BATTERY STORAGE APPLICATIONS FOR COMMERCIAL / EDUCATIONAL BUILDINGS

While not a new idea, the use of electric storage batteries for peak load management in the commercial/educational sector has been an uncommon practice due to their high capital cost coupled with the expense of custom system design. However, this cost control strategy now appears to be coming to the forefront. For example, Amazon and Target are among the major retailers currently testing advanced battery storage technology and several California school districts and colleges are also involved in testing programs. These include Mountain View-Los Altos UHSD, Oak Park USD, Butte Community College, Peralta Community College District and California State University, Fullerton. Some schools are using storage batteries to avoid electric demand charges as high as $45 per kilowatt.

WHY BATTERY STORAGE TECHNOLOGY IS BENEFICIAL FOR BOTH COMMERCIAL ELECTRICITY CUSTOMERS AND FOR ELECTRIC UTILITIES

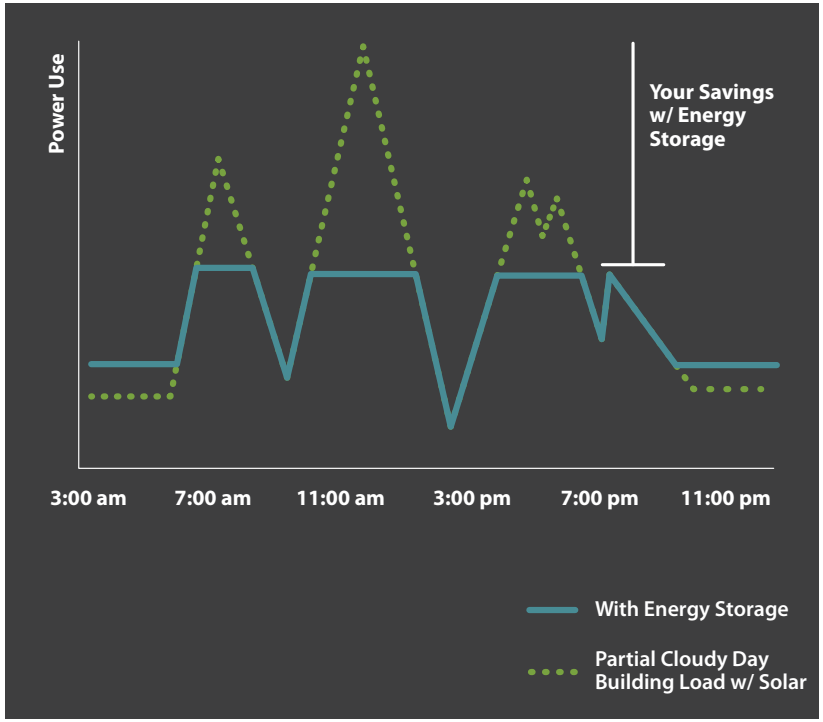
Energy storage technologies are not designed to conserve energy. In fact, losses associated with energy conversion are inevitable. The assessment of benefits derived from energy storage requires an underlying understanding of how utility customers are charged for electric power. Residential power customers only pay for overall power consumption, which is measured in kilowatt hours (kWh). Commercial utility customers, on the other hand, not only pay for the total power usage, but normally pay separate demand charges according to the peak usage of power they consume. The utilities justify demand charges because they must maintain a vast infrastructure of costly equipment to deal with the sudden power surges demanded by many of their commercial customers.

Every month many commercial electricity customers pay 50% or more of their electric bill in demand charges. Battery storage capability allows commercial customers to reap substantial annual savings on their electric bills by drawing on stored power during cycles of peak demand. The benefit to the utility from power storage is that the systems can defray expenses needed to expand and maintain supplemental power equipment kept on constant standby to address peak electricity demand cycles.

WHY THE MARKET FOR ON-SITE BATTERY STORAGE IS EMERGING

There are several market and technological factors that seem to be driving recent interest in on-site battery storage as follows:

- The rapidly increasing penetration of wind and solar renewable energy into the North American grid has focused attention on solving the "intermittency problem" of clean alternative energy. Battery storage is a technology that will help "smooth out" the minute-to-minute variability of wind and solar through balanced electric generation services. This solution might be provided by a grid operator or through a grid-connected customer who elects to install battery storage.



- The transformation of the old grid system into the emerging "Smart Grid" is promoting more active participation of load customers in the energy and ancillary services markets. Communication technologies and advanced controls will transform resources in the demand sectors from passive to active elements on the grid.
- Lithium ion battery storage technology is better suited to on-site electricity storage than the older lead acid batteries, which have been used for decades. For example, rechargeable lithium ion storage battery systems are being marketed with modular capacity units of 100Kwh up to 500Kwh. The battery storage equipment is now being sold as fully integrated systems to help reduce the need for additional system design costs. This includes battery panels, power inverters, predictive software (to identify the trajectory to hit peak demand) and controllers.

- Power efficiency agreements (PEA) are becoming a popular business model that is helping to transform the market in favor of battery storage systems. PEA options are now available to commercial and institutional utility customers that can provide installation and maintenance of advanced battery storage systems to commercial utility customers at no upfront cost. The customer, in return, agrees to share the energy cost savings with the third party investor for a specified period.

WHAT ARE THE COMMON DESIGN OBJECTIVES OF BATTERY STORAGE SYSTEMS?

Tesla is one company that is marketing utility-scale rechargeable batteries for off-the-grid customers, supplemental power systems and larger facilities on the electric grid. According to Tesla, their commercial scale battery system is designed to:

- Maximize consumption of on-site clean power
- Avoid peak demand charges
- Allow the user to buy and store electricity when it is cheapest
- Allow the user to get paid by utility or intermediate service providers for participating in grid services
- Back up critical business operations in the event of power outage

SUMMARY

A convergence of market and technological factors are now driving the installation of energy storage systems in the commercial sector, including battery storage systems. The primary advantage of battery storage is to provide flexibility to manage peak loads in a building or to balance load and generation in the electric power grid.

From the ratepayer's perspective, battery storage enables load shifting to minimize demand charges while maintaining comfort. From a grid operations perspective, building storage at scale could provide additional flexibility to grid operators in "smoothing" the generation variability from intermittent clean energy sources, such as wind and solar.

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REFERENCES & RESOURCES

Tesla Motors www.teslamotors.com/presskit/teslaenergy

Solar and Storage Solution Summary Handout, 2015 www.greencharge.net

Greentech Media, GTM www.greentechmedia.com

Institute for Energy Research, Latest Analysis www .instituteforenergyresearch.org

Solar Power World www.solarpowerworldonline.com

E Source, Battery Demand-Charge Management Looks Promising www.esource.com

U.S. Department of Energy. Research Paper: "The Role of Energy Storage in Commercial Building", September 2010