



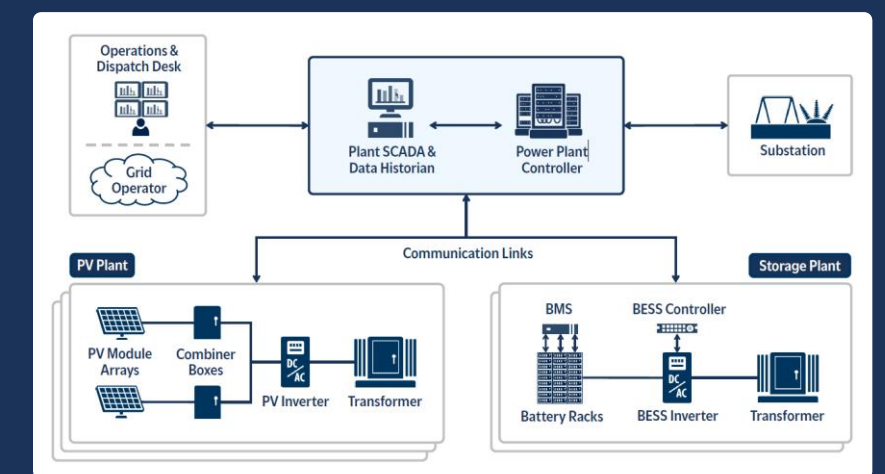
Key Theme



Utility-scale PV Solar provides Energy, Essential Reliability Services & Flexibility



Coupling storage with PV enables Clean & Competitive Firm Capacity & Grid Enhancements

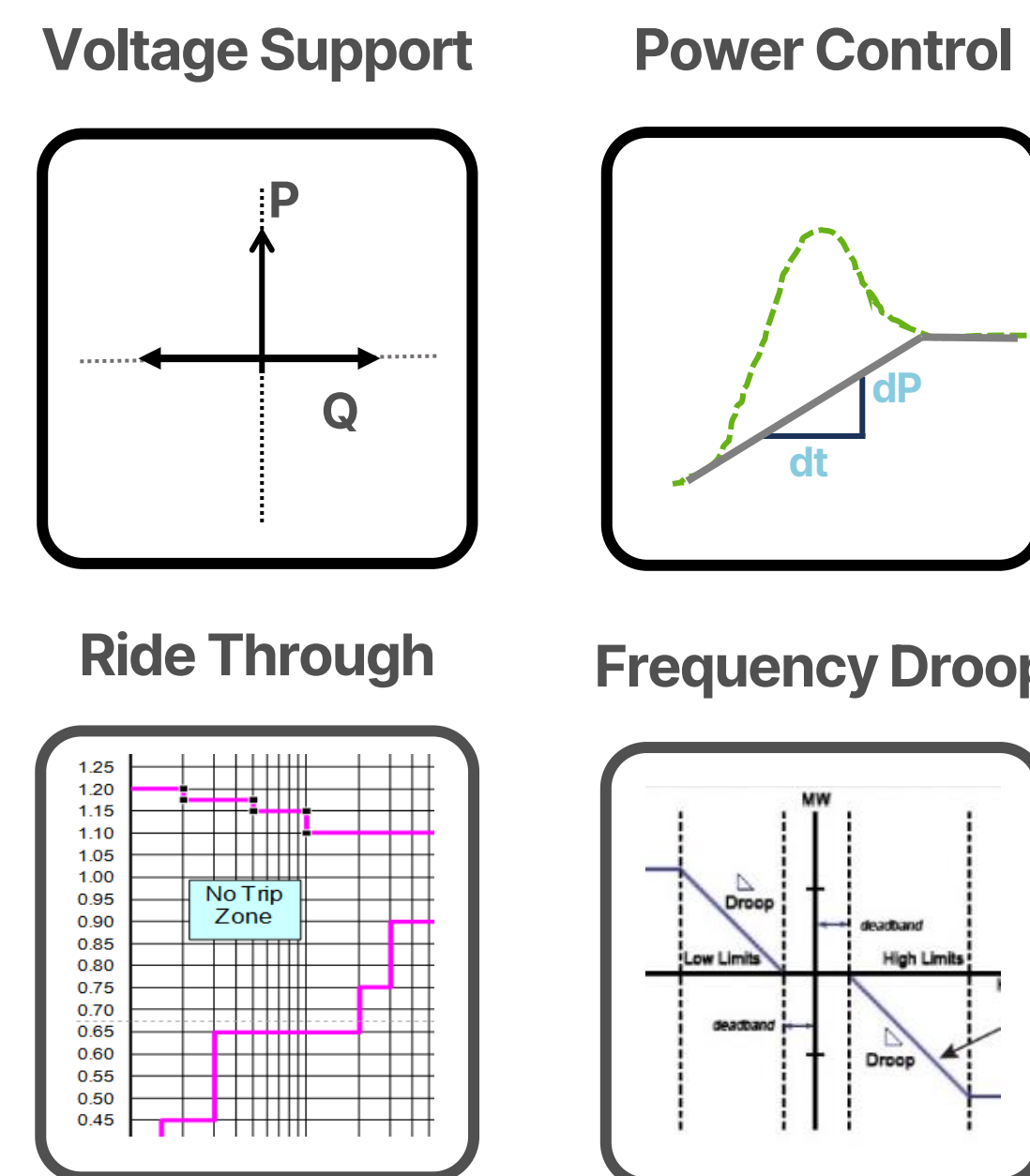


Plant controls play a critical role in unleashing hybrid plant's Full Operational Capabilities

Capability of Grid Friendly PV Plant

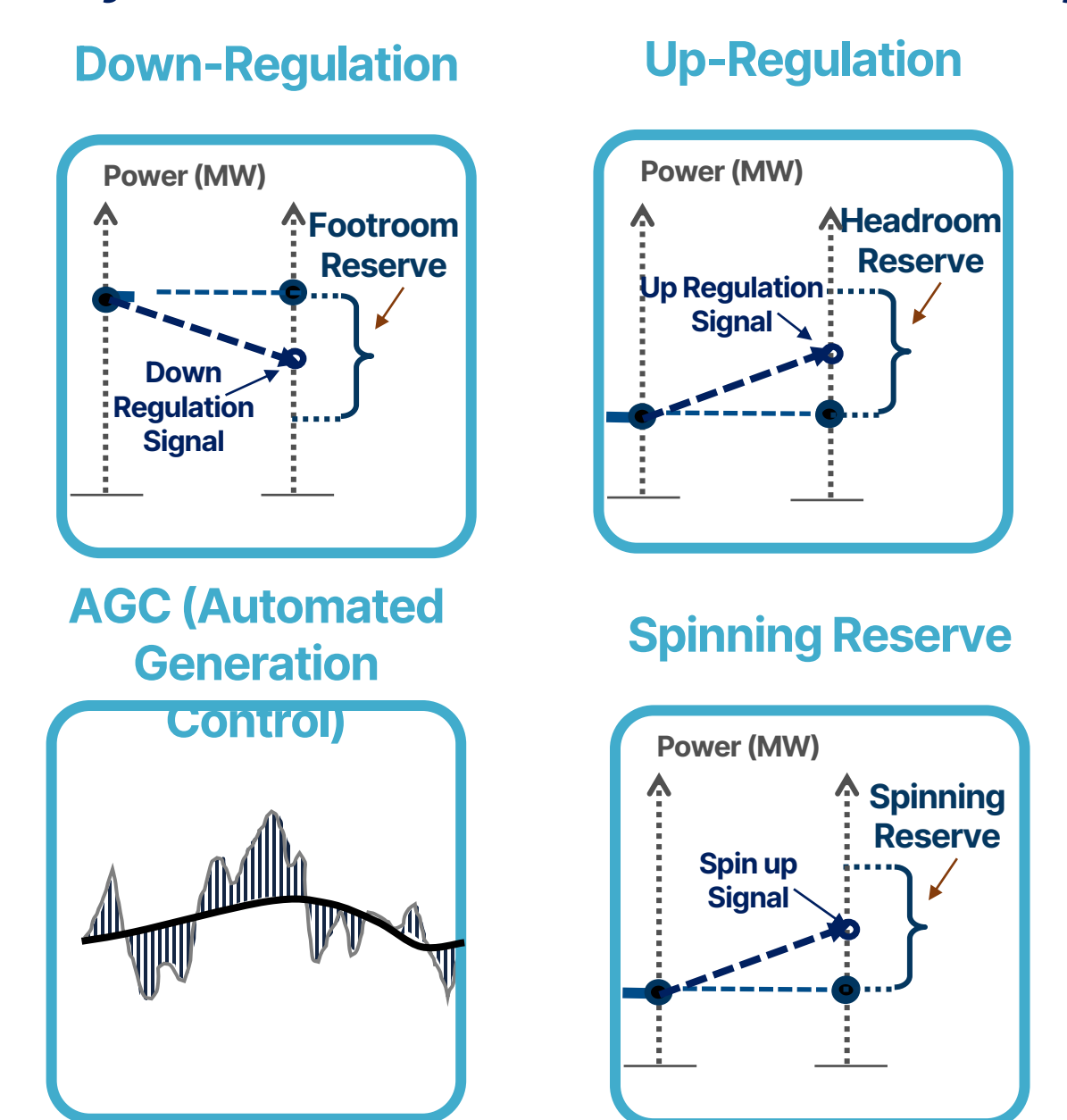
Base Capability

Features Required by NERC to be a Good Grid Citizen



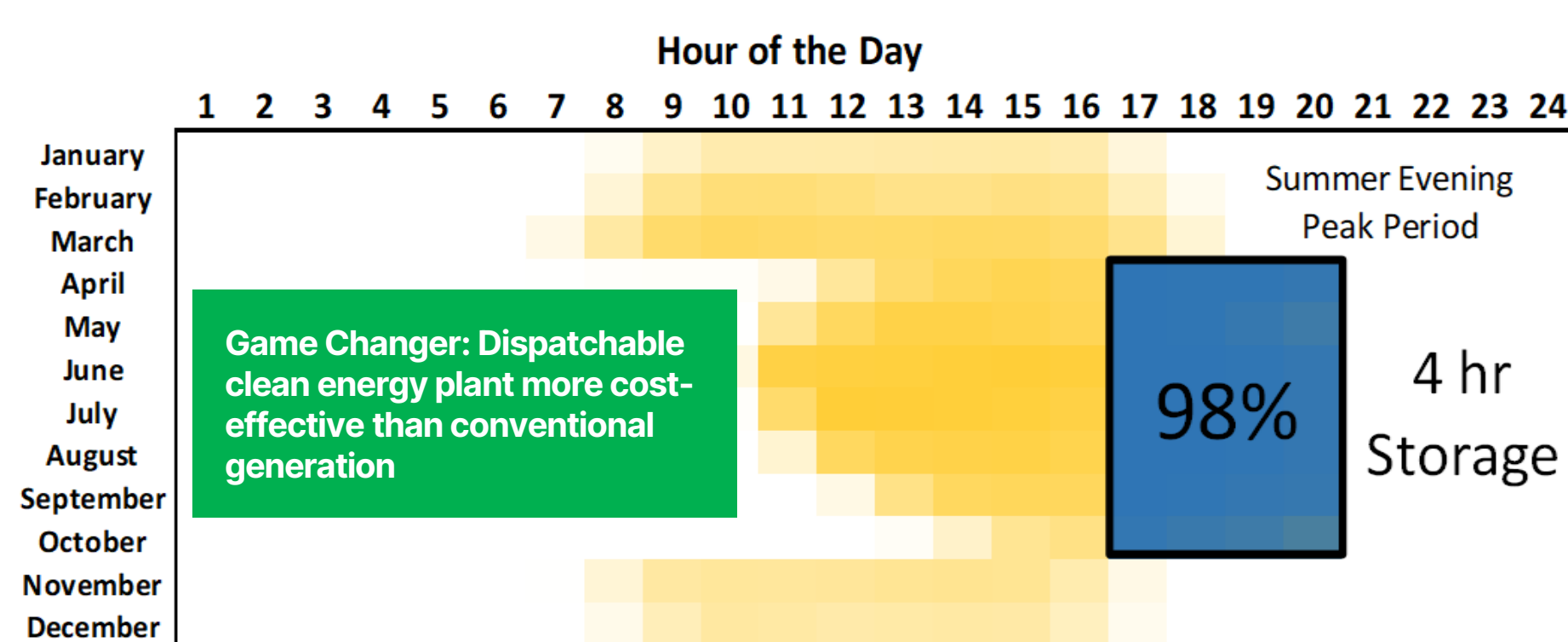
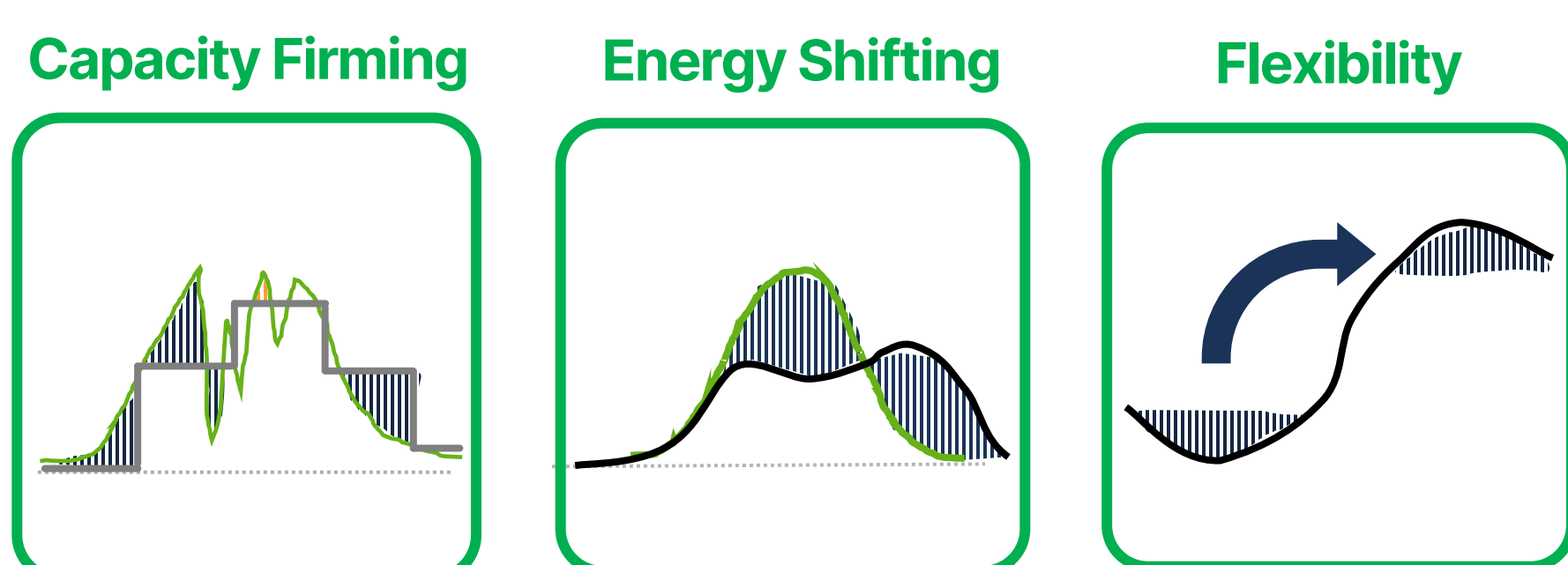
Grid-Reliability Services

Capable of grid services reserved for Synchronous Generators today

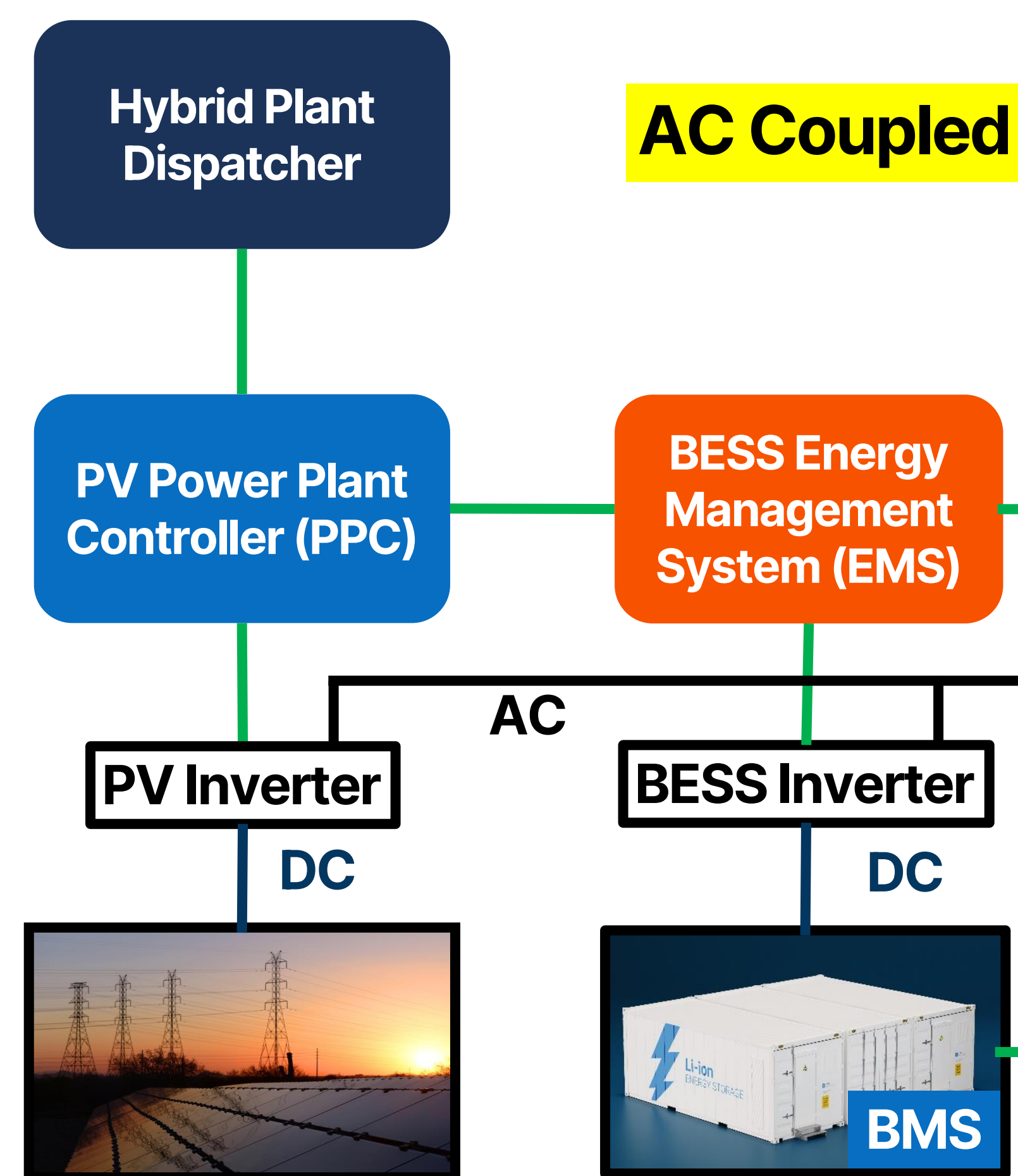


Grid Capability Enhanced with Storage

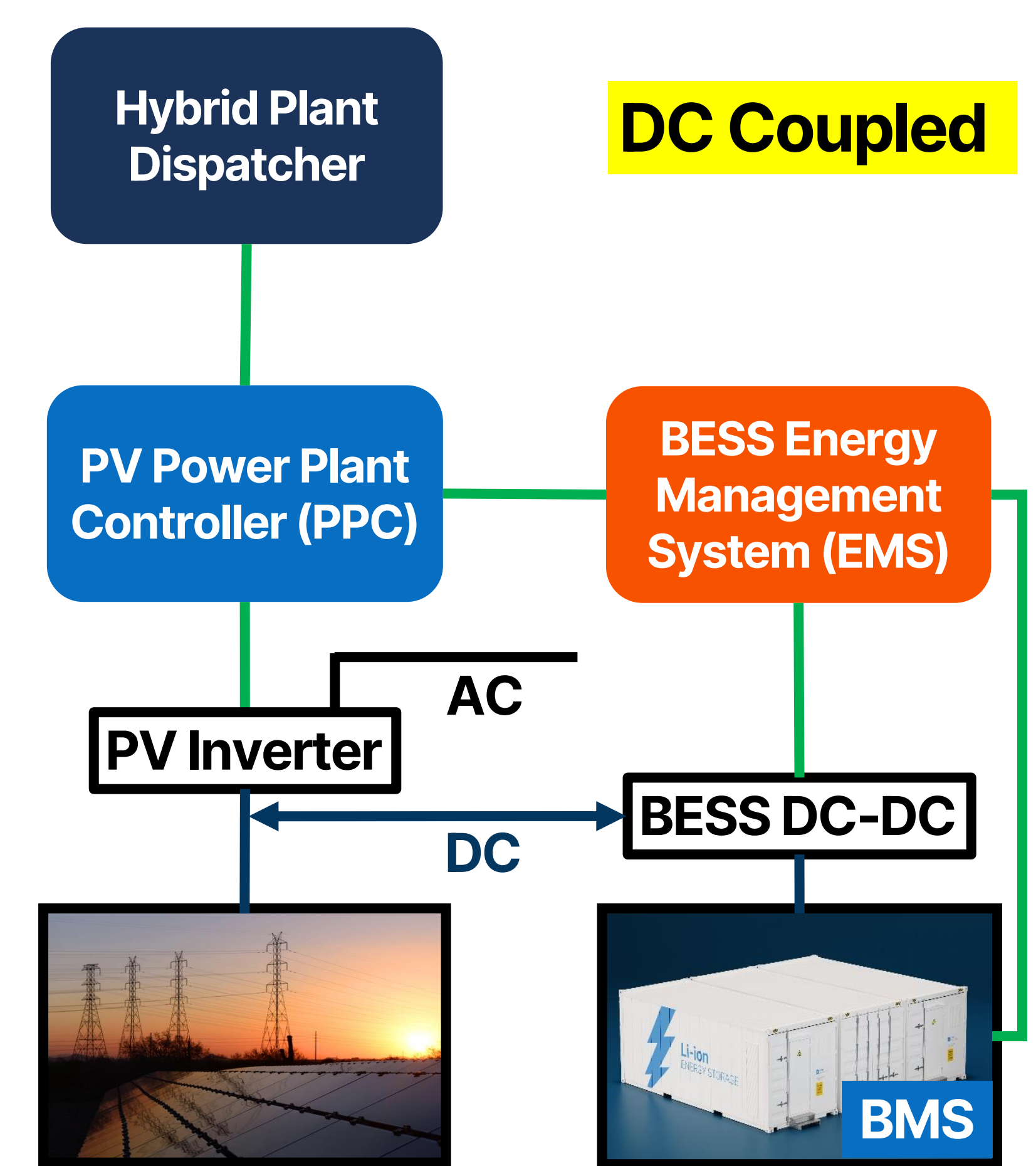
Clean dispatchable firm capacity



Hybrid Plant Control System Architecture

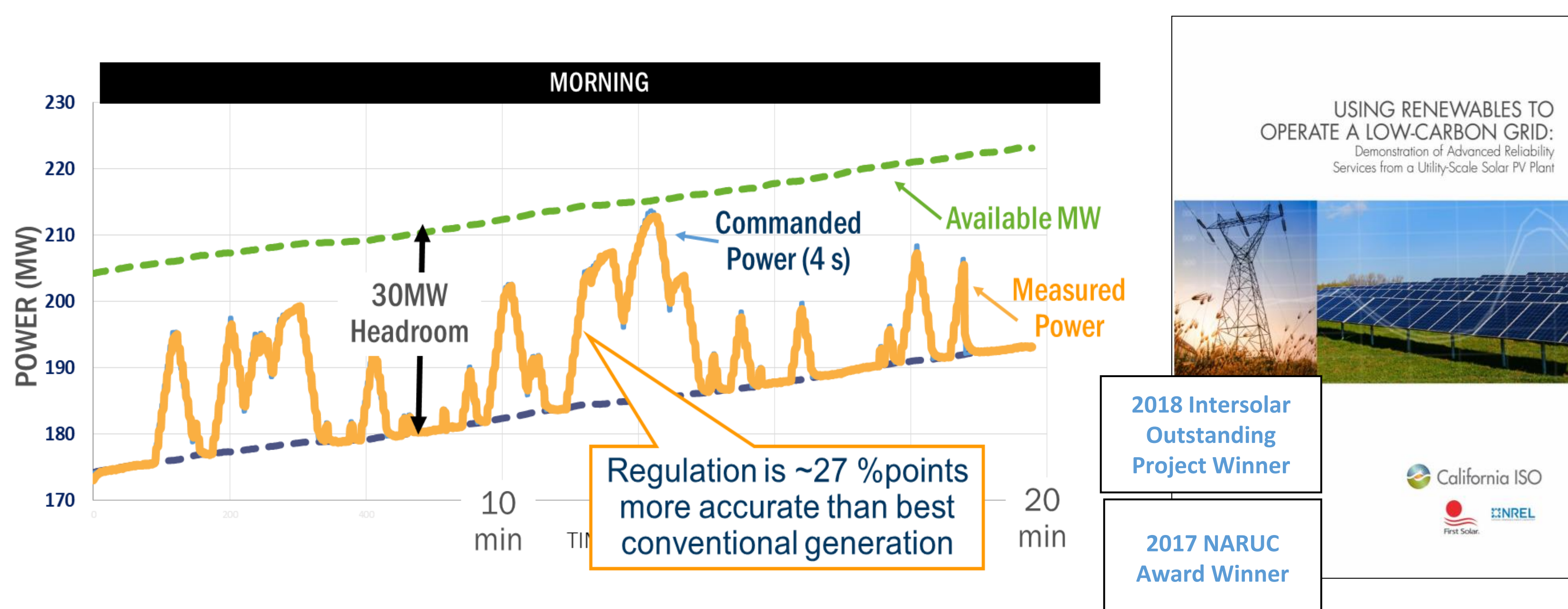


- Dispatcher determines PV and BESS setpoints
- Power plant controller (PPC) ensures that the plant meet the utility and interconnection requirements
- EMS operates the BESS system to meet the requested set points while optimizing its life
- BMS ensures that the battery system is protected and operates safely
- The control system architecture is the same for AC and DC Coupled systems

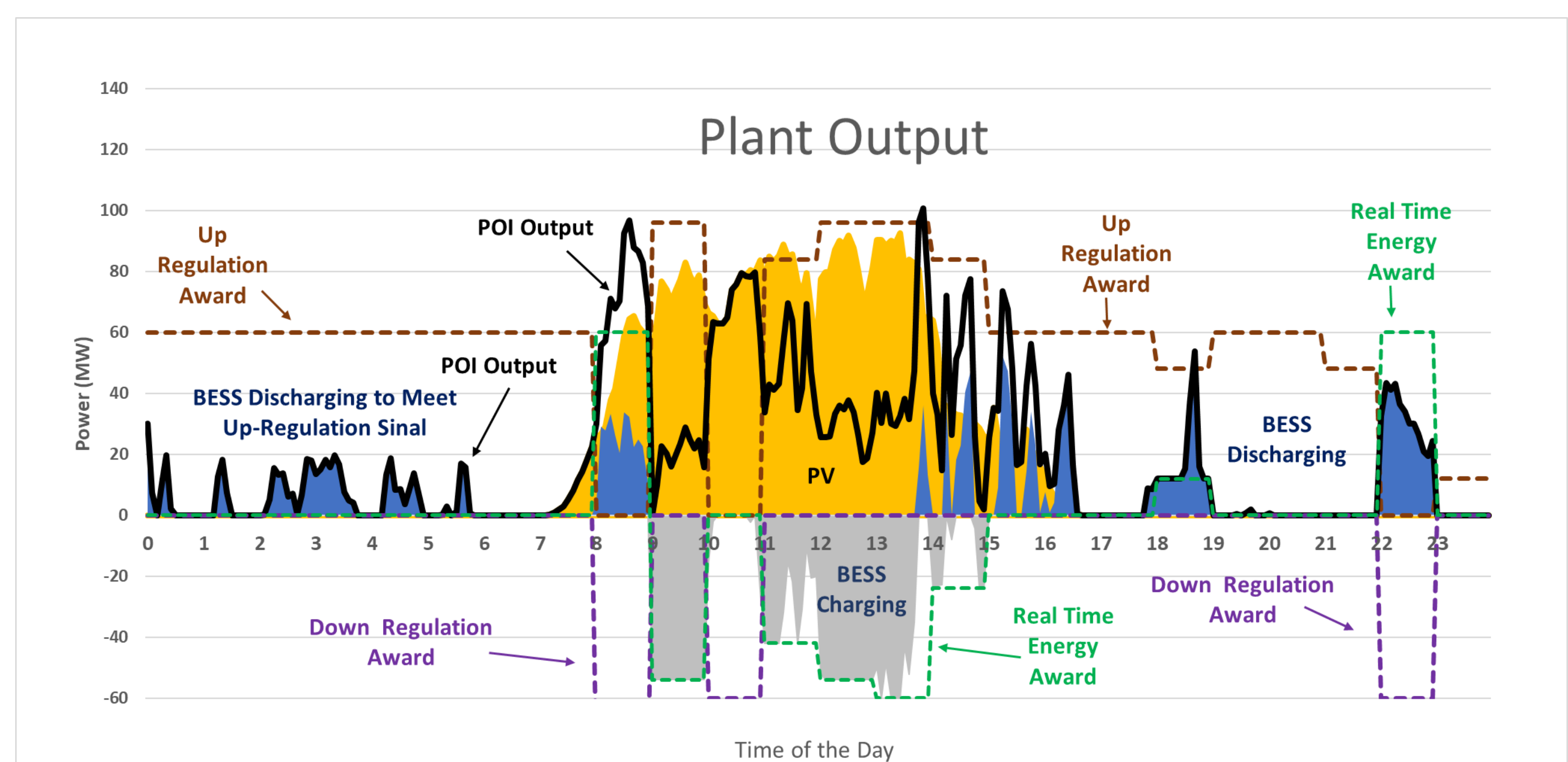


Plant Controls Enable Grid Services with Superior Performance

Power Electronics Enable Fast, High Accuracy Dispatch



Hybrid Plant Dispatch Unleashes Full Plant Value



SOURCES

- CAISO Report, "Using Renewables to Operate a Low-Carbon Grid", <http://www.caiso.com/Documents/UsingRenewablesToOperateLow-CarbonGrid.pdf>
- E3, Tampa Electric Company, and First Solar, "Investigating the Economic Value of Flexible Solar Power Plant Operation, 2018."
- S. Dahlke and M. Morjaria, "The Economics of Flexible Solar for Electricity Markets in Transition", May 2020.
- M. Morjaria, D. Anichkov, V. Chadliev, and S. Soni. "A Grid-Friendly Plant." *IEEE Power and Energy Magazine* May/June (2014)

ACRONYMS
IBRs: Inverter Based Resources
GFM: Grid Forming Inverters