Energy

The promise of hybrid CHP + solar + storage solutions

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Hybrid systems—consisting of photovoltaic (PV), energy storage, and combined heat and power (CHP)— can provide maximum resilience for critical loads while minimizing carbon emissions. Hybrid systems are similar to microgrids that incorporate multiple technologies, but hybrid system installations occur as a single, coordinated effort (as opposed to the piecemeal addition of system components over time, as is currently the case with most microgrids). However, bringing different technology developers together to design and implement an optimized hybrid system comes with its own set of challenges.

In this Q&A, Meegan Kelly addresses some of the considerations in setting up a hybrid CHP program. A recent paper explores these considerations in greater detail.

How can hybrid systems support state and utility program objectives?

As policymakers increasingly focus on reducing emissions and improving resilience at critical facilities, we may begin to see a shift in the future of CHP programs toward these objectives. The latest trends in CHP programs emphasize the ability to withstand extended power outages and to support greater integration of renewable technologies through microgrid deployment and hybrid CHP systems.

Hybrid CHP programs have the potential to bring greater benefits than a single-technology program. They can specialize in balancing multiple objectives, such as reducing fossil fuel use, withstanding multi-day outages, encouraging the integration of customer-sited distributed energy resource (DER) technologies, and alleviating grid congestion. Further, hybrid CHP programs can focus on developing solutions that are standardized and easily replicated across similar building types to reduce project installation time, risk, and cost.

Why is a program needed to drive the growth of hybrid systems?

The markets for both solar + storage and single-technology CHP are relatively established, but there is little marketplace alignment to deliver integrated and optimized solutions with all three technologies. Customers seeking hybrid solutions likely face uncoordinated contractual arrangements and timelines with multiple technology providers, engineering companies, microgrid developers, and financiers.

Programs can play a large role in accelerating the development of solution providers—either "all-under-one-roof" providers capable of delivering an integrated CHP + solar + storage, or project teams who combine their individual expertise to deliver hybrid system solutions. Because of the complexity of designing and implementing hybrid systems, teams may initially be slow to form, and leaders may not emerge organically. A well-structured program can initiate the essential learning needed to bring together highly capable solution providers and develop standardized, replicable hybrid solutions for commercial and industrial customers.

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What kind of customers would participate in hybrid programs?

Program administrators may initially choose to focus on a limited set of customers or building types as primary candidates for implementing hybrid systems. Good candidates are likely to require long-duration onsite resilience, to have footprint space to install solar, and to have thermal and electric loads that can be served by CHP. For example, hospitals, assisted living centers, certain multifamily buildings, and university campuses house vulnerable populations that need to shelter-in-place during an emergency or grid outage; state and utility programs may direct funds to ensure high levels of resilience at these facilities. Prime program participants are a slice of the marketplace where resilience is paramount, sustainability is crucial, and solar + storage without CHP is not large enough to meet critical loads.

What design decisions can program administrators consider?

Decisions about a range of factors—such as the application process, eligibility requirements, incentive structure, cost-effectiveness, technology sizing guidelines, and resilience criteria—impact alignment with the objectives of the overall program portfolio. Take sizing guidelines, for example. Programs may specify a sizing combination that maximizes solar capacity based on available rooftop space and sizes the storage and CHP components to supplement solar for meeting site-specific resilience criteria. This strategy effectively achieves resilience goals and emission reductions, but it may not yield the most cost-effective system. Today, most CHP developers size CHP to match the baseload thermal requirements of a site to maximize fuel conversion efficiency and economics. Clear guidance, with some amount of flexibility and scaling, can balance the need to achieve cost-effectiveness and ensure the system aligns with overall objectives.

Are there any examples of programs to support hybrid systems?

Existing state and utility programs are not yet streamlined to encourage hybrid systems with all three technologies, although some states are exploring options. For example, the New York State Energy Research and Development Authority (NYSERDA) hosted an On-Site Resilient Power Conference in June 2019, where solution providers could meet, learn about each other's products, and explore ways to work together to deliver hybrid CHP systems. NYSERDA and other states and utilities have also incentivized microgrid development, but these programs have not focused on standardized, replicable hybrid solutions through the formation of developer teams. States and utilities can lead the way in addressing the learning curve that ultimately leads to a robust pool of talented solution providers and a standard set of hybrid system solutions for customers.

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