

Axiom Cloud: Apps for Commercial Refrigeration

Virtual Battery™ Case Study - Energy Bill Management



OPPORTUNITY

In California, demand charges, which are billed based on the highest level of power consumption that a facility uses during the month, have been rising significantly each year. Demand charges now represent roughly half of the utility bill for an average supermarket, which cuts into their already thin profit margins.

This customer was looking for a lightweight way to add power flexibility to their building to significantly reduce their demand charges and therefore utility bills. They also wanted to take advantage of California's demand response programs as a new source of revenue.

SOLUTION

Axiom Cloud implemented its Virtual Battery app at the site, which unlocked the built-in flexibility of the low temperature refrigeration system, effectively turning it into a battery. Virtual Battery intelligently pre-cools the low temperature display cases prior to predicted peaks and then intelligently load sheds to keep building loads below an optimal demand threshold.

Virtual Battery also enables this site to participate in California's DRAM (Demand Response Auction Mechanism) market, so the customer gets paid year-round for the ability to dispatch approximately 45kW / 75kWh of flexible capacity during demand response events. The capacity at this site is aggregated along with other Virtual Battery sites, and Axiom takes care of all performance validation and quantification.

Customer type

Retail Grocery, 50,000 ft²

Location

Northern California, USA



Apps provided

Facilities Analyzer

Virtual Technician

Virtual Battery

Effective Virtual Battery capacity (design day)

45 kW / 75 kWh

Refrigeration system architecture

Tyler central parallel racks

Micro Thermo controls

MT: 1313 MBH, 130 HP, 404A

LT: 203 MBH, 36 HP, 404A

Estimated benefit of Virtual Battery at this site

\$54,000 over 5 years



RESULTS

During an average summer month at this facility, the customer saves approximately \$900 on demand charges and receives \$400 in demand response revenue. Over the course of a year, Virtual Battery creates more than \$10,000 of value for this store.

For more details on the implementation of the solution and what an average day looks like, refer to the next page.

Virtual Battery processes thousands of data points in order to predict the optimal charge and discharge levels, and then manages cases and compressors in real-time to help maximize value for the customer.



AXIOM CLOUD

510.683.5200 | sales@axiomcloud.ai | AXIOMCLOUD.AI

EXAMPLE DAY OF OPERATIONS

In order to deliver savings and revenue each month, Virtual Battery uses the following methodology:

FORECAST: Using machine learning, estimates future thermal loads and power demands based on historical data and weather forecasts.

OPTIMIZE: Generates an operational strategy for each refrigeration system to help maximize savings/revenue for the customer across multiple value streams.

PRE-COOL: To "charge" the Virtual Battery, compressors are commanded on, while EPRs are opened to allow this extra cooling to reach low-temperature refrigerated cases.

LOAD-SHED: To "discharge," compressors are modulated to reduce the building's total electrical load and bring the low-temp cases safely to back to their original set points.

Although savings are generated each month, it often only takes a few days of operation within each utility bill period to generate significant savings. Below is an example day at the site during which Virtual Battery intelligently shaped the refrigeration load to lower the building's peak demand for the entire month.

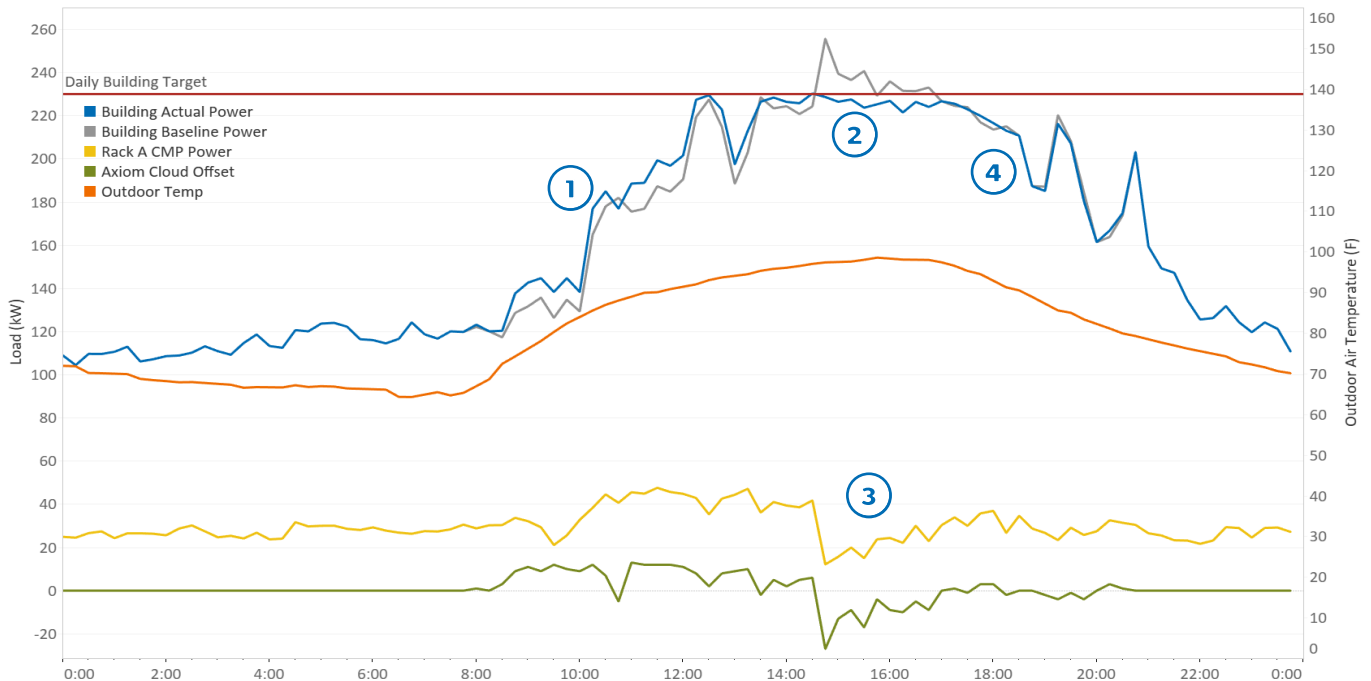
MONTHLY RESULTS

- Max daily discharge: 55 kWh
- Peak demand reduction: 28 kW
- Max OAT: 99 °F

Value generated (1 month)
\$1,322

Includes Demand Response and Energy Bill Management

VIRTUAL BATTERY OPERATION OVER 24 HOURS



9:30 - 14:00

1

By running compressors more often than they normally would be run this early in the day, Virtual Battery effectively "pre-cools" the low-temp cases in preparation for a hot afternoon.

14:00 - 17:30

2

By cycling individual compressors on and off as necessary, Virtual Battery prevents the building load from going above the forecasted optimal target of 230 kW. Concurrently, commands are sent to open and close EPRs on individual cases to ensure that no case temperature drifts above its setpoint.

14:30

3

By significantly decreasing the aggregate rack load during this 15-minute interval, Virtual Battery prevented a building demand spike that would have increased demand charges for this entire billing period.

18:00 - 00:00

4

Once the hottest part of the day has passed, Virtual Battery allows the refrigeration system to resume normal operation.

CONTACT US TO SUBSCRIBE TODAY

Axiom Cloud's mission is to use software and automation to transform how the world's cooling systems are powered, operated, and maintained. To learn more more about our Facilities Analyzer, Virtual Technician, or Virtual Battery apps, send us an email or visit our website.

510.683.5200 | sales@axiomcloud.ai | AXIOMCLOUD.AI



AXIOM CLOUD