



Tap into the Golden Triangle of C&I Energy Storage



Stephen L. Prince

PES hears from Stephen L. Prince, President & CEO at Younicos, about the adaptability and different complexities associated with the use of batteries by commercial and industrial energy users.

Despite being a relatively new technology, energy storage has already traveled a long and impressive path on the road to full-scale commercialization. It started with niche applications and the provision of very specific ancillary services to stabilize the grid. Now, however, batteries are being adopted much more broadly – making full use of their versatility, which is a defining factor of energy storage systems. In fact, it's this versatility that makes them ideally suited for commercial and industrial (C&I) energy users - with or without co-located, renewable self-generation.

That sounds good - from 30,000 feet in the air. But how exactly can C&I energy users address their energy needs through batteries? While individual use cases differ by geography and the specific energy needs of each user, all fall within what I like to call the “golden triangle” of C&I energy storage: price reduction, extra revenues and increased resilience. Let's look at each in some detail:

The first, and I suppose most obvious, application of commercial energy storage is the reduction of peak consumption to avoid peak rates. Again, the specific



economics of this function vary with geography, but it's safe to say that tariff structure and fluctuations make this particularly interesting in the northeast U.S. and some parts of South America. In Europe, both the UK and the German markets also offer attractive opportunities. In the UK, for instance, it is possible to combine the optimization of DUoS (Distribution Use of System) with the so-called "Triad charging system," as well as other supply charges. Thus, a 500 kW / 100-minute system can save more than GBP 50,000 per year.

Add to that the revenues from the second side of the "golden triangle" - the provision of grid balancing and capacity services. In this case, the aforementioned system can provide annual revenues in excess of GBP 70,000, by providing firm frequency response and participating in the UK's capacity market - both through a third-party aggregator. Similar revenue streams

can also be utilized within Germany and North America.

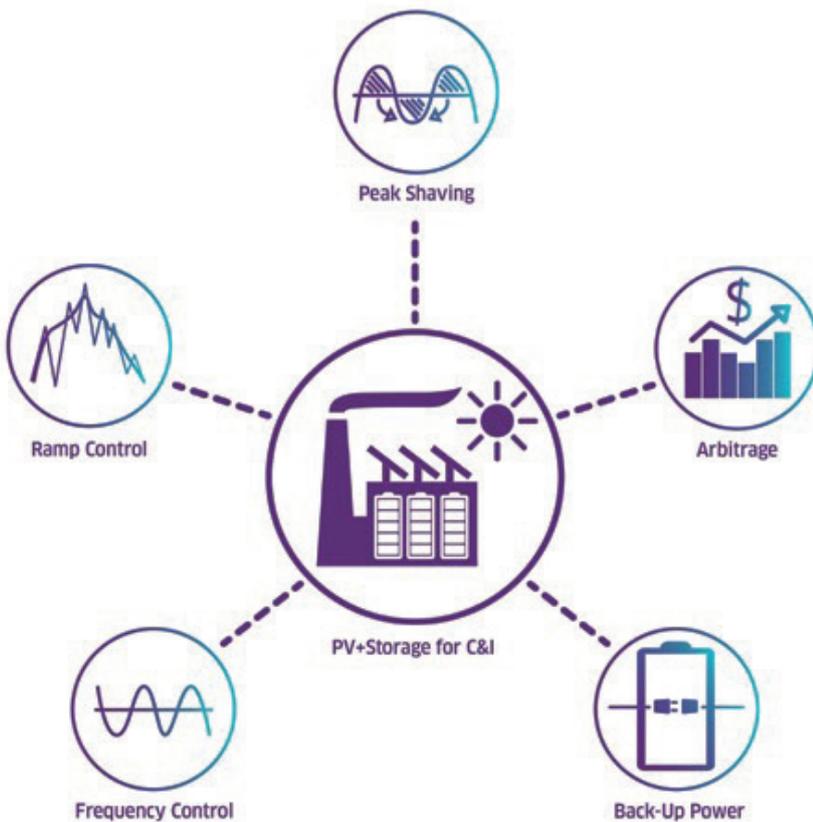
Together, these two parts of the triangle already exceed GBP 110,000 a year in savings. Still, this does not fully capture the value of the storage system for energy users with critical loads who benefit from increased site reliance, and are thus shielded from risks attached to voltage drops or a sudden loss of power.

In Germany, the use case is similarly attractive. Under German law, "energy-intensive" industries must pay additional fees during "high-load" windows, which typically occur in fall and winter depending on the voltage level. That said, consider an industrial process with a peak load of 1.5 MW: A 1.25 MW system with a 1.25 MWh energy capacity (i.e. a duration of 60 minutes) allows the user to reduce the load to 700 kW during the high load/charge window, while outside that window the user can market 1 MW for frequency control.

Together both functions will reduce the customer's energy bill by at least 120,000 euros a year, implying a payback of six years, max.

Of course, if you include solar, you can add even more corners to your triangle. A C&I microgrid project, which we just installed in collaboration with Panasonic and Xcel Energy at Peña Station NEXT in Denver, Colorado, is a case in point. This project combines a 1.6 MW carport solar PV installation, a 259 kW DC rooftop solar PV array and a 1 MW / 2 MWh lithium-ion battery system housed in four of our Y. Cubes. This integrated microgrid enables a total of five use cases:

1. Solar energy grid integration via solar smoothing ramp control and time-shifting
2. Grid peak demand reduction
3. Energy arbitrage
4. Frequency regulation



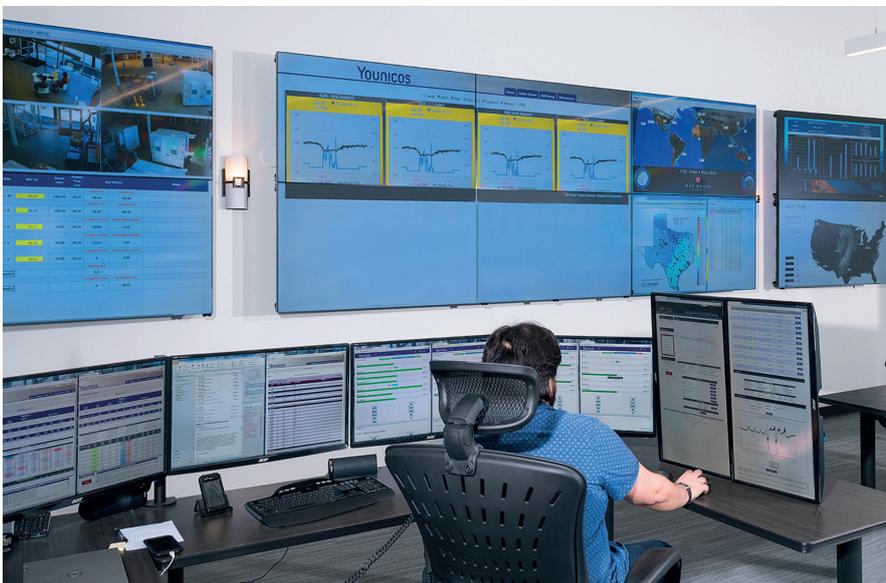
5. Backup power for Panasonic’s network operations center.

Of course, this all looks great on paper. But does it deliver? While it’s becoming fashionable to talk about the multifunctional, versatile nature of batteries, few are aware of the complexity of software and controls required to fully utilize the many opportunities batteries can provide. That is, in order to achieve all of the feats described above, the battery system requires sophisticated energy management software and advanced controls.

As you can see from the graph, the system must be ready to deliver the “right” service or function at the right time. For a battery, that implies - among other things - that it must manage its state-of-charge (SOC) so that it can be discharged and charged as required.

As we have maintained over the years, a key element in maximizing the lifetime of batteries is to keep them within certain SOC “islands” - what we like to call “feel-good zones” - as much as possible. This adds another level of complexity to the management of the system.

Maximizing asset life and thus utilization, also requires a deep understanding of the chemical properties of different battery types from different manufacturers.



Depending on where within our “golden triangle” the battery system is best used commercially, not all types may be equally well suited. In fact, we know from the many cases that we have looked at over the last 10 years that - with the right software - battery type A may last up to 20 years handling one type of application, though it would wear out after just a few years if employed differently. Furthermore and, alternatively, battery type B may provide both services for 15 years.

Finally, as promising as these numbers are, we know that the global energy system is undergoing fundamental change: change that is constantly disrupting entrenched business models while opening new opportunities. This means that any investments undertaken today should not irreversibly lock us into specific use cases. Instead, we must be flexible enough to adapt to changing demands, and thus to tap into any new opportunities that open up as the global energy transition continues to accelerate.

This example shows perfectly what energy storage can do for C&I customers. However it is still important that clients partner up with experienced energy storage providers who know exactly which system configuration and capacity will best suit the client’s needs. This will ensure that the “golden triangle” doesn’t become, well, the Bermuda Triangle.

If all of these dimensions and requirements send your head spinning - don’t despair! Any decent energy storage system worth its money comes with software that delivers services “à point,” optimizes battery SOC and maximizes lifetime. Identifying the right partner will help you navigate the market and find the optimal spot in the “golden triangle.”

www.yunicos.com

Stephen Prince, President and CEO of Yunicos, is a transaction-oriented executive with more than 25 years of experience of growing and leading companies in global markets, as well as a published author and speaker with numerous industry awards. Stephen holds an M.S. in Taxation from Golden Gate University and a B.A. in Business Administration and Accounting from California State University Fullerton.