Unlocking the Financial Value of Behind-the-Meter Energy Storage

While many commercial and industrial (C&I) enterprises are drawn to the sustainability and resilience advantages of energy storage, the technology is becoming increasingly valuable for its ability to support multiple demand-side management strategies.

One of the most important benefits of a well-designed and optimized energy storage system (ESS) is the opportunity for "stacking services," i.e. leveraging the same equipment, system, or process to deliver multiple benefits that maximize the financial impact. Some examples of these services include:

- **Demand response:** Businesses can leverage an ESS to create revenue by participating in demand response programs, while minimizing energy curtailment required at the site level.
- **Time-of-use charge management:** An ESS can enable businesses to avoid daily peak prices by reducing grid demand in line with energy providers' time-of-use periods.
- **Demand charge management:** With an ESS, businesses can reduce costly demand charges that account for a significant amount of annual energy costs by reducing demand at the right time.

Value stacking means not only leveraging these kinds of services, but optimizing the deployment of an ESS to get the most possible value out of them. While these are just a few examples of services that businesses can leverage, they can enable some organizations to create hundreds of thousands of dollars in value every year—if they are managed properly.

Understanding the Challenges of Value Stacking

Traditionally, ESS controllers have implemented these demand-side management strategies on an individual basis. To date, the obstacle to stacking multiple value streams has been compatibility. According to the Energy Storage Association:

"Benefits must be both technically and operationally compatible if they are to be stacked. A combination of benefits is technically compatible if the storage system has all technical characteristics necessary to perform as needed when used for all targeted benefits. Benefits are operationally compatible if no operational conflicts arise when used for the respective benefits."

For example, on a given day, an ESS may be able to perform renewable energy firming while also helping to manage time-of-use charges and participate in demand response programs, but the amount and timing of each maneuver would depend on cloud cover, the building's operational schedules and load requirements, and other factors on that specific day. Without an intelligently optimized approach, this could result in missed financial opportunities and negative impacts on battery performance or operating life.

If this sounds complicated, that's because it is. A good analogy is determining the best altitude to fly a passenger jet from Seattle to New York, which requires balancing considerations like passenger ride quality, fuel consumption, safety, and time of arrival. At the same time, the calculation

must also account for how the winds change throughout the flight path and react while maintaining the balance of the other considerations.

In the same way, buildings need to leverage all available demand-side value streams while accounting for other variable factors, such as changing electrical loads and battery degradation, in order to optimize the value of their ESS assets.

The Key to Value Stacking: Real-Time Optimal Control

An ESS platform with real-time optimal control is capable of continually balancing participation in multiple value streams simultaneously—especially when they may compete with one another—while also considering the impact on battery degradation.

A real-time optimal control system analyzes information on all aspects of the building's energy situation—tariffs, incentives, demand response programs, battery chemistry and sizing, etc.—while also learning the building's energy consumption patterns. Armed with this data, the system plans and automatically executes a control strategy that deploys the ESS to deliver the maximum total economic value from all available value streams and extend battery life. As a result, businesses maximize the return on an investment in an ESS, while also capitalizing on sustainability and resilience benefits.

The days of deploying energy storage systems for only one purpose are ending. With today's evolving rate structures, market demands, and incentive programs, system ROI has become a more complex and economically beneficial calculation, based on the value of stacked services.