

Energy Storage Inverter Framework





Overview

How do inverters work in energy storage?

Energy storage, like wind and solar, uses inverters for converting direct current to alternating current to interface with the grid. Industry has historically classified inverter control technology as “grid-following” (GFL) or “grid-forming” (GFM) to represent the bookends of control characteristics, capabilities, and performance.

Why are inverters important for energy storage projects?

Inverters also serve as the brains of an energy storage project, managing, optimizing and driving project performance and financial returns. The difference between central and string inverters, while simple, has profound implications for long-term project design, performance and safety.

Are string inverters good for energy storage?

Typically, central inverters have been the standard for commercial and utility-scale energy storage applications. But that is shifting as costs drop and developers, EPCs, owners and operators discover more about the performance benefits of string inverters. The solar PV market embraced string inverters first, but energy storage is gaining momentum.

What does an inverter do?

An inverter turns the direct current (DC) output of a battery or solar panel into alternating current (AC) for use in homes and businesses or to feed directly into the electrical grid. Inverters also serve as the brains of an energy storage project, managing, optimizing and driving project performance and financial returns.

What is universal interoperability for grid-forming inverters (unifi)?

The Department of Energy funded Universal Interoperability for Grid-Forming Inverters (unifi) Consortium, a multi-year effort underway to advance GFM



technology, produced the second version of GFM specifications in March 2024. MISO reviewed and adopted several aspects of this work in requirements and guidance as well.

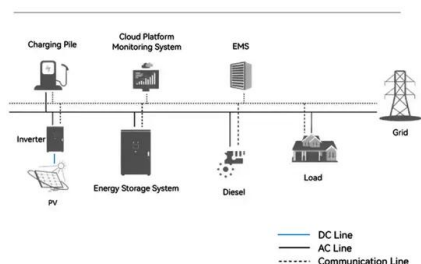
Can a solar inverter create a microgrid?

Grid-forming capability. Inverters for solar PV are unidirectional, but string inverters designed for energy storage are bi-directional and some (such as those from LS Energy Solutions) have grid forming ability. This opens up the opportunity to create a microgrid.



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System Topology



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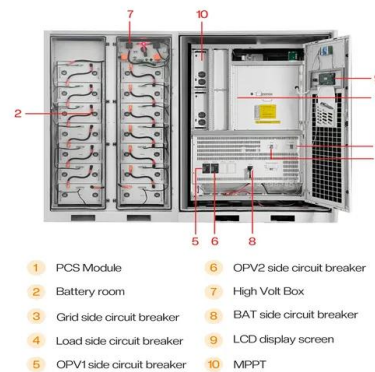
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Definition of Grid-Forming

Functional Definition - GFL Grid-Following: Most inverter based resources currently in service rely on fast synchronization with the external grid (termed Grid-Following) in order to ...

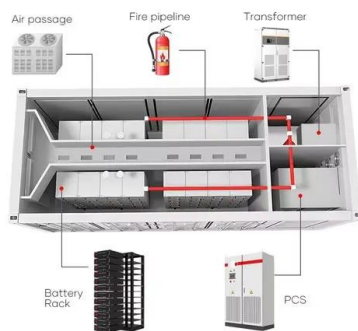
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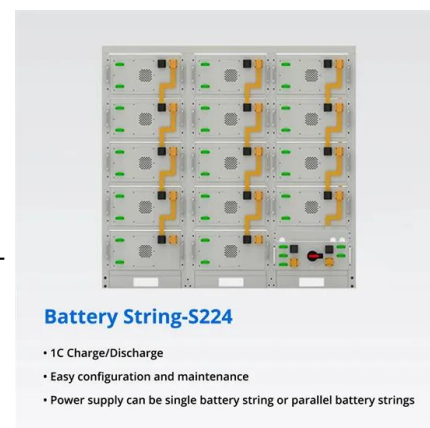
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