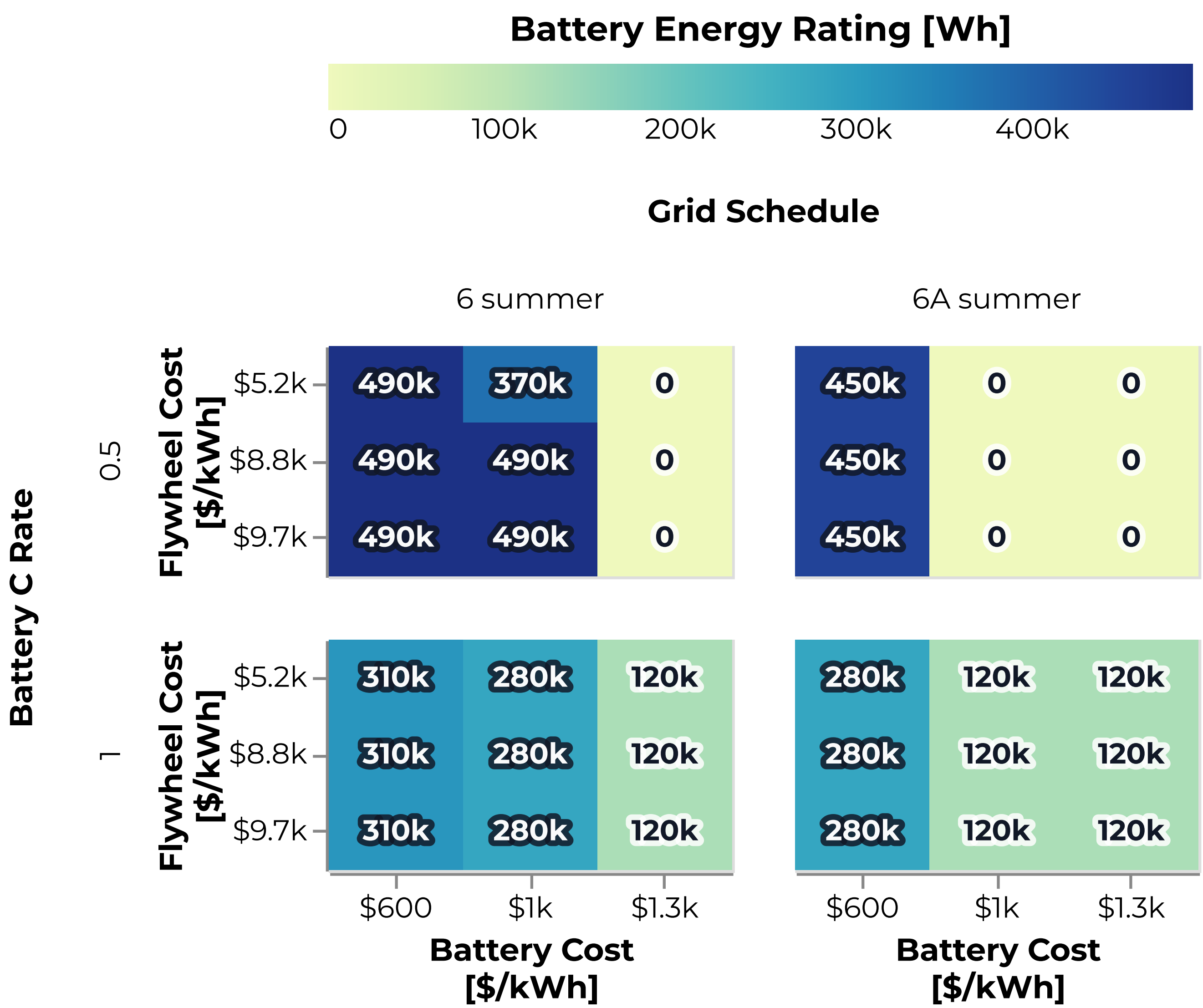


Figure 36: Selected battery energy capacity across the SLC FrontRunner Central Station scenario sweep.

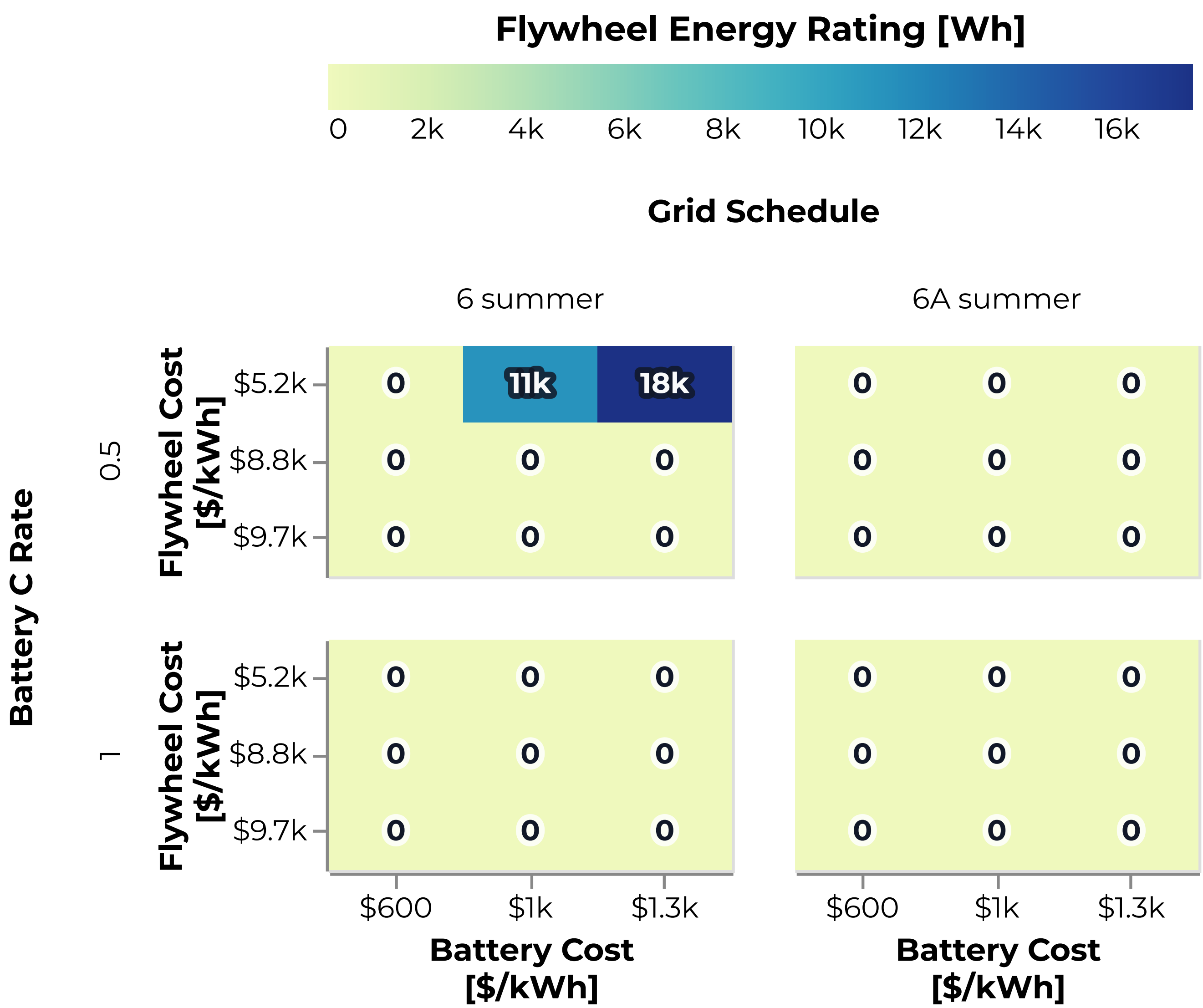


Figure 37: Selected flywheel energy capacity across the SLC FrontRunner Central Station scenario sweep.

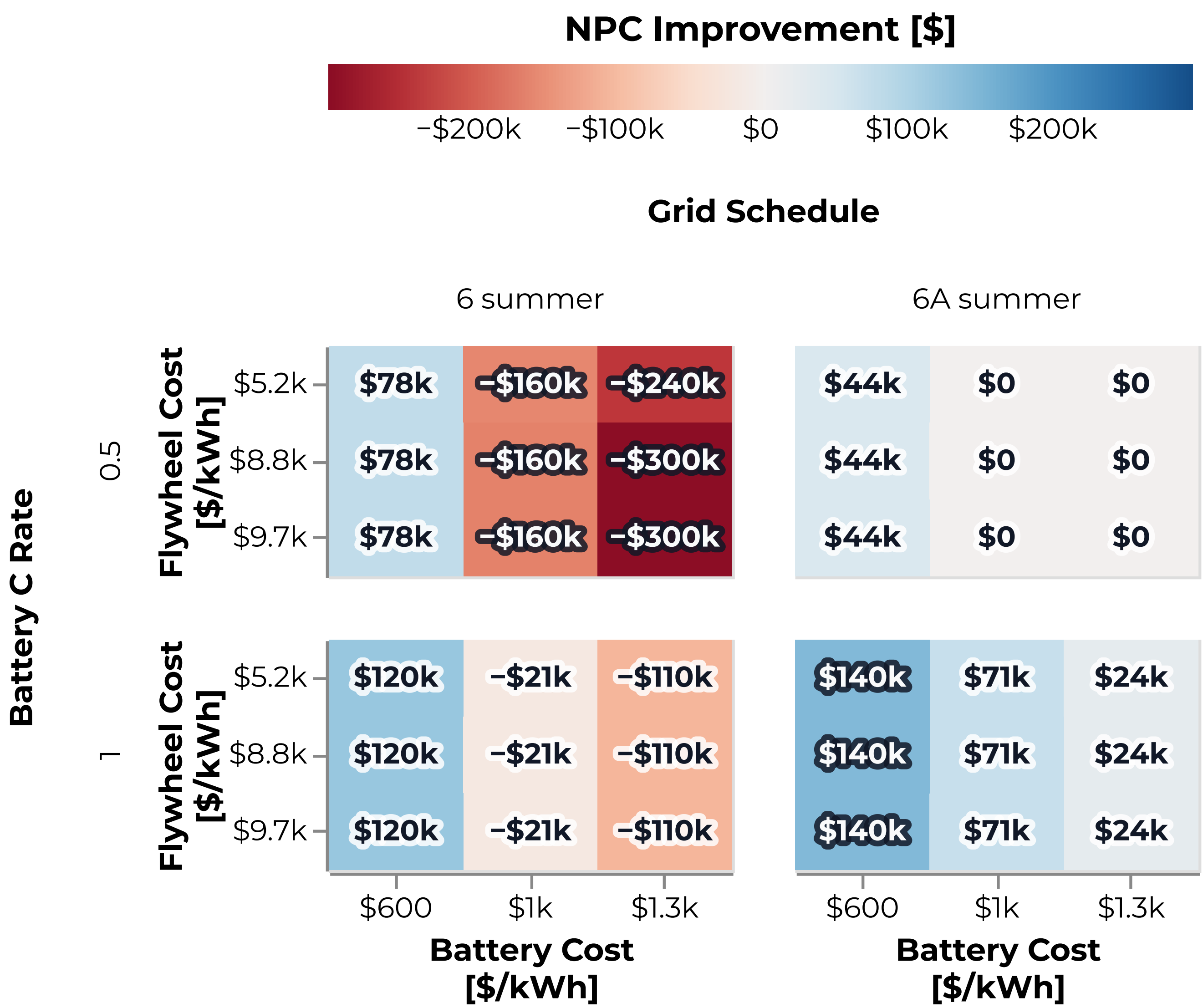


Figure 38: Optimized net-present-cost improvement for SLC FrontRunner Central Station over the modeled system lifetime relative to the Schedule 6A no-storage baseline, using January through March 2026 charging profiles. Positive values are savings; blue is better and red is worse.

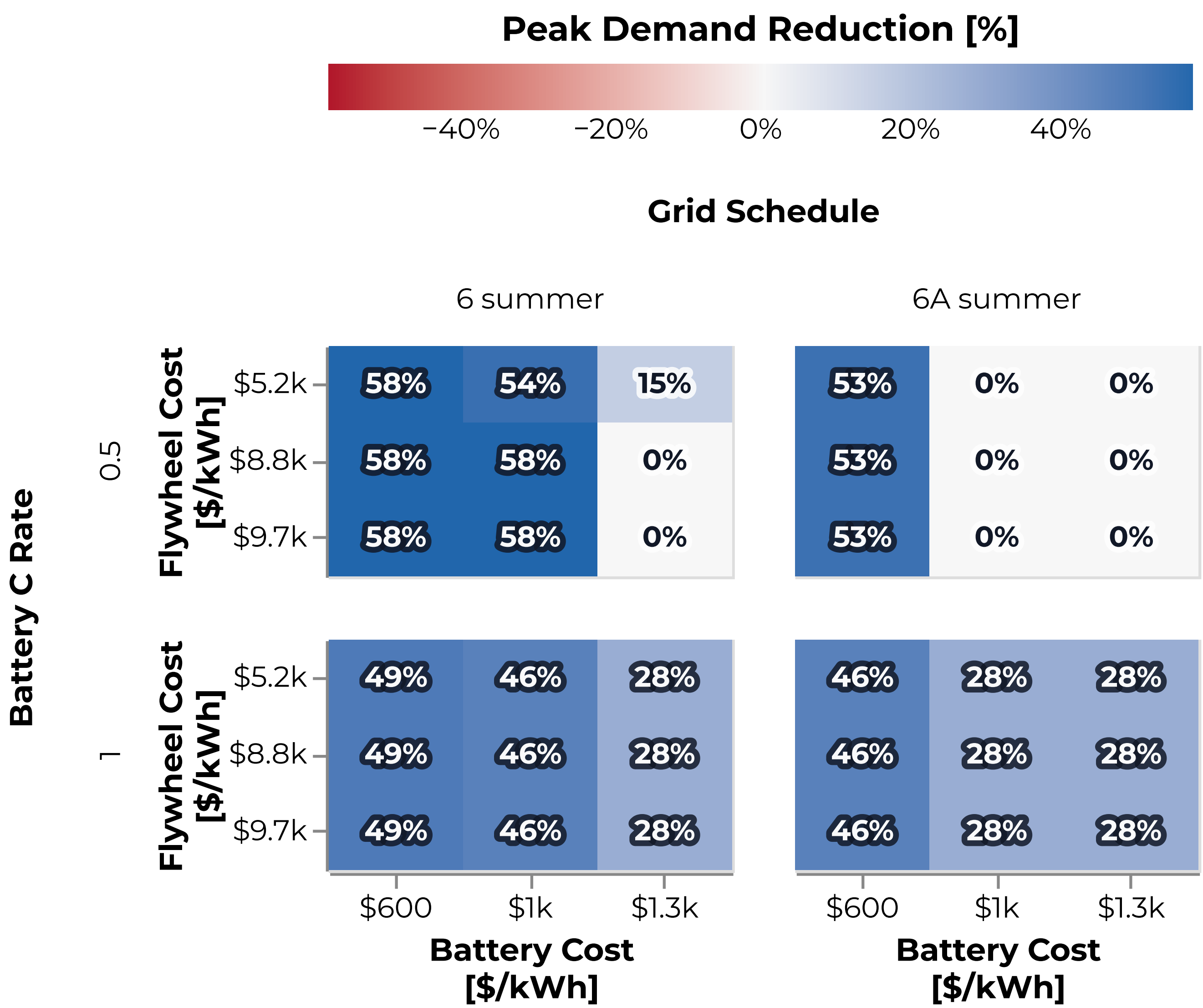


Figure 39: Peak demand reduction for SLC FrontRunner Central Station relative to the measured January through March 2026 load-profile baseline.

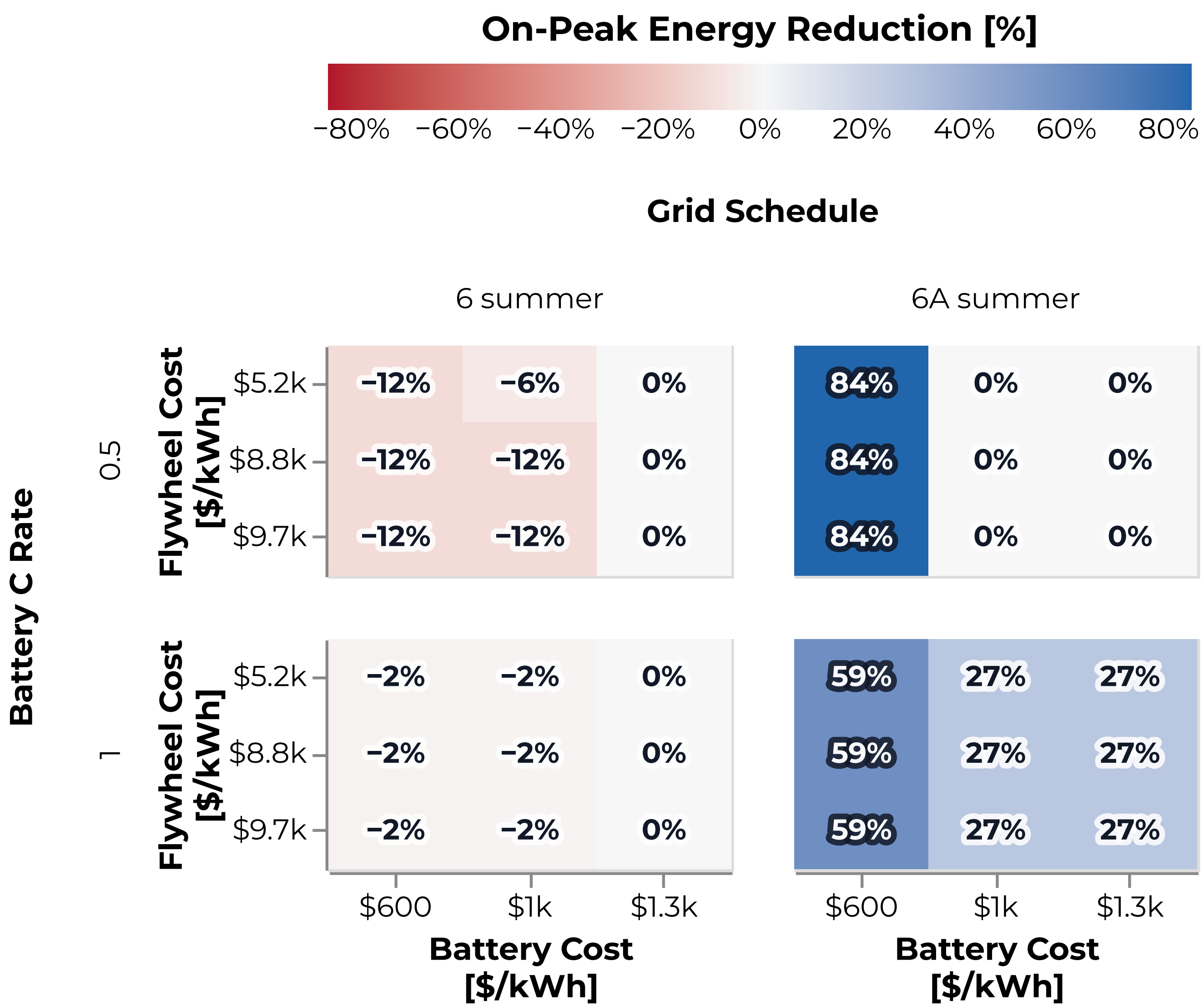


Figure 40: Schedule 6A weekday evening on-peak energy reduction for SLC FrontRunner Central Station relative to the measured January through March 2026 load-profile baseline, with observed holidays treated as off-peak.

3.2.6 SLC Orange Street

SLC Orange Street has one of the smallest absolute NPC ranges among the sites, but storage is still selected in favorable battery scenarios. The best-performing 1 C cases select about 100 kWh under both schedules, while the low-cost, 1/2 C cases select about 240 kWh under Schedule 6 and 230 kWh under Schedule 6A. These selected sizes are smaller than the higher-energy depot and central-station sites, consistent with the lower total charging demand at this mixed site.

The NPC improvement chart in Figure 43 indicates that SLC Orange Street is not the largest storage opportunity in absolute dollar terms, but it remains relevant in a portfolio analysis. A modest battery can be sufficient when battery cost is low or power capability is high. At the quoted high battery and flywheel costs with 1/2 C battery performance, however, storage is not selected.

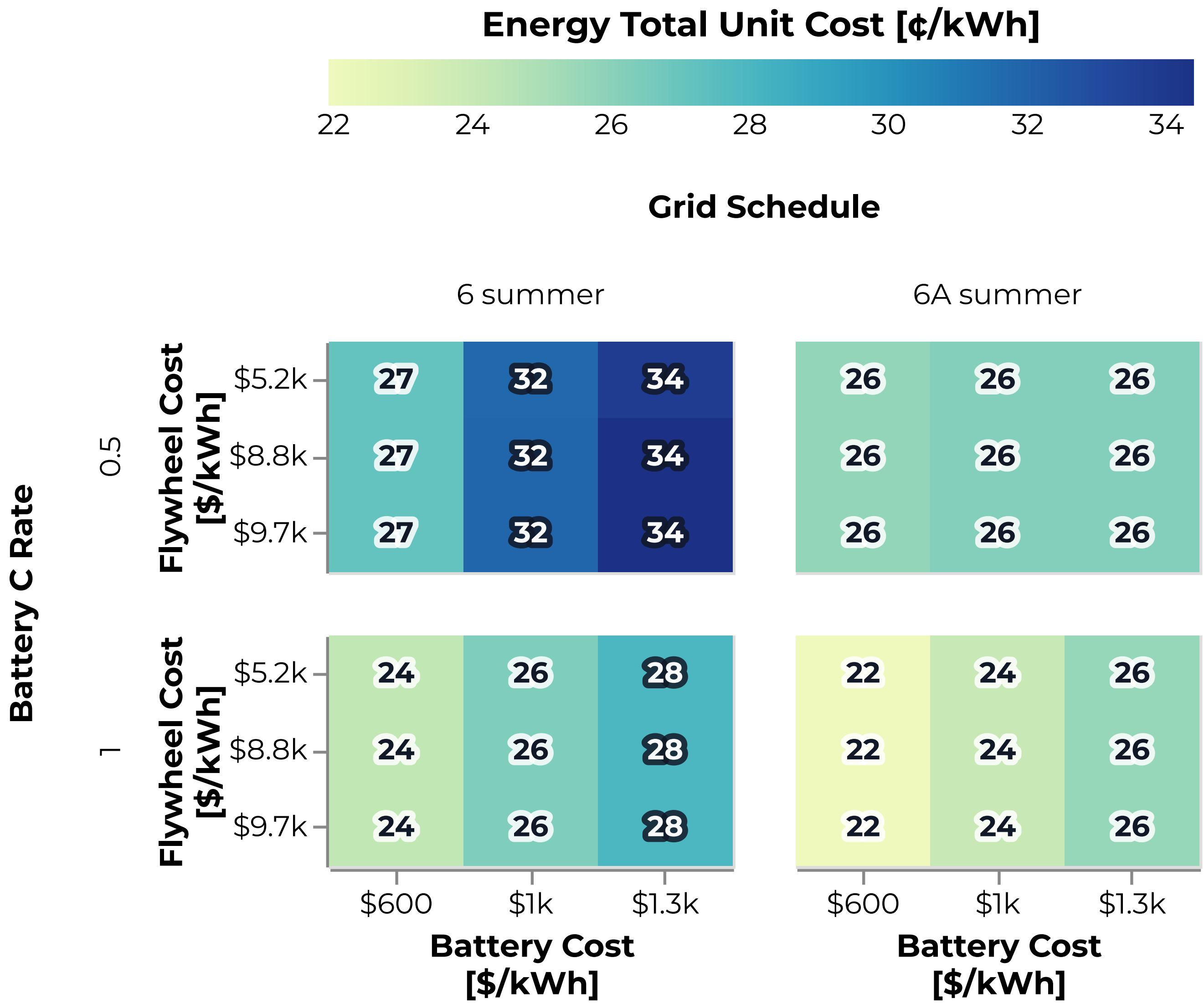


Figure 41: Total unit cost across the SLC Orange Street scenario sweep.

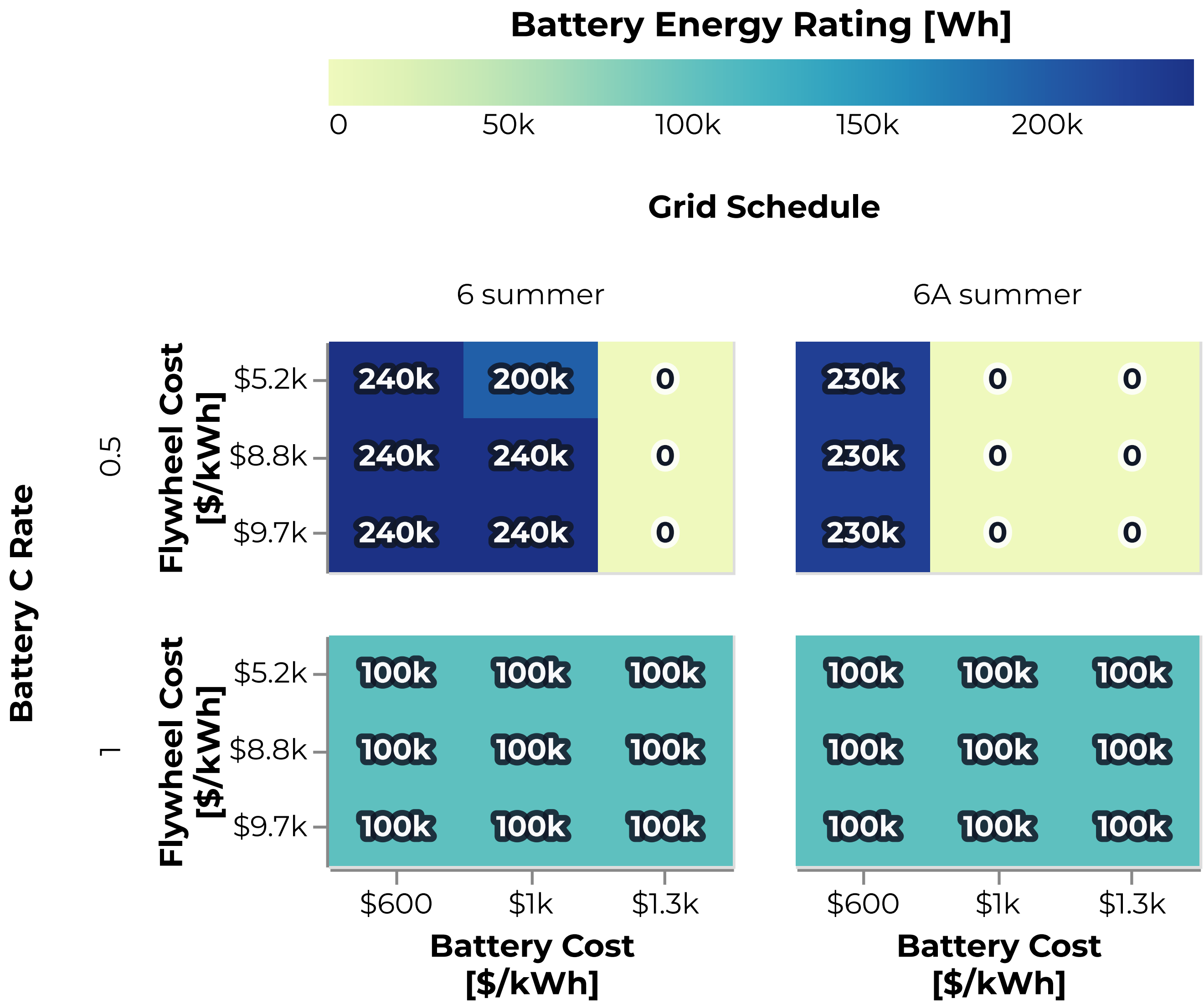


Figure 42: Selected battery energy capacity across the SLC Orange Street scenario sweep.

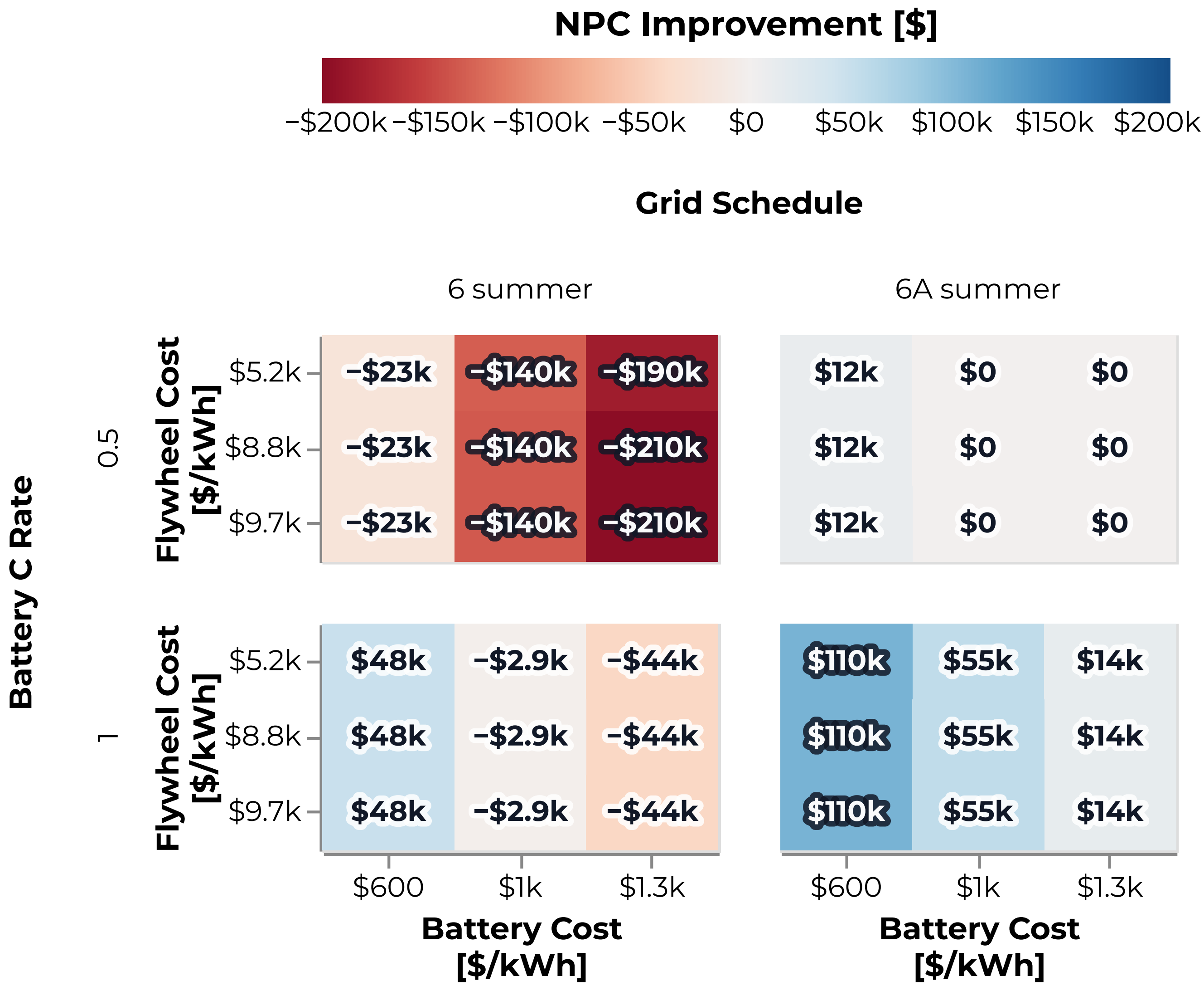


Figure 43: Optimized net-present-cost improvement for SLC Orange Street over the modeled system lifetime relative to the Schedule 6A no-storage baseline, using January through March 2026 charging profiles. Positive values are savings; blue is better and red is worse.

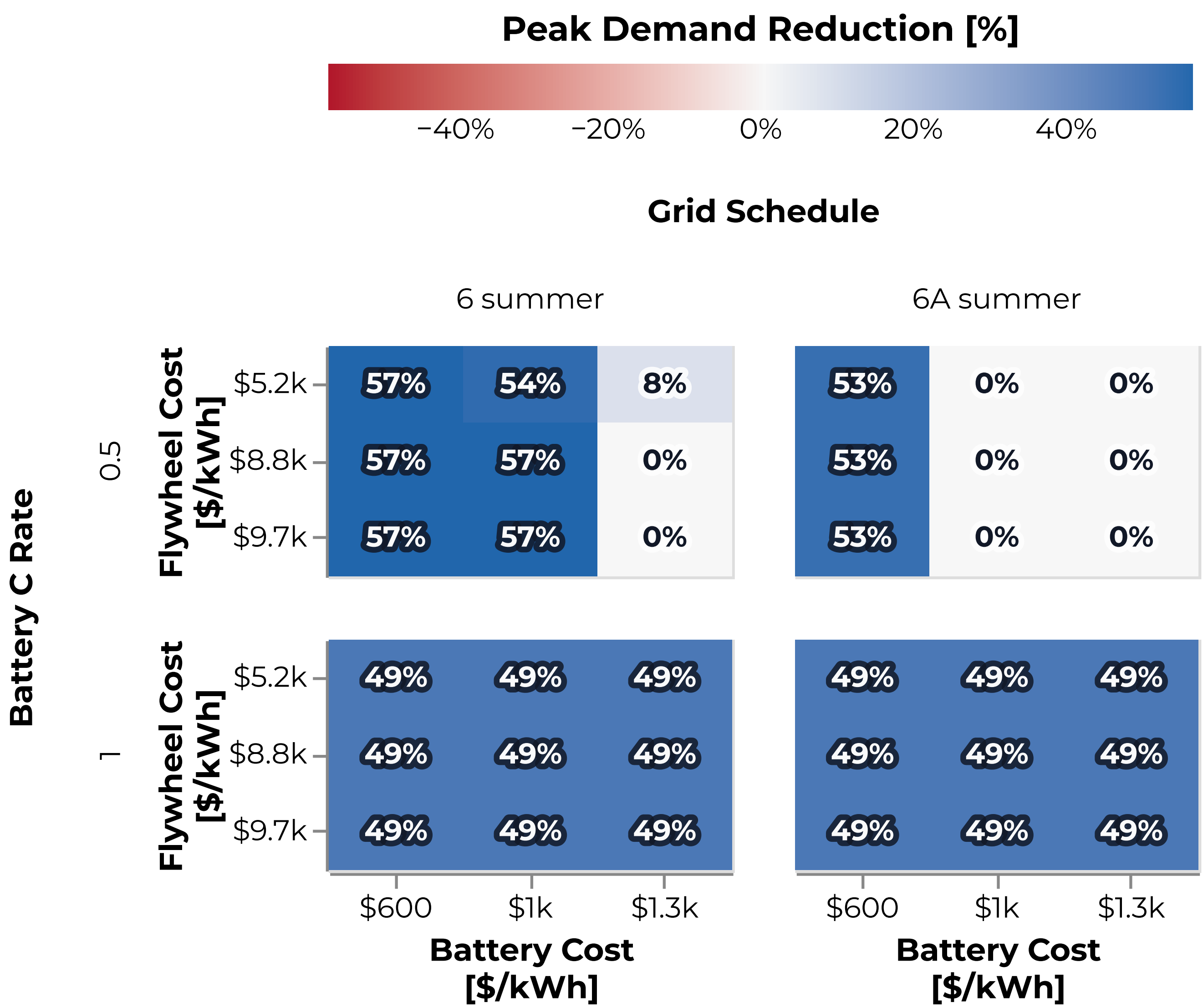


Figure 44: Peak demand reduction for SLC Orange Street relative to the measured January through March 2026 load-profile baseline.

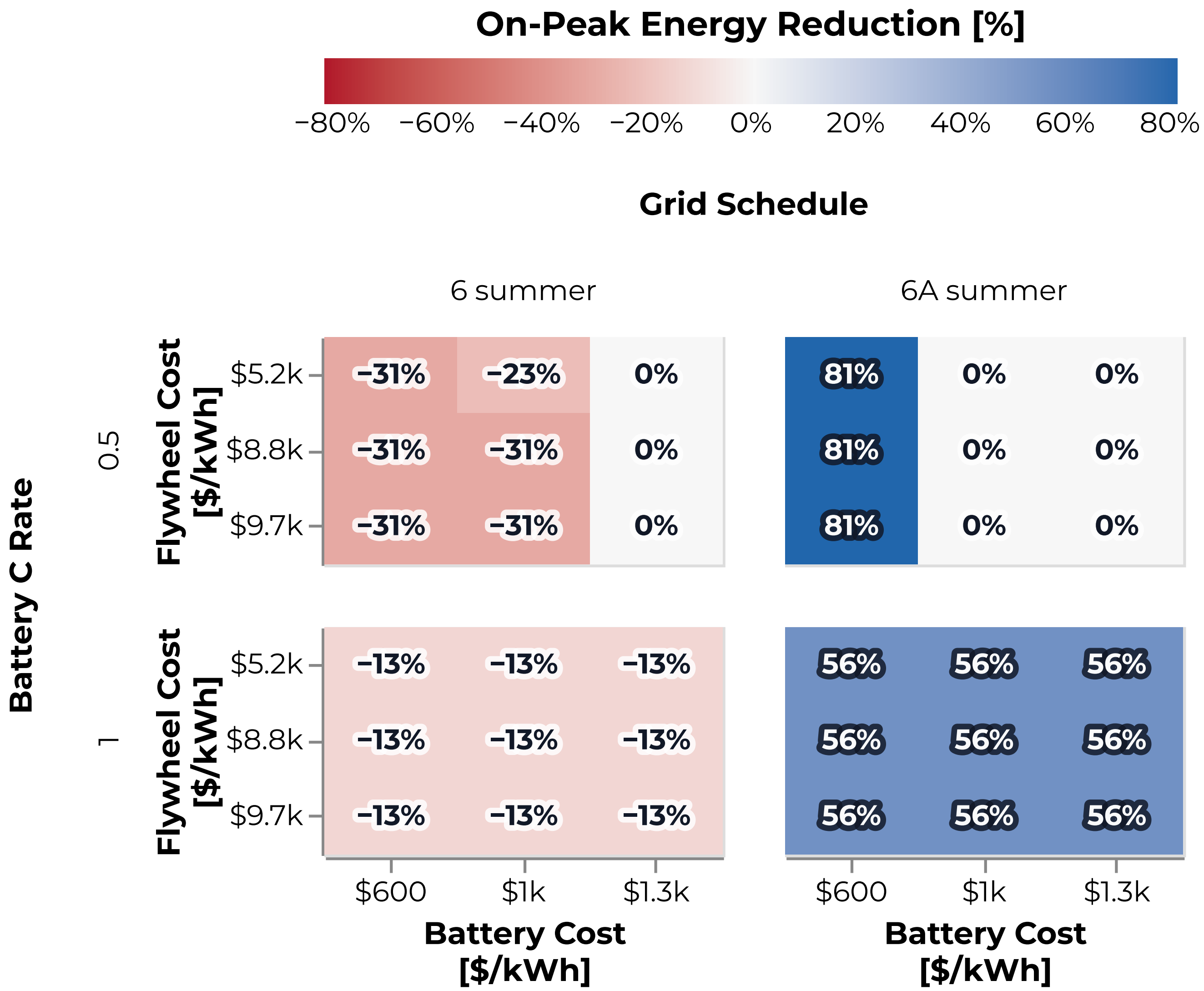


Figure 45: Schedule 6A weekday evening on-peak energy reduction for SLC Orange Street relative to the measured January through March 2026 load-profile baseline, with observed holidays treated as off-peak.

3.2.7 Merged SLC Central Station

Merged SLC Central Station compares the cost of serving the combined SLC Depot District and SLC FrontRunner Central Station load against the sum of the two separate Schedule 6A no-storage baselines. This is the relevant decision baseline for meter aggregation: aggregation would only be attractive if the combined-meter storage and tariff case improves on the cost of leaving the two current sites separate. The modeled savings do not include the cost of physically merging the two sites behind one utility meter, which would require non-trivial infrastructure changes. The savings should therefore be interpreted as upper bounds on how much that metering transition could cost while still remaining financially sensible. The merged-site sweep uses Schedule 6A and Schedule 6 to match the other site-level sensitivity cases.

The merged case shows positive NPC improvement across all evaluated tariff and storage-cost scenarios relative to the two separate Schedule 6A baselines, with improvements ranging from roughly $300k to $1.2M over the modeled lifetime. The best modeled case is a low-cost 1 C battery under Schedule 6, selecting about 590 kWh and improving NPC by about $1.2M. Under Schedule 6A, the best case selects about 370 kWh and improves NPC by about $1.1M.

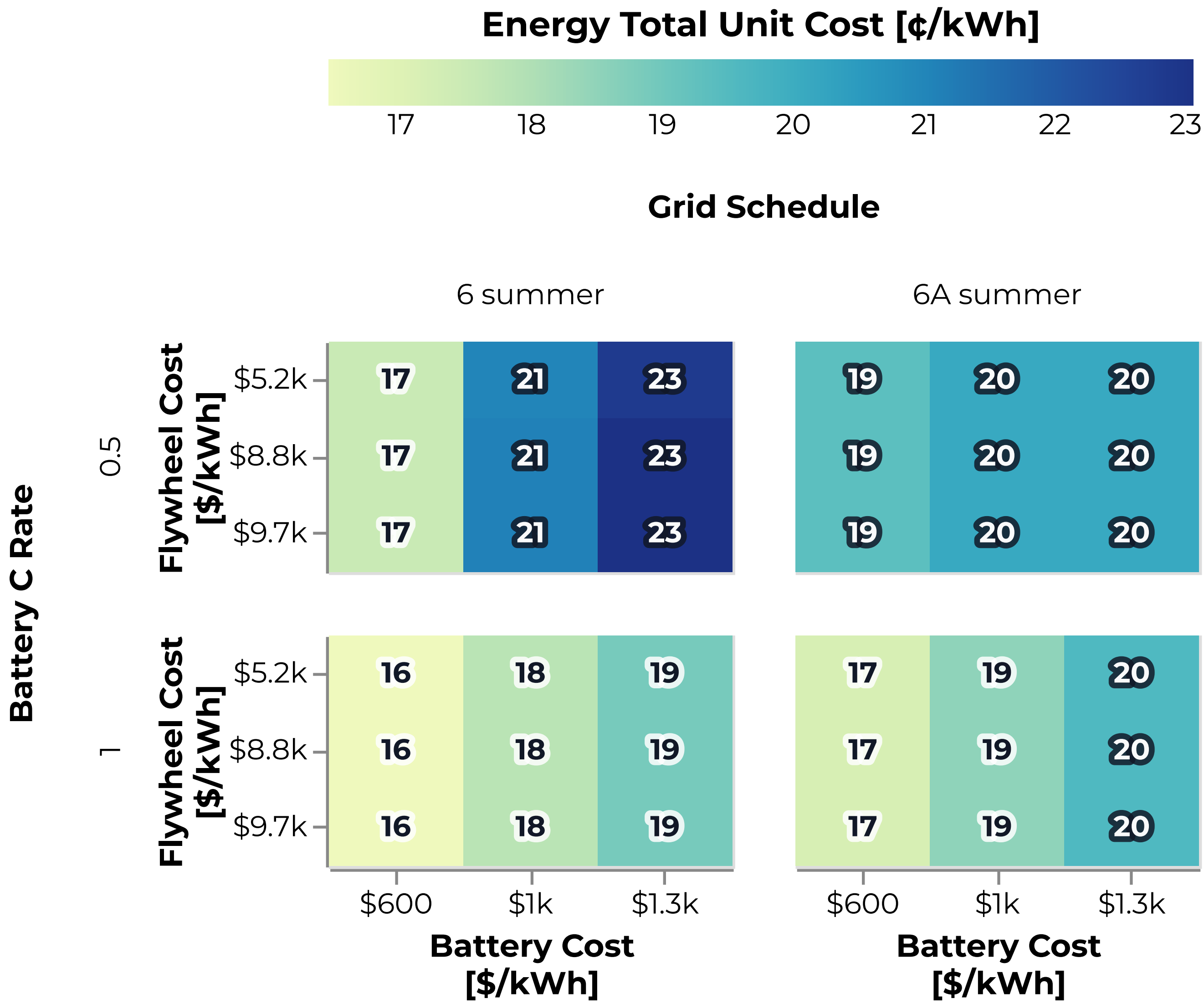


Figure 46: Total unit cost across the Merged SLC Central Station scenario sweep.

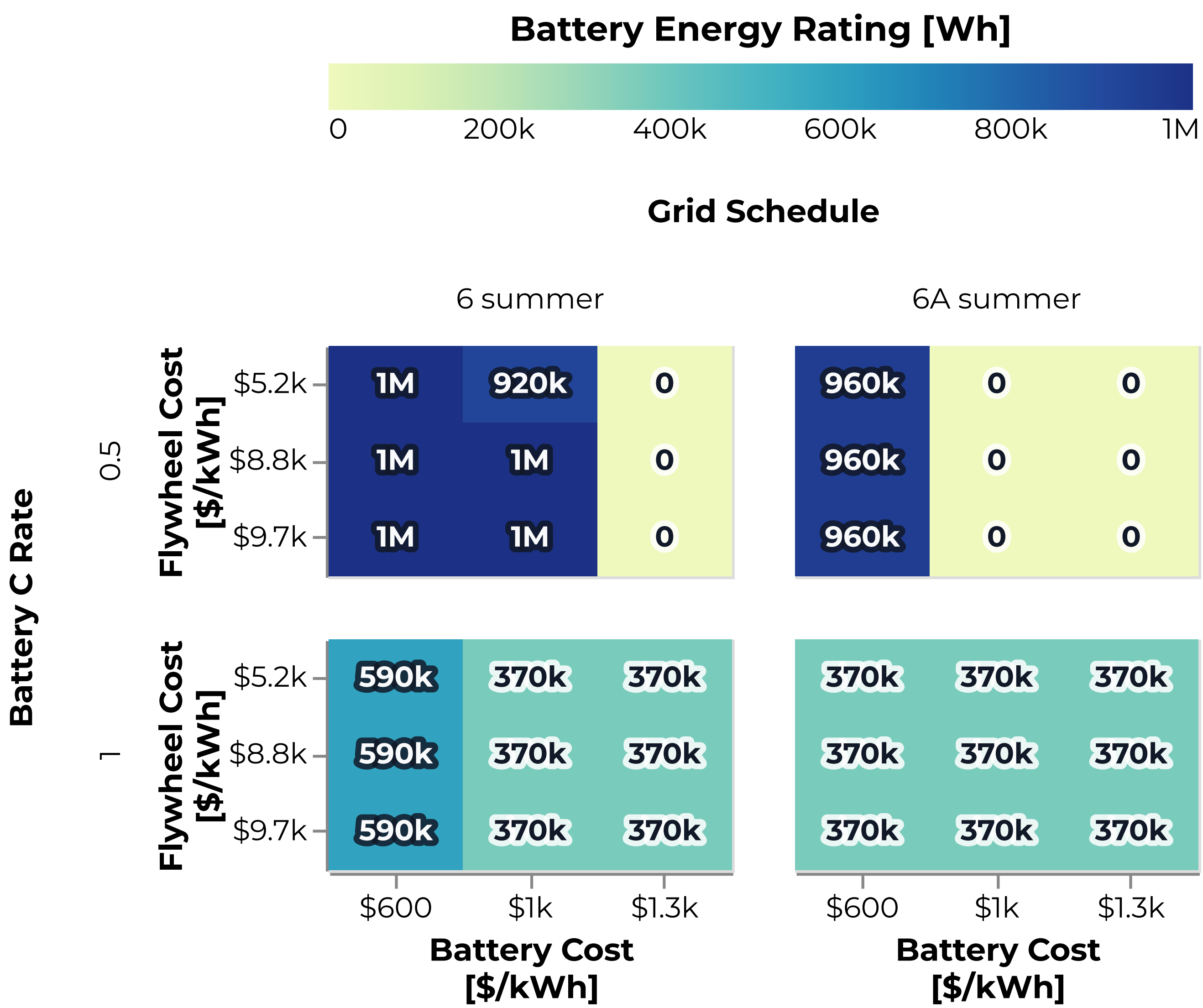


Figure 47: Selected battery energy capacity across the Merged SLC Central Station scenario sweep.

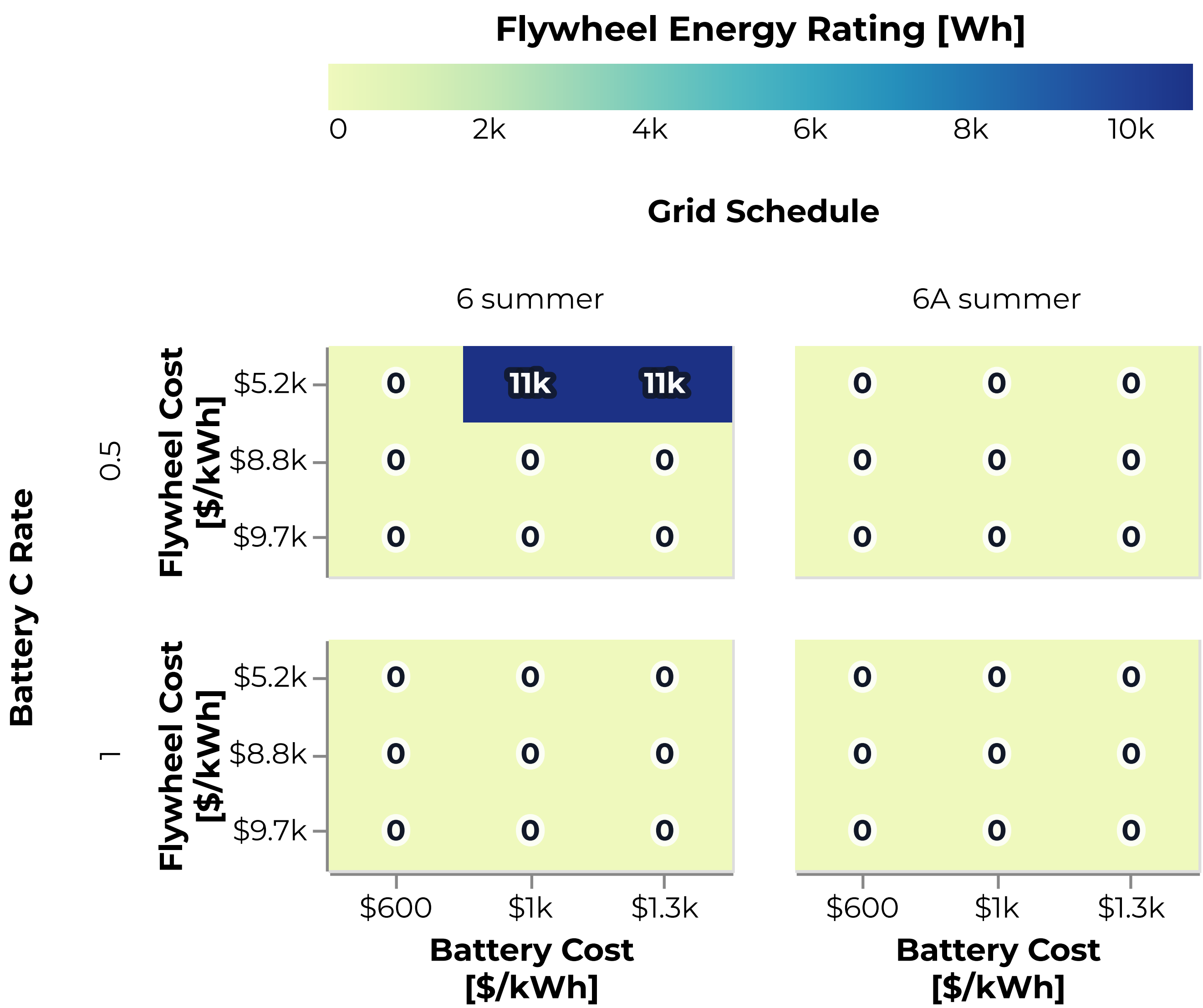


Figure 48: Selected flywheel energy capacity across the Merged SLC Central Station scenario sweep.

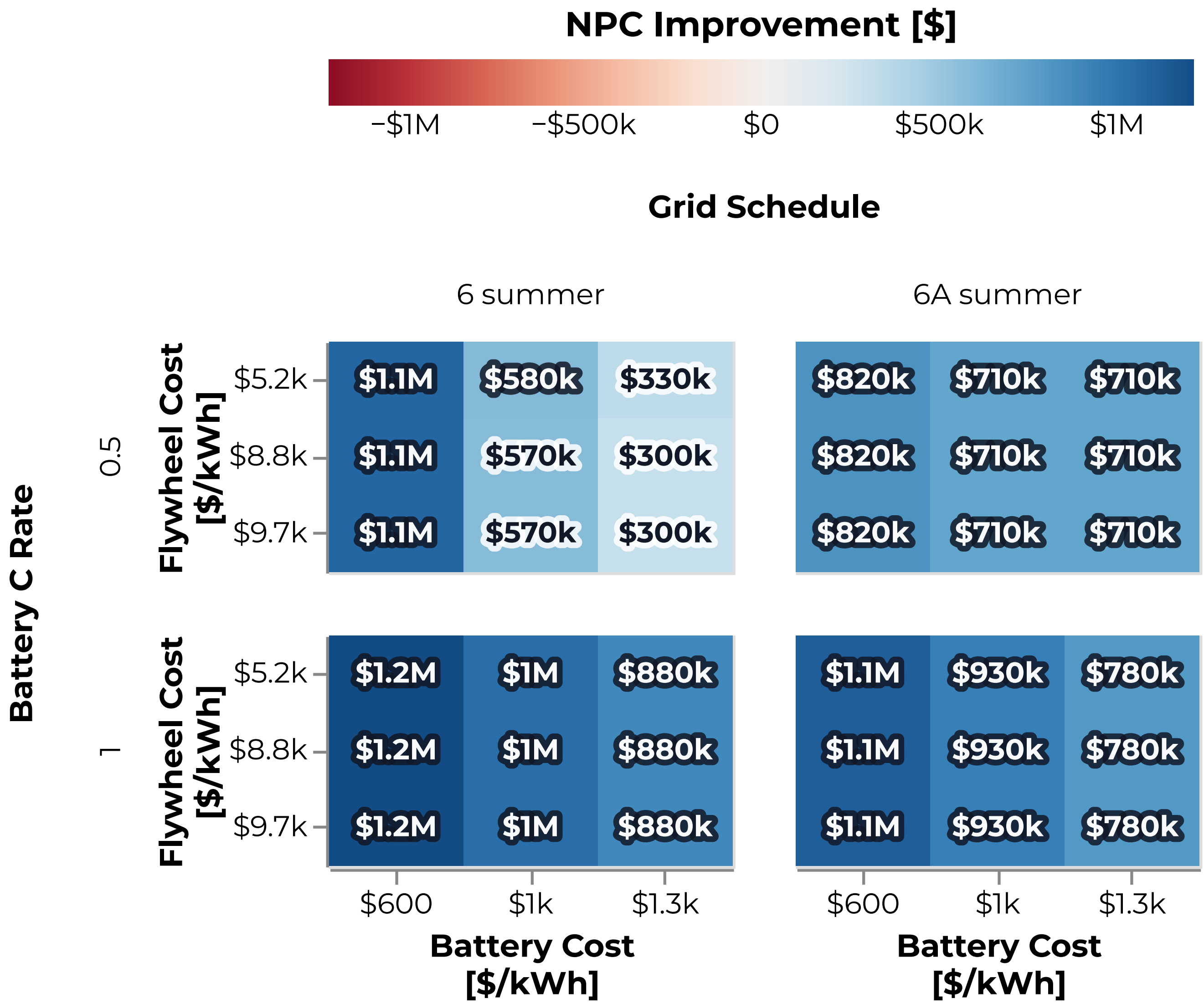


Figure 49: Optimized net-present-cost improvement for Merged SLC Central Station over the modeled system lifetime relative to the sum of the SLC Depot District and SLC FrontRunner Central Station Schedule 6A no-storage baselines. Positive values are savings; blue is better and red is worse.

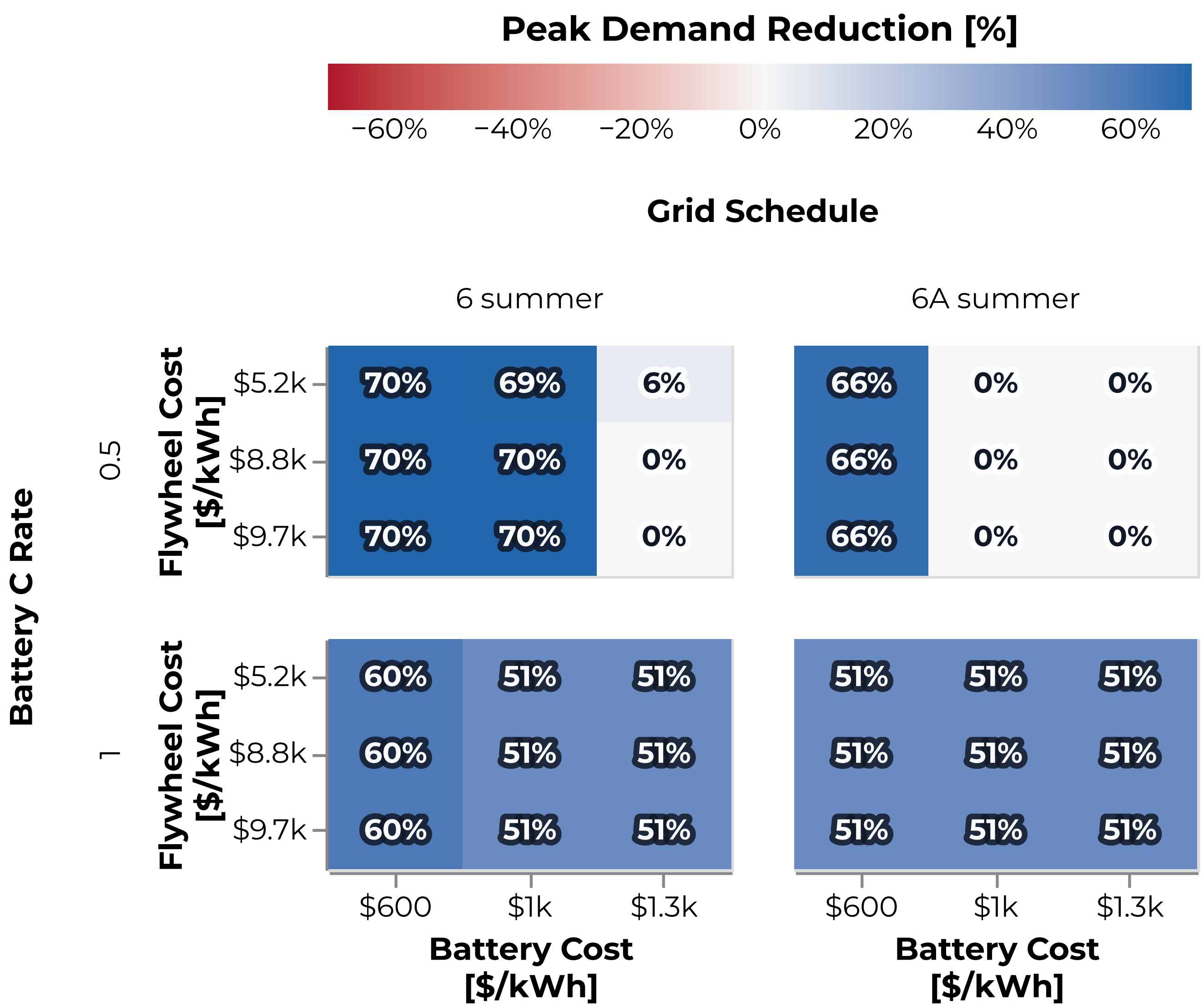


Figure 50: Peak demand reduction for Merged SLC Central Station relative to the combined measured January through March 2026 load-profile baseline.

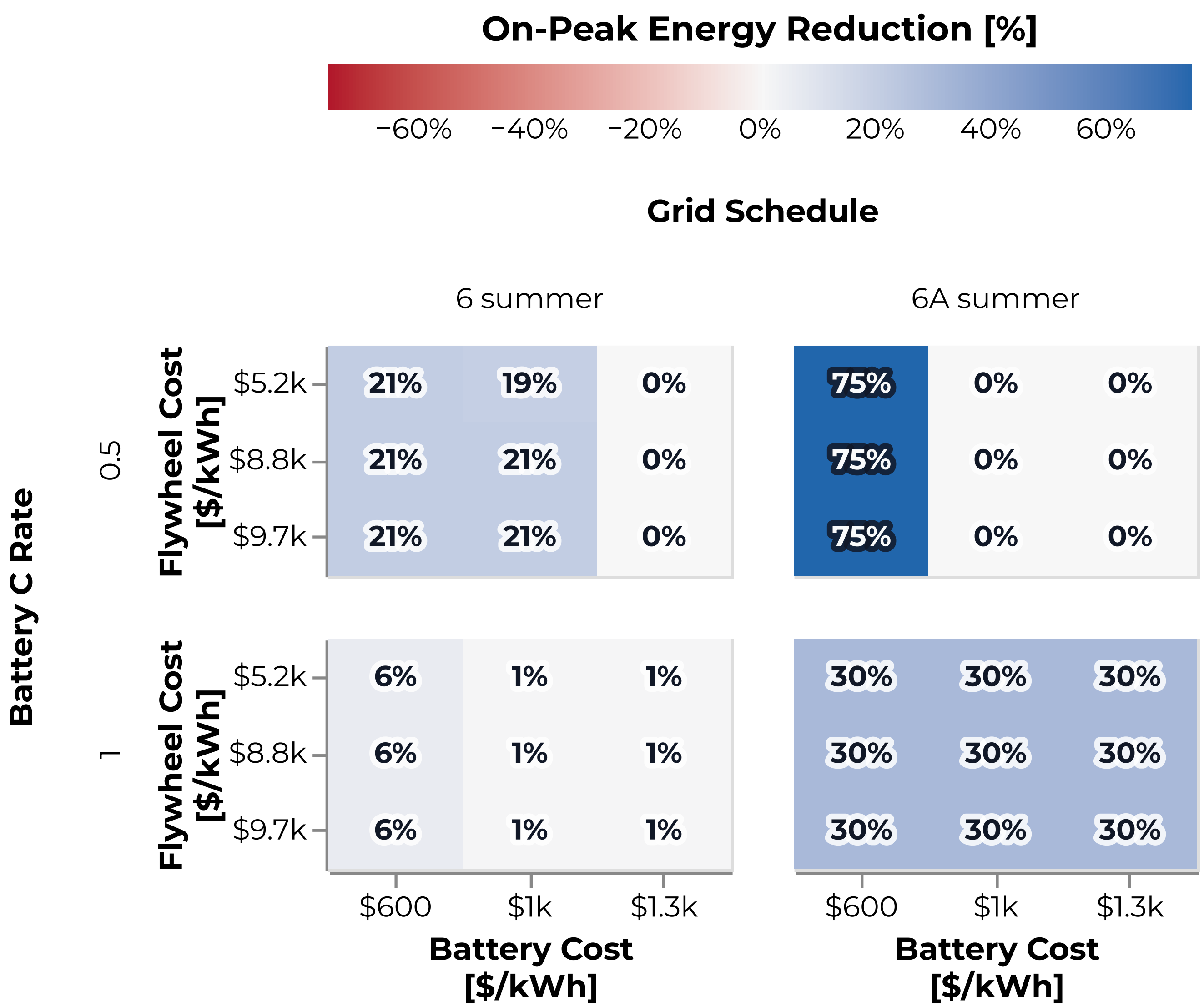


Figure 51: Schedule 6A weekday evening on-peak energy reduction for Merged SLC Central Station relative to the combined measured January through March 2026 load-profile baseline, with observed holidays treated as off-peak.

3.2.8 Tariff Sensitivity

The tariff comparison is one of the main reasons to evaluate Schedule 6A and Schedule 6 side by side. Schedule 6A is the current UTA site schedule, so it is the practical baseline for near-term operations. Under Schedule 6A, storage is more selective: it is generally chosen when battery prices are low or battery power capability is high. Schedule 6 provides a useful comparison because it places a stronger financial signal on reducing billing demand, which generally makes storage dispatch more valuable.

The clearest tariff-sensitive case occurs at the middle battery cost, quoted flywheel cost, and 1/2 C battery performance. Under those assumptions, Schedule 6A selects no storage, while Schedule 6 selects batteries at all five sites. This indicates that the same physical charging load can support very different storage decisions depending on how the utility bill values peak reduction and how the storage hardware converts installed energy capacity into usable power. In contrast, at 1 C battery performance, batteries are selected across all five sites under both tariffs at every evaluated battery-cost level, showing that higher battery power capability can overcome much of the tariff difference. This is particularly true in power-constrained cases; increasing from 1/2 C to 1 C can roughly halve the required battery energy capacity needed to deliver the same peak-shaving power.

The flywheel results further reinforce the tariff distinction. Flywheels are not selected under the quoted flywheel price in the evaluated scenarios. When flywheels are selected in the sensitivity cases, those selections occur only under Schedule 6 and only at the lowest flywheel cost. This suggests that flywheels may be technically aligned with short-duration peak reduction, but at the evaluated prices their financial role is limited relative to batteries.

The key conclusion of the tariff comparison is that Schedule 6 creates a stronger marginal value for storage dispatch, especially for reducing short-duration charging-demand peaks. However, Schedule 6A's favorable underlying structure means that in many cases Schedule 6 is still considerably more expensive even with substantial storage. Schedule 6A can still support battery storage, but the favorable cases depend more heavily on low installed battery cost or higher C-rate capability.

4 Conclusions and Recommendations

This report evaluated whether stationary storage could reduce the long-run cost of serving measured UTA charging demand at five existing sites. The analysis used January through March 2026 charging records and optimized storage sizing and dispatch across a sweep of tariff, battery cost, flywheel cost, and battery performance assumptions. The results therefore compare storage against current operating patterns rather than against a modified charging schedule or future expansion case.

The primary conclusion from this analysis is that the 2026 quoted storage options do not create a compelling financial case for deployment at the evaluated UTA sites. At the quoted battery price, quoted flywheel price, and supplier-specified 1/2 C battery performance, no evaluated site reduces net present cost by installing storage. This does not mean that the sites have no peak-reduction opportunity; rather, it means that the value of that peak reduction is not large enough under the current cost and tariff assumptions to justify the storage capital cost. Storage could still provide savings if paired with strategic operational shifts, but that combined storage-and-operations case would require additional analysis.

The merged SLC Central Station sensitivity is the main exception to the physical-site framing. Combining the SLC Depot District and SLC FrontRunner Central Station loads behind a shared meter and storage-control problem produces modeled savings even at quoted storage prices. Those savings should be interpreted as an upper bound on the implementation cost that could be justified, not as a direct deployment recommendation, because the modeled NPC does not include the utility coordination, electrical work, civil work, controls integration, or operational effort required to physically merge the sites behind one billing arrangement. Given the modest quoted-price upside relative to that likely implementation burden, the storage-only case does not appear strong enough to justify pursuing the merge on its own. The merged configuration may become more relevant in a future vehicle-aware smart energy management analysis, where coordinated charging controls could create additional value beyond the storage-only case evaluated here.

Battery storage becomes more beneficial only under favorable battery pricing or higher battery power capability. The strongest modeled opportunity is SLC Depot District, where low-cost battery scenarios produce the largest NPC improvement. Even at that site, however, the result depends on securing battery pricing substantially lower than the quoted high-cost case. That lower pricing could come through programmatic scaled procurement, continued battery-price declines, or both. Across the broader set of sites, the modeled cost reductions are moderate at best, so a storage project would need to clear not only the modeled financial threshold but also the practical effort of procurement, installation, controls integration, maintenance, and operational oversight.

Flywheels are not recommended for near-term pursuit under the evaluated pricing. At the quoted flywheel price, flywheels are not selected in the evaluated scenarios. They appear only in limited sensitivity cases with substantial price reductions, and only under Schedule 6. These results suggest that flywheels would need significant discounts or a separate operational value stream before they would be worth advancing for these sites.

Given these results, the most promising next step is likely vehicle-aware smart energy management rather than stationary storage procurement. The demand results show that several sites still have low energy utilization and brief high charging-demand intervals, so there remains an opportunity to reduce billing peaks. Schedule 6A, however, provides a relatively weak financial reward for reducing those peaks with dedicated storage hardware. Vehicle-aware smart energy management could target the same peak-reduction problem through software-based charging controls that use vehicle dwell time, energy need, and charging flexibility to reshape charging rather than add new storage capital investment. Verification of the potential value of vehicle-aware smart energy management will be performed in future analysis.