A STREAMLINED MODELING TOOL

Helps Local Co-ops Improve Solar-Plus-Storage Procurement

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Overview

Development of storage and solar-plus-storage solutions is beginning to take off in the electric cooperative (co-op) sector, with an estimated 50 energy storage projects of all kinds developed by spring 2021, according the National Rural Electric Cooperative Association. But this progress indicates only a fraction of the market potential. **Solar-Plus for Electric Co-ops (SPECs)** is a collaborative project co-funded by the U.S. DOE as part of the Solar Energy Innovation Network, which is administered by the National Renewable Energy Laboratory. The SPECs project aims to increase the pace and impact of storage and solar-plus-storage procurements among co-ops and other local distribution utilities.

Working directly with co-op energy storage pioneers from
- Cobb Electric Membership Corp. (GA)
- Kit Carson Rural Electric Co-op (NM)
- United Power (CO), and
- North Carolina EMCs and its member co-ops,

and from other industry players nationwide, SPECs spotted unique challenges facing these smaller, local utilities. These include rapidly changing wholesale relationships, markets and rates and new load-balancing, resilience, and reliability needs–sometimes stemming from rising customer-side solar and DERs, and potentially complicated by extreme weather events. Moreover, co-ops have limits on staff and board-level time, training, and tools.

The SPECs Early-Stage Decision (ESD) model is an Excel-based economic modeling tool that provides hands-on education for utility staff and boards and analyzes the impact of various options in solar-plus-storage project design. It can help get co-ops through critical go/no-go decisions. The ESD is open-access, free, and customizable, delivering data and information for further discussions internally and with solar-plus-storage providers.

Key Features

The ESD dovetails with NREL's Solar Advisor Model (SAM) to take advantage of SAM's capabilities, e.g., analysis of solar resources and of solar-plus operations for local demand-reduction. Then SPEC tackles more complex questions about battery requirements and operations, so users can test how different battery-storage value streams would interact in their situation, under their load and economic requirements. The model includes user-friendly instructions for setting assumptions or defaults, adding hourly load data, and integrating SAM analytic results in order to run relatively complex solar-plus use cases with up to three value streams.

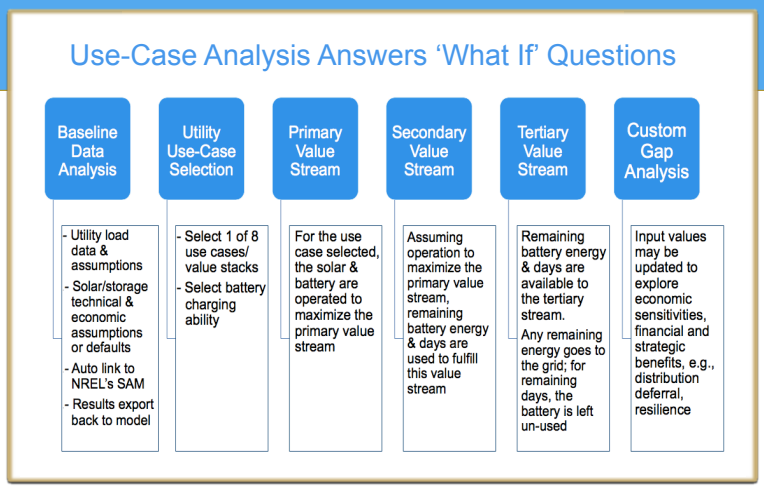

Figure 1. *Model Logic Diagram.* The SPECs Early-Stage Decision Model (ESD) is an Excel-based tool to help co-ops, and other local utilities pursuing solar-plus-storage development to test likely use cases, explore value streams, educate decision-makers, and provide detailed information for procurement RFPs. Gap Analysis and Sensitivity Analysis support further customization.

The modeling methodology is summarized in Figure 1. Battery parameters, such as minimum and maximum state of charge and effective battery capacity, may be set as defaults or calculated, based on user inputs. Assuming typical load and weather conditions over the test year, the primary storage value stream would be addressed first. Then the secondary value is addressed, so long as the battery is available. To the extent that the battery still remains available, the tertiary value would be achieved. The ESD makes informed simplifications, yet it can prioritize use cases and test changing conditions, for example testing proposed policies that could shift focus from standard demand charge reduction to optimizing a wholesale time-of-use rate. Such contingencies should be tested before the warranty is set or the PPA and ESA agreements are signed.

Another ESD feature supports a gap analysis. This innovation offers a way to incorporate approximate strategic values, such as infrastructure deferral value or the net value of a project resiliency upgrade. Such values may used conservatively to fill the gap between the economic result of the tested use case and the co-op's target result, e.g., a break-even B/C metric. An accompanying guide details the basis for using such strategic values to fill a proposed project's cost-effectiveness gap.

Case Study

As Kit Carson Electric Co-op (KCEC) approached its goal of *100% daytime solar*, planners recognized that the addition of battery storage would be critical. Their use case included coincident peak demand reduction as well as arbitrage and ancillary services values that could be monetized in regional markets that are expanding in the West. The ESD was used to assess KCEC's 15-MW storage procurement, based on these value streams. The results were encouraging, yet the co-op wished to incorporate strategic values, which helped drive their initial interest in storage. These included the imperative of managing local imbalances, which typically increase with the growth of distributed solar generation and other DERs.

Such imbalances create the risk of back-feeding onto the transmission grid–an issue for KCEC and for other utilities with high renewable-energy targets. The ESD gap analysis function approximated the value of addressing this need with well-placed battery storage. It conservatively calculated the net savings for deferring a more costly grid upgrade, and it incorporated this result into the overall use case. Notably, KCEC also valued the ability to operate at least one of its two planned battery storage systems as a microgrid, to offer resilience against a possible fire-related outage. The ESD gap analysis offers guidance for conservatively estimating that strategic value, too, resulting in a stronger case for the solar-plus storage procurement.

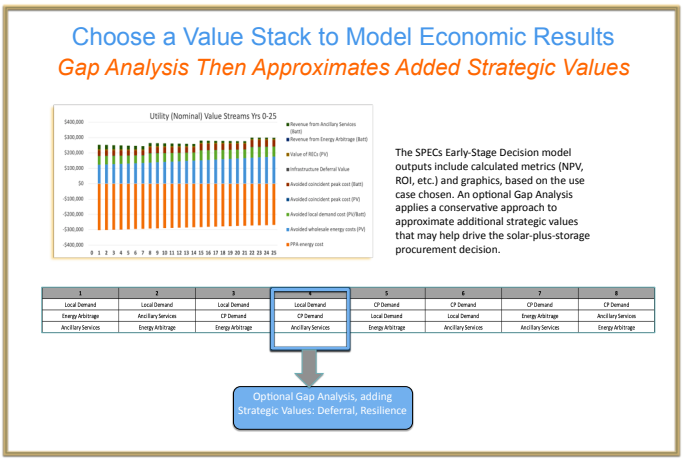

Figure 2. Sample Outputs for a Selected Value Stack. The SPECs model supports testing calculated and strategic values.

Figure 3. Kit Carson Electric Co-op, in Taos, NM, is acquiring a 15 MW of battery storage, split between two sites, to support its goal of achieving 100% daytime solar.

Solar-Plus for Electric Co-ops

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For more information on accessing the ESD model and optional support, contact:
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