SunSpec Alliance Energy Storage Initiative

San Jose, CA, October 2014

The SunSpec Alliance Energy Storage Workgroup, in conjunction with the MESA Standards Alliance, is pleased to announce the fruit of its first work product: the SunSpec Energy Storage (ES) Model Specification, now available for download with other supporting SunSpec specifications at www.SunSpec.org.

The SunSpec Energy Storage Workgroup

In January 2014, the SunSpec Alliance, a global trade association defining open information standards for the distributed energy industry, announced the formation of a new workgroup with the MESA Standards Alliance to develop and promote communication standards for batteries and other energy storage technologies used in grid-connected energy storage systems.

The SunSpec Energy Storage Workgroup worked over the last nine months to develop models to support a variety of energy storage applications from large, multi-megawatt-hour systems deployed at utility substations, to islanded microgrid installations and smaller systems connected on the customer side of the meter. SunSpec members in the workgroup included 1Energy, Advanced Energy, SMA, Outback Power, Ideal Power Converters, and Loggerware, with inputs from the MESA Standards Alliance and other SunSpec Alliance members.

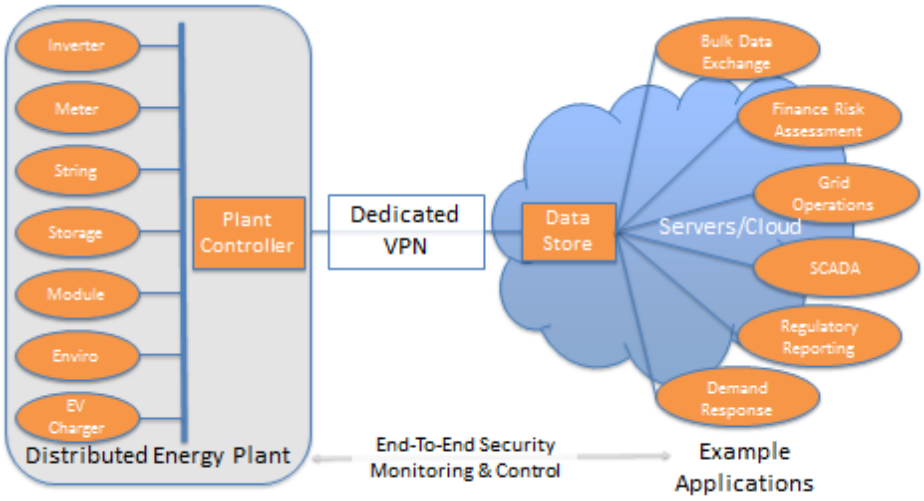
The charter of the SunSpec Energy Storage Workgroup is to develop and promote communication standards for batteries and other energy storage technologies used in grid-connected energy storage systems. The SunSpec ES Specification standards work is the starting point for storage control and communications standards.

Outcomes of the SunSpec ES Specification

- Standards-based communications and lower integration costs
- Minimal non-recurring energy (NRE) costs encourages propagation of energy storage systems within a service area
- Modularity allows for the replacement of major system components as storage technology advances
- Plug-compatible products can be extensively tested prior to system delivery

The intention of the storage standards work is the seamless integration of storage and distributed energy.

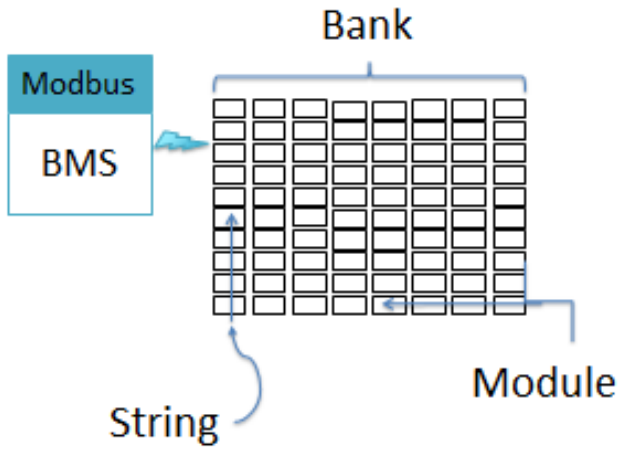
SunSpec Energy Storage is the newest SunSpec Specification and fits in with SunSpec's open information model for distributed energy (see figure below.)



SunSpec Energy Storage Workgroup Scope

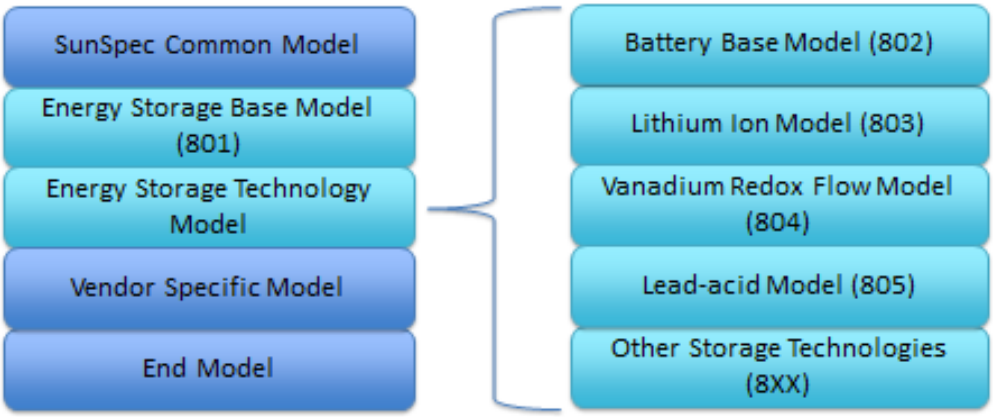
- Complement SunSpec inverter & meter models and leverage existing standards
- Enable complete systems with minimum non-recurring engineering expenses
- Define standards for varied storage technologies
- Optimize for energy storage type: lithium-ion batteries are an initial focus because of their broad market impact in the short term
- Expand to other storage technologies in the future and prioritize based on market demand
    - Vanadium redox flow batteries
    - Lead-acid batteries
    - Etc.

Lithium-ion Battery Example:



The battery management system (BMS) communicates with battery strings and modules, and surfaces aggregate data. Different vendors expose many common attributes: state of charge, current limits, temperature alarms, etc. Many BMS implementations use Modbus today, and the SunSpec Energy Storage Specification defines standardized sets of software interface to these registers for compatibility and plug-and-play operation.

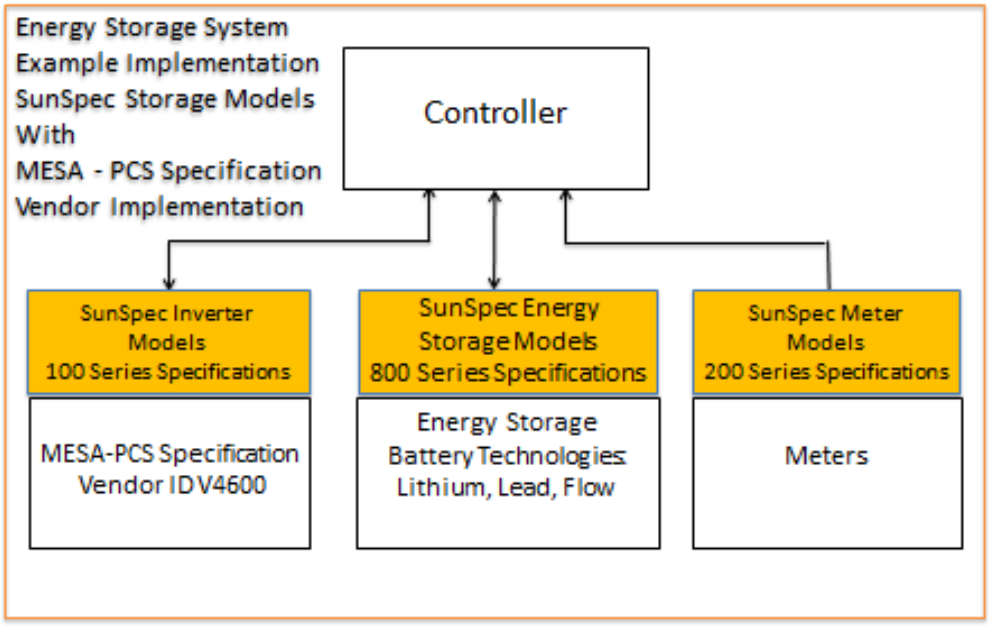
How the SunSpec ES Map fits into Standard SunSpec Common Data Models



SunSpec Energy Storage Model example attributes

- Nameplate capacity
- Nameplate charge rates, etc.
- Common attributes of battery storage systems
- Module temperatures, cell voltages
- Bank and string state of charge
- Alarms and warnings, etc.

Current energy storage systems are costly partly due to the lack of standards and the amount of non-recurring energy (NRE) costs that are required on each project. SunSpec and MESA are working together to develop communication standards that target the components used to construct these energy storage systems.



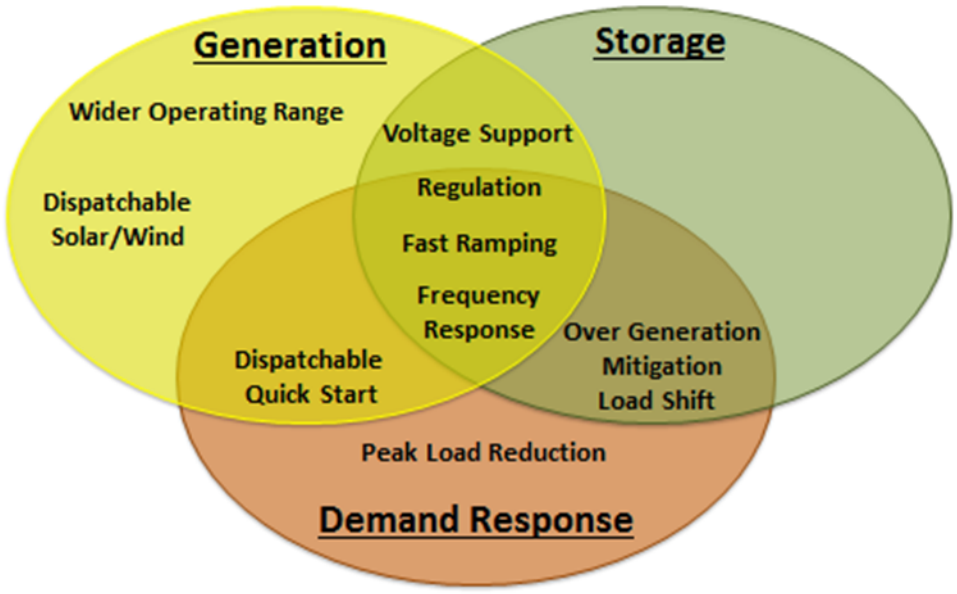
The SunSpec Energy Storage Workgroup invites comments and additions to the specification during the review period, and invites the industry to join in on the continued specification evolution for tightly-coupled distributed energy/PV/storage and standalone energy storage applications. If you would like to join he work group email info@sunspec.org or any SunSpec representative.

Applications

The SunSpec Energy Storage Specification enables standard use cases:

- Energy load shifting
- Peak shaving
- Voltage & frequency support
- Power smoothing

The integration of distributed energy resources such as solar PV presents unique opportunities generated by the overlapping applications of generation, storage, and demand response (shown in the figure below).



An increasing number of grid-connected energy storage systems are being deployed to enable energy arbitrage, better integration of renewables, voltage support, microgrids, and other scenarios. But, a lack of standards and high integration cost are impeding the technology's adoption.

SunSpec standards now address the operational aspects of distributed generation power plants on the smart grid and thus reduce costs, promote technology innovation, and accelerate industry growth. With the addition of energy storage standards, our goals are to do the same for the energy storage market and offer a natural complement to our efforts to grow the distributed energy industry.

About the SunSpec Alliance

The SunSpec Alliance is a trade alliance of developers, manufacturers, operators and service providers, together pursuing open information standards for the distributed energy industry. SunSpec standards address most operational aspects of PV, storage and other distributed energy power plants on the smart grid—including residential, commercial, and utility-scale systems—thus reducing cost, promoting innovation, and accelerating industry growth.

Over 70 organizations are members of the SunSpec Alliance, including global leaders from Asia, Europe, and North America. Membership is open to corporations, non-profits, and individuals. For more information about the SunSpec Alliance, or to download SunSpec specifications at no charge, please visit www.sunspec.org.