4 Requirements You May Be Missing on Your Battery Energy Storage System (BESS) Project

Whether you are in the concept stage or preparing for construction, there are BESS requirements you may be forgetting.

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From substations to hybrid renewable sites, energy infrastructure that plans to include an AC coupled battery energy storage system (BESS) can be surprisingly complex both below ground and behind the scenes for developers, utilities, and contractors. Some ordinances may be obvious to the seasoned stakeholder, but there can be hidden requirements that even experts may overlook when designing or constructing a BESS project.

Currently, 17% of solar projects[1] are paired with energy storage in the United States. The scale of the batteries serving today's U.S. power grid are projected to increase from about 1.5 GW to tens or hundreds of GW by 2030[2]. With energy storage growing as a critical asset to the grid, it is important to understand these four BESS requirements to avoid unexpected costs or schedule delays.

1. Drainage and Stormwater Control Requirements

From rural land to urban sites, and the construction stage to post-construction, drainage requirements will vary greatly, adding an element of complexity often not anticipated. To protect the soil, land, and surrounding communities, drainage and stormwater requirements are put in place to control water leaving the site, which limits environmental disruptions and flooding.

During the construction stage, native soil is disturbed and moved to build a reliable BESS facility. In urban areas, if proper planning and control is not planned into the design, this can leave downstream communities at risk of increased sediment and stormwater runoff.

In the post-construction stage, after the soil is stabilized, there is typically an increase in impervious areas. This leaves less soil for infiltration and adds a need for a long-term stormwater plan. Unlike rural renewable energy sites, systems in more urban environments come with additional requirements, including storm inlet pollution controls, specific tie-in agreements to existing storm drains, location-specific discharge requirements, and downstream system upgrades. Since these systems rely on gravity to move water, this can sometimes leave very little design flexibility. **Missing these requirements early can result in major layout and redesigns to accommodate the placement of storm drain infrastructure down the road**.

2. Equipment Layout Requirements

Developers must anticipate the requirements for land use before determining the BESS equipment layout in the initial design process. These considerations include leaving room for landscape and setback buffers, drainage infrastructure, interconnection equipment, and access roads for semi-trailers and cranes. The remaining land is then ready for the most important step of the project – designing the areas to install the batteries and associated electrical equipment.

The best BESS site design finds the right balance between a compact layout and open access. More compact sites can lower the overall cost of the project by shortening the length of underground wires and cables, and by reducing construction needs for earthwork. However, compact layouts can also limit access and lead to inefficient production for contractors and complicated maintenance. Additionally, the design must foresee the use of large wires that need to be spaced apart from each other to prevent overheating during operations. Ultimately, the **layout and cable management must be considered during the early stages of a conceptual design to help find the right balance.**

3. Fire Code Requirements

There is another major equipment layout requirement that cannot be forgotten: fire codes. Fire is a risk for all energy projects. Since BESS technology is so new, code requirements, both on the national and local levels, are constantly in flux. At the layout stage, this typically means providing sufficient access to the site or a defensible perimeter inside and/or outside the fence. Getting ahead of local fire officials' expectations can be key to a successful project. **Missing this important step can once again lead to a complete redesign of a site**.

Not only does fire access around and through the site come into play, but the rapidly evolving requirements around fire propagation (fire moving from one piece of equipment to another) are a driver of site design. While accepted standard industry practice follows the National Electrical Code (NEC) for the electrical portion of the installation, it is also important to keep in mind the NEC's parent association, the National Fire Protection Association (NFPA). The NFPA recently updated standards specific to energy storage that provide additional requirements and guidance that many local building and fire codes adopt as part of their code requirements. In the end, the challenge is working through the details. Even small increases in spacing can lead to large impacts on the layout or the total energy storage capacity.

4. Basic Utility Access Requirements

Some may underestimate the basic utilities required for the construction and operation phases of BESS projects, most commonly being water, power, and communications.

WATER

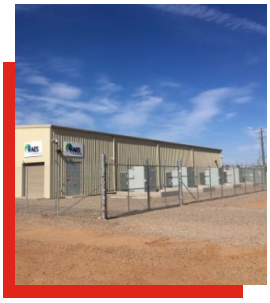
The unthinkable happens – there is a fire on the BESS equipment, and access to water is needed. Trucking in water for construction work may be a feasible option, but many fire officials will require a nearby source of water for fighting fires,

both during construction and operations. This means having water available at the site before the equipment even arrives.

With sites in urban and suburban areas, the solution could be getting a fire hydrant added to the site by the local municipality. Also, if the equipment itself is sprinklered, a hookup for the sprinkler system may be required. At the other end, if the location of the BESS site is more rural, a tank or a water well and the associated power and equipment to operate it may be required.

BACKFEED OR RETAIL POWER

While charging and discharging happens at the grid-level interconnection to the utility as part of the revenue stream for the project, BESS systems themselves can consume a significant amount of power not directly related to the charging or discharging of batteries. The most significant of these loads is for temperature control of the batteries with air conditioning. Plus, there are other loads such as lighting, security, and control systems.



State laws and system operator requirements vary by location, but there is often a requirement to provide power to some of the non-battery-charging loads with retail power (i.e. not wholesale power sourced from the grid-level that your BESS project is connected to). In this sense, the project is like any other commercial or industrial electricity customer in the utility service area and needs a retail power meter. Distinguishing between an interconnection source versus customer meter power can become quite detailed; it requires careful system designs to bring power on site.

COMMUNICATIONS

Similar to the requirement for power, wired and wireless communications are relied on to operate the system. Since most storage systems are operated remotely and require real-time interaction with the grid system operator, these internet connections are critical to operate the system.

The reliable connection needed for communication services is often dependent on local service providers. A project design can be heavily influenced by the service provider, their local equipment, and the vicinity of hard-wired and radio equipment. But be aware, even if urban and suburban areas have more speed and service availabilities, this can come with concerns around network congestion and security considerations.

Optimizing the planning stage

Although each project has unique considerations at the start of the development and construction cycles, it is best practice to plan ahead for drainage, equipment layout, fire codes, and utility access. While rural areas have more design flexibility, there tends to be limited access to basic utilities and further distance to interconnect. Conversely, as you move closer to urban areas and more resources – you are met with less land access and more requirements to keep the site and surrounding communities safe.

In the evolving world of renewables and power delivery, additional requirements may need to be considered by developers, contractors, and owners during the development, design, and construction phases of BESS sites.

[1] Clean Power Quarterly Report Q1 2021 | ACP
[2] U.S. Energy Storage Monitor | Wood Mackenzie