ENSIGHT
ENERGY CONSULTING

FROM GENERATION TO OPTIMIZATION:
TRANSFORMING SOLAR PROJECTS WITH **BESS**

As the energy landscape evolves, solar developers are increasingly turning to Battery Energy Storage Systems (BESS) to unlock new value streams. But what happens when your solar project is already operational?

Retrofitting with BESS can be a gamechanger

- if you know what to consider.

With the surge of BESS technologies, an increasing number of solar PV projects are integrating BESS to unlock new revenue streams such as energy arbitrage or ancillary services. BESS projects improve grid stability, reduce grid congestion, and minimize grid curtailment, thereby enabling energy injection into the grid during high-demand periods. Most of the BESS are being built simultaneously with solar, but what if you already have an operating solar PV project that doesn't currently have BESS?

In this post, we highlight three key factors to consider when adding a BESS to an existing solar project. From technical requirements to regulatory considerations, understanding these elements can help you unlock the full potential of this transformative technology, boosting both performance and return on investment.

Space Constraints and Project Substation

When designing your system with BESS in mind, there are two possible configurations: DC- or AC-coupled BESS. DC-coupled systems place the BESS near the modules on the DC side of the inverter, while AC-coupled systems typically place the BESS near the substation. Solar PV optimization tools reduce the space between modules and inverters, leaving little to no space for DC-coupled BESS in existing projects. Ensight Energy's recommendation would be to plan for an AC-coupled BESS, which would require around 10-15 acres near the project's substation, depending on the planned BESS size. This estimate is based on large-scale projects; smaller systems may require proportionally less space (e.g., ~1 acre per 10 MW/4h BESS capacity).

When designing an AC-coupled BESS, it's essential to account for the configuration of the site's substation. Installing a BESS typically requires additional, independent infrastructure to connect it to the same Main Power Transformer (MPT). This infrastructure is installed on the Medium Voltage (MV) side of the MPT and usually includes switchgear, medium voltage circuits, and an additional bus position.

While the BESS can share equipment on the High Voltage (HV) side of the substation, the MV side must have enough space to accommodate the new components.

Therefore, it's important to assess whether the existing substation layout can support the required additions, particularly the space needed for the extra bus position.

Additionally, depending on the planned operation of the BESS, existing metering and SCADA systems must be augmented to accommodate the BESS.

Interconnection Agreement Surplus

Once it has been determined that the site has the minimum space required for an AC-coupled BESS installation, the next step is to notify the Transmission Provider of modifications through their request queue to include the BESS as either a co-located, standalone project or as a surplus interconnection.

A surplus interconnection option is used when the project will not increase the total injection power to the grid, and the BESS will charge from the on-site generation at the existing interconnection point. The surplus interconnection definition was introduced in FERC's Order 845 with the Surplus Interconnection Service Request procedure and requires the Transmission Provider to perform

studies to estimate possible impacts to the system with the additional BESS. If no material impacts are detected, the Transmission Provider can approve the surplus interconnection request and amend the Interconnection Agreement.

Environmental & Permitting Constraints

The next important consideration for the addition of an AC-coupled BESS to your operating solar project is the environmental and permitting constraints. Environmental and permitting requirements are project-specific and should be addressed on a case-by-case basis. However, some important considerations are:

Zoning, Permitting, and Working with Local Authorities

- The Developer should be prepared to work with the respective Authority Having Jurisdiction (AHJ) to include the BESS in the Zoning and Land Use classifications, or in specific cases, obtain a Conditional Use Permit for the installation of the BESS project.

Landscape and Noise Mitigation

- Depending on the location and distance from the project to occupied structures, some AHJs may require the installation of landscape and noise mitigation measures. When designing the BESS layout, noise mitigation measures and required setbacks should be accounted for.

Access Roads and Laydown Space

- Delivery and installation of BESS containers require the use of cranes and heavy trucks. Equipment delivery routes should be planned to avoid damage to the existing project. If the BESS area is to be located near the substation, typically, equipment deliveries will use the same road used to deliver the Main Power Transformer. Since PV laydown yards are often the biggest flat area remaining on a project and located near the substation, they are often used for BESS additions. Care should be taken to ensure adequate space post-construction of the BESS.

Fire Safety and Compliance Standards

- During the early stages of the design process, fire code requirements need to be considered, as well as any local fire department's expectations for the project. Fire code expectations usually include multiple access routes to the site with enough room for quick deployment, fire suppression systems, perimeter fences, and setbacks to avoid fire propagation and separation requirements between the BESS containers.
- The National Fire Protection Association (NFPA) has established NFPA 855, *Standard for the Installation of Stationary Energy Storage Systems*, which outlines the design and construction requirements for BESS to reduce fire risks. These safety standards are a critical consideration and should be integrated into the BESS design process from the outset.

Ready to unlock the full potential of your solar project with BESS?

In addition to enhancing grid performance and reducing operational inefficiencies, adding BESS to your existing solar PV project offers the opportunity to improve your bottom line. Ensight Energy understands DC- and AC-coupled BESS requirements and what system adaptations are needed for an operational solar project to be successful in development and financing.

Ensight Energy offers expert consulting and engineering services to help you integrate BESS into your existing solar infrastructure.

*Contact us at info@ensightenergyllc.com or **720.648.6554** to learn more.*

About the Author

Francisco Diaz has over 10 years of experience in the renewable energy and power sectors, with a focus on utility-scale solar and BESS projects. His expertise spans independent engineering, project development, and construction, including site assessments, contract reviews, permitting, and financial modeling. He has contributed to the development of over 1 GW of solar + BESS projects, leading engineering design, CAPEX estimation, and coordination across environmental and land teams. Francisco holds a bachelor's degree in Sustainable Development Engineering from ITESM and a master's in Corporate Finance from the University of Barcelona.

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