



Hybrid Power Plants

Definitions, Motivations and Implications

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Definitions

Co-Located Resource:

Multiple technologies at a common point of interconnection and participating as separate resources

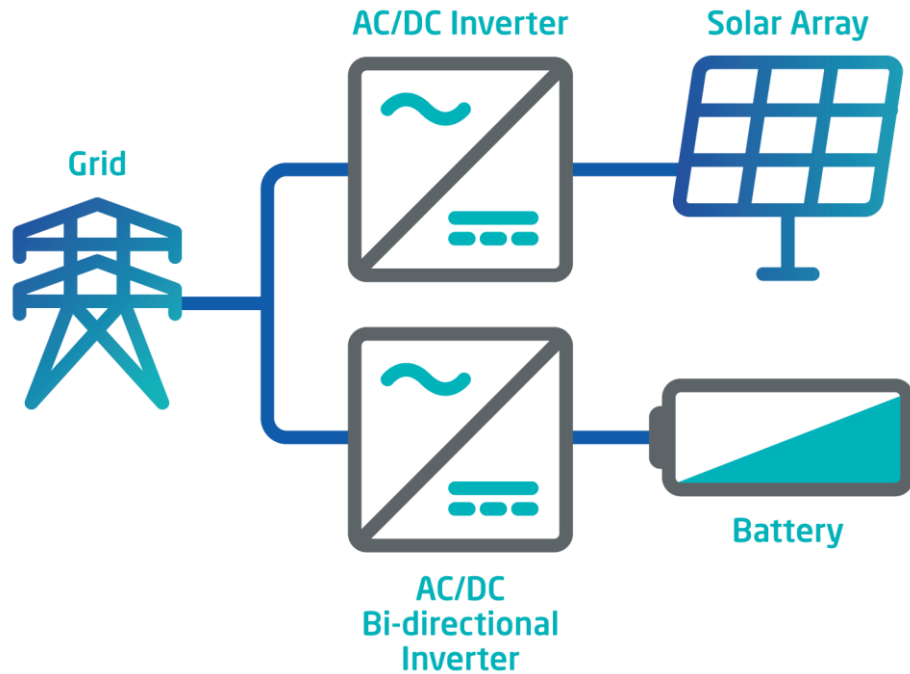
Hybrid Resource:

A combination of multiple technologies that are physically and electronically controlled by the plant's owner/operator and participating as a *single resource*

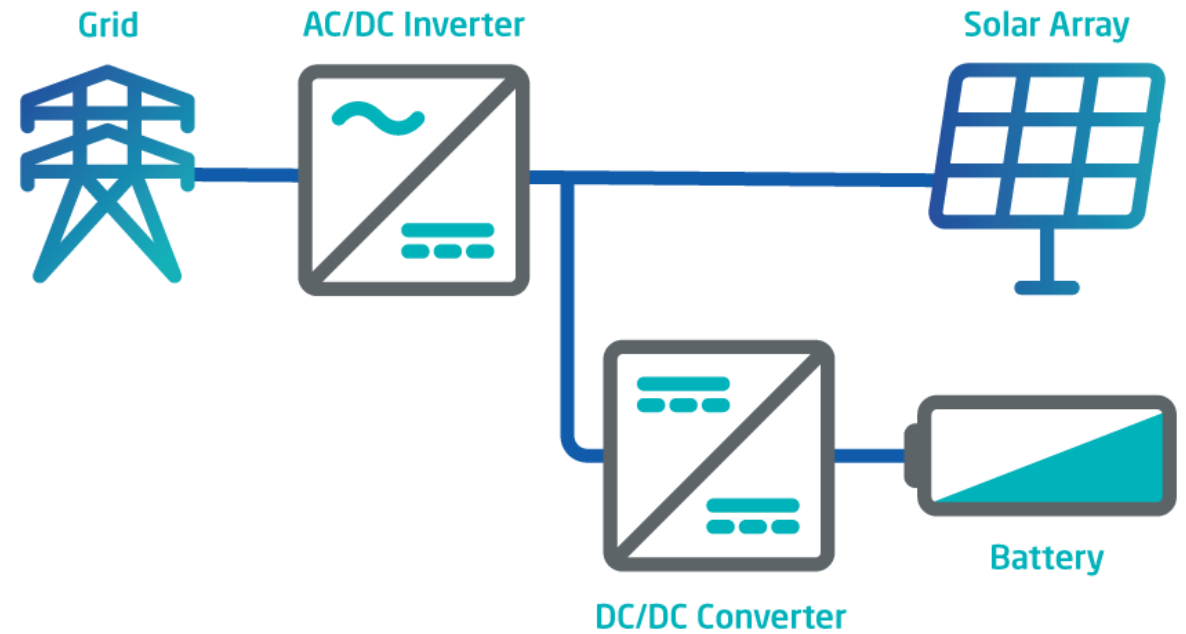
Both types can be useful... but in my view, the hybrid resource will prove to be far more powerful and innovative

Examples: AC Coupled and DC Coupled Solar PV + Storage

AC Coupled



DC Coupled



Benefits of Hybrid Resources

- A hybrid can emulate an existing type of resource, but with more flexibility and control
 - A carbon-free power plant that can provide not just “as available” renewable energy, but also other services without needing to retain headroom (i.e., self-curtailing energy) to do so
- Directly managing batteries is complicated – hybrids simplify things for the “customer”
 - The plant’s owner/operator manages battery state-of-charge (through their offers of services) and optimizes the operation of all the components in the hybrid with sophisticated analytics & controls
- In markets, provides a simpler and “more ideal” offer to the market operator
 - Can provide simple offers without startup, minimum generation levels or other constraints

Important Implications

- 1) Given sufficient electronics, software, energy and storage, we can create any kind of electrical machine that we want to see at the point of interconnection.
- 2) Initially, the hybrid resource can use an existing market participation model.
 - If a hybrid can emulate a generic generator (but with no startup cost, no startup time, no minimum run time, and a faster ramp rate), why not allow it to participating in this way?
 - Or, should it participate as a battery storage resource that doesn't need to be charged?
- 3) If a resources wishes to provide services and responses at the point of interconnection as a single resource, and if it can provide such services with the same quality, reliability and forced outage rate as a conventional resource (with offers to do so that are fair and competitive), shouldn't it be allowed to do so?



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