



### Storage Industry Topology With Examples for the Co-op Sector\*

Battery Manufacturers	Battery Energy Storage System Manufacturers	Advanced Operating System (AOS) Providers	Developers with Solar and Battery Partners
LG Chem	Tesla	Engie	Ormat/Viridity
CATL	Sungrow	Enel X	Today's Power, Inc.
Panasonic	Fluence Energy	Fractal EMS	NextEra Energy
Samsung SDI	Canadian Solar	Stem	EDF Renewables
BYD	Wartsilla	RES RESolve	Strata Solar

Most battery storage manufacturers and AOS providers offer multiple services, and some, such as Engie or RES are full-service project developers as well. The matrix above describes the market landscape by offering examples of popular companies that work with electric co-ops in the U.S. Note that list is not intended as a ranking or endorsement.

As the market for battery storage and solar-plus-storage solutions is still evolving, industry players are defining their product and service portfolios and forming relationships, in order to provide the solutions that utilities, including electric cooperatives (co-ops) want. The chart above is not an exhaustive list, but it provides examples that may help co-ops to understand the market landscape. **Battery manufacturers** listed above provide lithium-ion (Li-ion) battery technologies. There are other battery chemistries (and some of the manufacturers listed offer options), but Li-ion dominates the market today. Battery components, including battery cells, modules, panels, fire suppression systems, power management controls, and basic operational software are assembled into **battery energy storage systems (BESS)**. **Advanced Operating System (AOS)** providers typically offer BESS hardware, but also provide software and services that integrate with utility operations on site or remotely. Using artificial intelligence and machine learning, AOS can increase storage performance and value and integrate with other distributed energy resources (DERs). AOS is evolving quickly. Systems are differentiated by the complexity of applicable use cases, degree of remote analysis and control (versus training for on-site use) and cost-effectiveness in comparison with other system integration and control options that the co-op or its wholesale provider may offer.

The companies that are listed as **Developers with Solar and Battery Partners** have pre-arranged agreements or internal capabilities in solar and storage. They are likely to bid on RFPs as the “project prime” or full-service developer. However, occasionally, a developer will respond to an RFP as the project prime with development partners at the same time as one of its partners responds as a prime with a different set of partners! A lack of exclusive marketing arrangements has led to some confusion in the market. SPECS is continuing to develop guidance around a better understanding of storage and solar-plus market topology as the industry evolves. One clear recommendation is for co-ops that issue storage or solar-plus-storage development RFPs to require a clear explanation of partner relationships, including which relationships are confirmed and which are pending availability of equipment or personnel or other requirements.

Published August 2021. Solar-Plus for Electric Co-ops (SPECS) is a project of Cliburn and Associates, LLC, cofunded under Subcontract No. AGR-2020-10205, as part of the Solar Energy Innovation Network, administered by the National Renewable Energy Laboratory (NREL) under Contract No. DE-AC36-08GO28308 by the U.S. Department of Energy's (DOE) Office of Energy Efficiency and Renewable Energy Solar Energy Technologies Office. The views expressed herein do not necessarily represent the views of Alliance for Sustainable Energy, LLC, the DOE, or the U.S. Government. No warranty is expressed or implied. Readers are encouraged to perform due diligence in pursuing any specific project opportunity. For more information see the SPECS page at the [Solar Value Project](#) website.