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Solar-Plus for Electric Co-ops

# Emerging Best Practices for Procurement of Battery Storage and Solar-Plus Systems

A Resource in Support of the
Solar-Plus for Electric Co-ops Project

# Background

**Solar-Plus for Electric Co-ops (SPECs) was launched** to help optimize the planning, procurement, and operations of battery storage and solar-plus-storage for electric cooperatives. SPECs was selected by the U.S. Department of Energy's National Renewable Energy Laboratory (NREL) for Round 2 of the Solar Energy Innovation Network (SEIN). Cliburn and Associates, LLC, led the project team, including North Carolina Clean Energy Technology Center (NCCETC), Cobb Electric Membership Corporation, Kit Carson Electric Cooperative, United Power, and stakeholders from other co-ops and public power utilities and wholesale suppliers, market experts, and the energy storage industry. As SEIN Round 2 culminated in Summer 2021, Cliburn and Associates and the NCCETC have continued to support dissemination of SPECs resources and to carry the work forward, broadening our focus as it applies to new development models and market trends.

The challenges of procurement for utility-side storage and solar-plus projects center largely on early-stage decisions: defining the top-priority use case, but also exploring ways to get more value out of the project and to prepare for market changes over its life. The choice of acquisition strategy—by asset ownership or PPA/ESA contract—also greatly influences procurement. With resource contracting on the rise, the lack of publicly available guidance for that type of procurement is acute. This brief (in presentation format) begins to address the need for guidance on these points and more. By definition, it does not attempt to conclusively or fully address every step in the process. **Due diligence—research on the applicability of this guidance for your particular situation—is assumed as a term of use for this information. A detailed disclaimer is appended.**

# Assumptions

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- **Most co-ops projects are at the distribution scale...** though some use cases capture both local-grid value and market value.
- **Wholesale-market projects...** are a distinct trend, with solar-plus projects scaling up.
- **Li-Ion batteries...** are assumed, as these were used in >90% of projects up to 2019. You may also consider other chemistries.
- **Preference for solar-plus…** but SPECs provides some resources to help assess battery-only options as well.
- **Microgrid applications...** are a small fraction of all projects today, but interest in resiliency is on the rise. This presentation provides references, but few details.
- **Our procurement framework...** is focused on local knowledge-building, coordination, and preparation for making the most of external support. We assume utilities will work with upstream partners, consultants, and short-listed bidders to fine-tune project plans. Yet success requires a baseline of knowledge and vision from utility staff and decision makers.

# SPECs Procurement Framework

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## Concept

- Seed the team
- Check policy landscape
- Check existing contract/s
- Update market research
- Draft use case
- Collect data for ESD modeling
- Run and review
- Draft questions
- **1st Go/No-Go**

## Clarification

- Research financing
- Propose a financing plan; alternatives
- Check permit needs
- Issue RFI (optional)
- Plan RFP logistics
- Review RFI (optional)
- Refine ESD model
- Refine operating plan
- Revise use case, team & RFP logistics
- Finalize RFP & plan
- **2nd Go/No-Go**

## Contract

- Issue RFP
- Carefully implement RFP logistics plan
- Engage expertise for RFP review (optional)
- Short-list top RFP bidders (optional)
- Review/due diligence
- Negotiate technical & legal issues
- Finance-grade review
- **3rd Go/No-Go**
- **Approvals**

## Connect

- Prerequisite: include operational needs in project/RFP objectives
- Meet responsibilities per development plan
- Implement safety & reporting plans
- Complete operational training & agreements with upstream partners
- Commissioning
- Interconnection
- Implement O&M plan
- Reassess periodically

# High-Level Guidance on the Framework

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- **It assumes the local utility perspective,** but it is adaptable to projects using either an asset acquisition or contracting (PPA/ESA) approach.
- **It adapts to the participation or even leadership of upstream partners,** such as G&Ts or Joint Action Agencies.
- **Color key:**
  - Orange = major action steps
  - Gray = research steps (internal work)
  - Blue = optional steps, depending on the utility's comfort-level and expertise
- **Recommendation: customize the process to your needs and refer to it as a checklist.** Solar-plus-storage procurement processes frequently last over a year, and it is important to periodically refresh the team's understanding.

# Your Needs for Knowledge Differ Based On…

- Three categories of utility storage and solar-plus use cases
  - Community-scale projects, owned or contracted by local co-ops
  - Community-scale projects that are part of a G&T fleet
  - Wholesale projects owned or contracted by G&Ts vs. IPPs
- Two major acquisition strategies
  - Long-term PPA/ESA
  - Asset acquisition
- How you plan to engage outsourced expertise
- Your place in the acquisition process timeline and in the utility's decision hierarchy (e.g., staff engineer vs. c-suite or co-op board)

# Policy Landscape

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Institutional and Policy Landscape for
Solar-Plus-Storage Deployment by Electric Cooperatives

Solar-Plus for Electric Co-ops
July 2021

David Sarkisian
North Carolina Clean Energy
Technology Center

Jill K. Cliburn
Cliburn and Associates, LLC



## Check Contracts and Policies First

- Resolve issues related to the wholesale power contract before you begin. Read fine print and make no assumptions.
- Assess regional market opportunities and challenges.
- Look for uncommon or emerging opportunities
- Refine your understanding in order to advance for local priorities

# The Market Landscape Differs Among Sectors and Regions

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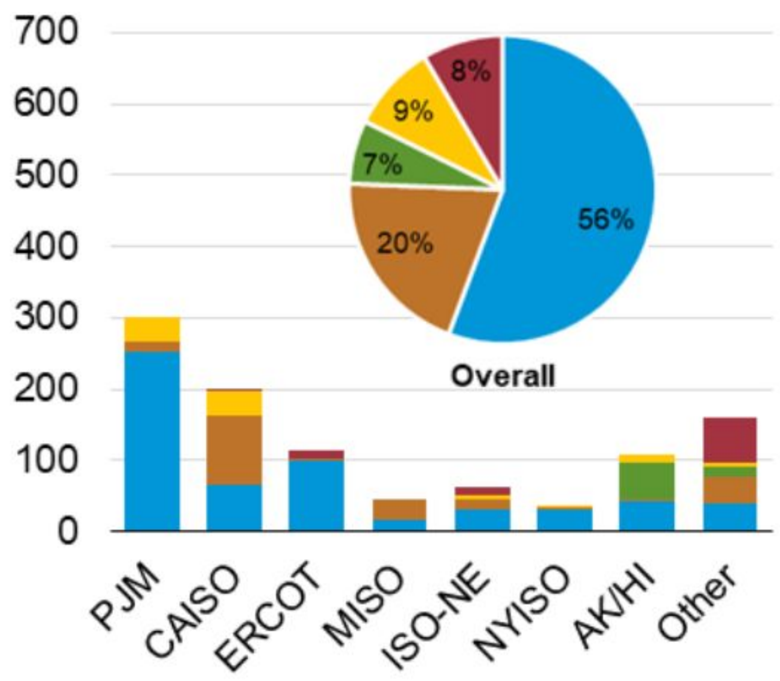
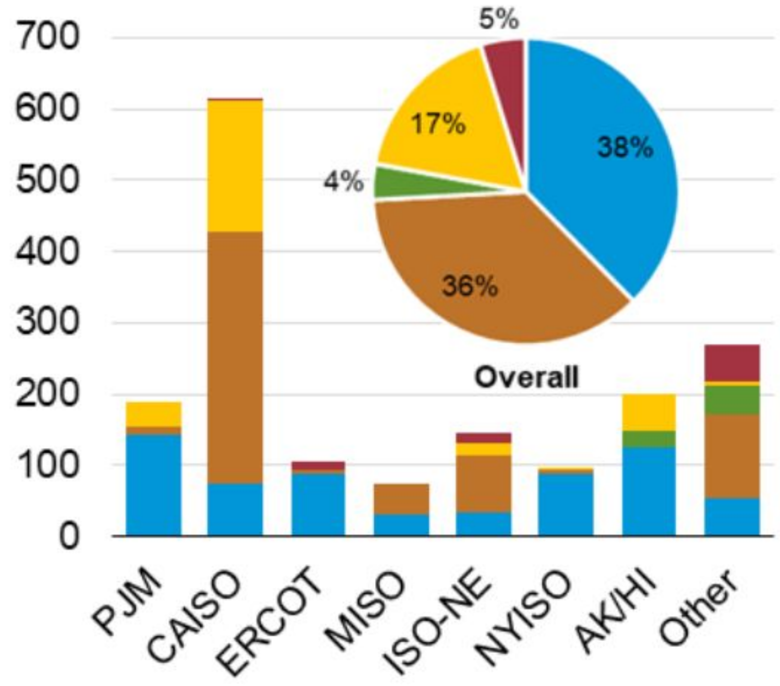
**power capacity**
megawatts



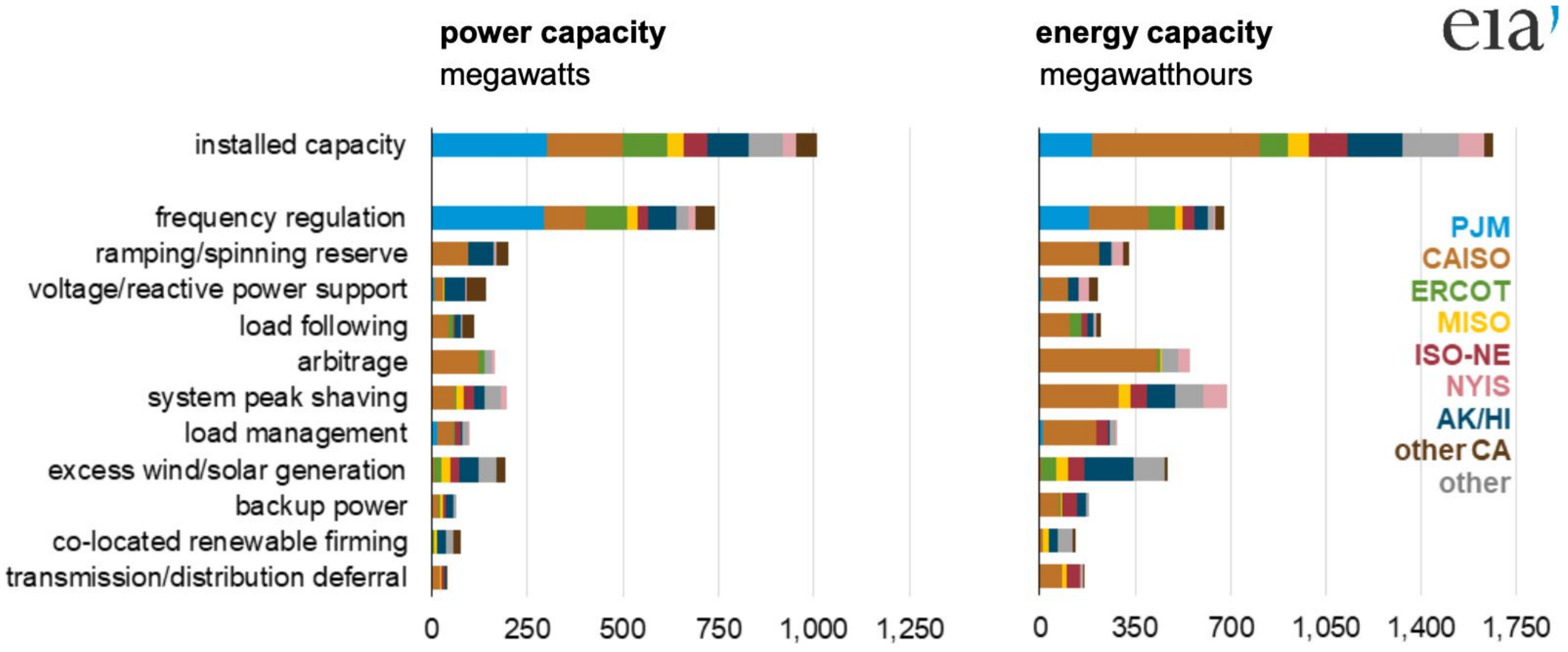

**energy capacity**
megawatthours




independent power producer
investor-owned utility
cooperative
municipal/govt-owned
commercial/industrial

Source: U.S. Energy Information Administration, 2019 Form EIA-860, *Annual Electric Generator Report*

# Values Tapped by Region, 2019




Source: U.S. Energy Information Administration, 2019 Form EIA-860, *Annual Electric Generator Report*

Note: This figure is based on information provided by Form EIA-860 survey respondents regarding their market region and the applications that battery storage systems provided in 2019. Survey respondents could select more than one application for each battery system.

# While Projects Are Trending Larger, Local Project Values Are Significant, Too

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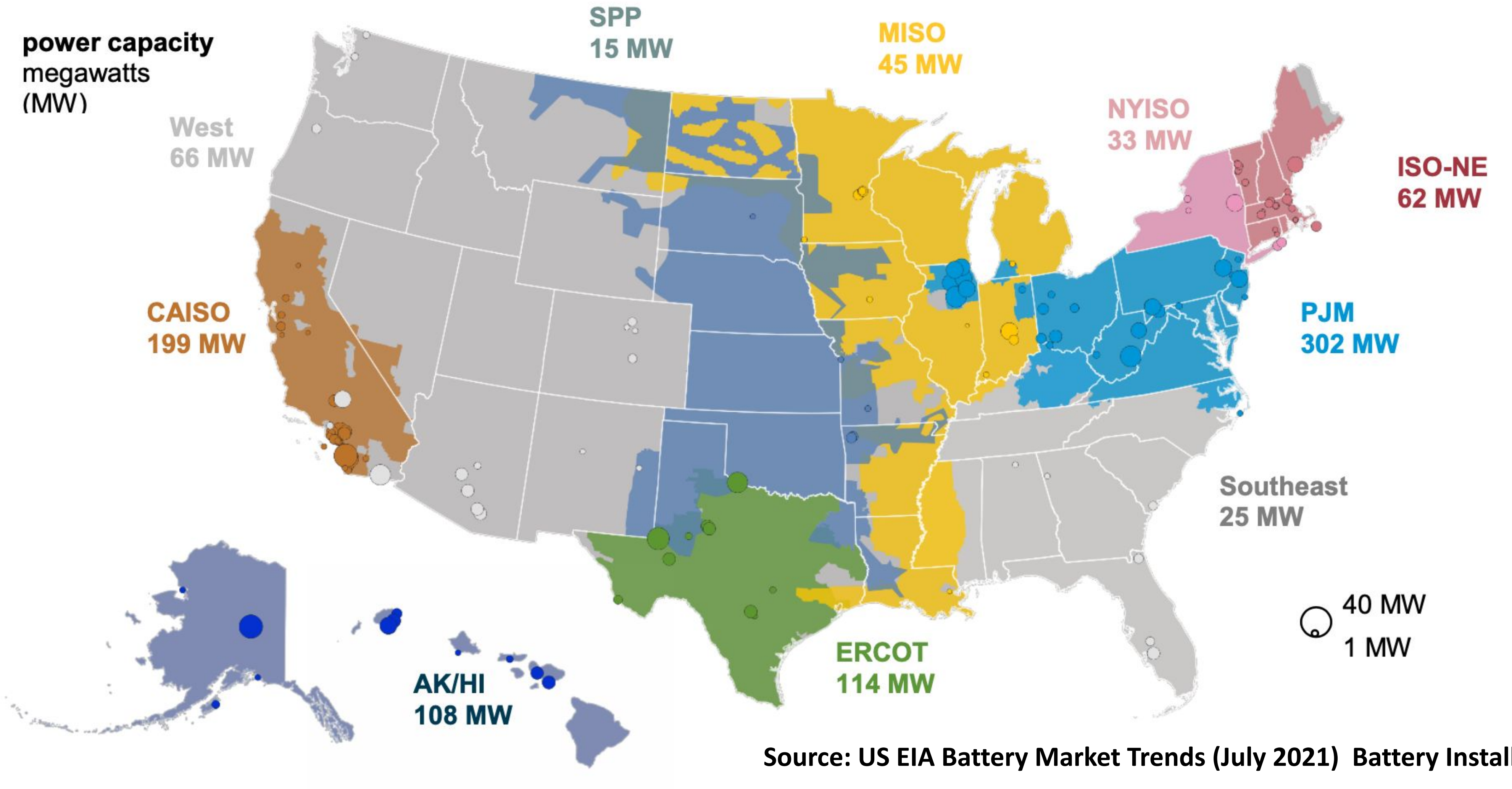


**Source: US EIA Battery Market Trends (July 2021) Battery Installations in 2019**

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# Co-op Trending Use Cases

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 |
| System Location | | Distribution | Distribution | Distribution | Distribution | BTM | Distribution |
| Region | | ISO-NE | NYPA | ERCOT | G&T | CAISO | NPPD |
| Co-op's System Peak (Demand) | | 13% | 9% | 4% | 100% | 67% | 79% |
| Supplier's Monthly Peak Transmission) | | 48% | 55% | | | 13% | 21% |
| Supplier's Annual Peak (Capacity) | | 16% | 26% | 61% | | | |
| Local Peak (Feeder/Substation Capacity) | | | | 1% | | | |
| Time-Shift Renewables | | | 9% | | | 12% | |
| Daily Cycles in Cost of Energy (Arbitrage) | | 14% | | 12% | | | |
| Market for Ancillary Services | | | | | | | |
| Local Need for Ancillary Services | | | | | | | |
| Increased Solar Output | | 10% | 1% | | | 8% | |
| Congestion Relief | | | | 22% | | | |

Source: Jeff Cook Coyle for SPECs, 2020

# What We See in Trending Use Cases

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- **Reduction in local system demand charges and in G&T coincident demand charges** (reflecting regional transmission costs) remains the focus of many utility use cases.
- **In some regions, other market-based value streams may be monetized,** but conditions in some markets (e.g., ERCOT and PJM) have changed significantly, impacting storage projects for better and worse. Flexibility is key.
- **Note rising interest in value streams that are locally realized**, e.g., time-shifting to balance rising distributed energy resources (DERs) locally. Battery storage can prevent solar over-production, while facilitating local high-renewables goals. It also may sometimes defer the need for a distribution upgrade (non-wires alternative).
- **The SPECs Early-Stage Decision (ESD) model primarily addresses regional/market value streams, but also provides a way to assess strategic values,** such as achieving high-renewables goals, local reliability, distribution upgrade deferral, and resiliency.

# Storage in Different Locations and at Different Scales Can Work Together

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From EPRI's Energy Storage Integration Council: "Energy storage services flow from the bottom up… Reliability takes priority (e.g., T&D deferral before market services)… Long-term planning takes precedence over shorter-term needs…" Customer storage can support distribution utility goals, which in turn can support regional system goals.

**Transmission-connected storage may provide:**

- Generation capacity (resource adequacy)
- Black start
- Virtual transmission capacity
- Energy time-shifting
- Ancillary services

**Distribution-connected storage may provide:**

- Virtual distribution capacity (demand reduction)
- Enhanced power quality
- Resiliency / back-up power / microgrid
- Upstream transmission impacts (costs or benefits, e.g., coincident peak demand reduction)

A baseline understanding of value-stacking.

**Customer-connected storage (not the focus of this brief) may provide:**

- Customer bill savings: Retail time-of-use tariff energy shifting, Demand charge management
- Back-up power
- Upstream T&D impacts (costs or benefits)

Source: https://storagewiki.epri.com

# Acquisition Acumen

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| Buyer Owned & Operated | Hybrid (PPA/ESA) |
|---|---|
| Buyer-side analysis required | Buyer-side analysis required |
| May use low-cost loans, grants, ITC | Low entry cost; ITC not directly available; may partner with a for-profit subsidiary |
| Use case defines technical specs | Use case defines desired results |
| Buyer is typically responsible for EPC | Buyer monitors development |
| Buyer responsible for commissioning | Pay for performance per agreement ($/kWh) |
| Buyer responsible for operations or may contract out; operational changes allowed within limits of all warranties | Buyer & provider responsibilities defined per agreement and warranties; limited changes as defined or negotiated |
| **Maximum flexibility** | **Minimum risk** |

# Questions and Answers

- **What does storage cost?** It depends. It is not hard to find data on average battery and battery energy storage system (BESS) cost, but each project differs. Storage duration, which is an operational parameter that depends on both rated power (MW) and energy capacity (MWh) of the BESS, is one key cost driver. But every aspect of anticipated operations contributes to a given project's cost.
- **Is a large-scale BESS cheaper on a per-unit basis than a distribution-scale BESS?** Smaller battery systems *may* have lower costs based on limited expectations for operation and on factory pre-assembly for some parts of the system. However, very large systems tend exhibit significant economies of scale. (Illustrated on the next slide.)
- **How do cost differences map onto hybrid solar PPAs with energy service agreements (ESAs)?** and review data from Berkeley Labs on storage cost adders. Utilities generally can identify a starting place for initial economic assessment (e.g., using the SPECs ESD model), pending further refinement. (Illustrated on a subsequent slide.)
- **The industry is driven by competition, especially in some regions,** so RFP or RFO bids may be tied to bidders' marketing objectives, as well as to actual costs.

# Counting Benefits and Costs: How Use Cases Affect Project Costs

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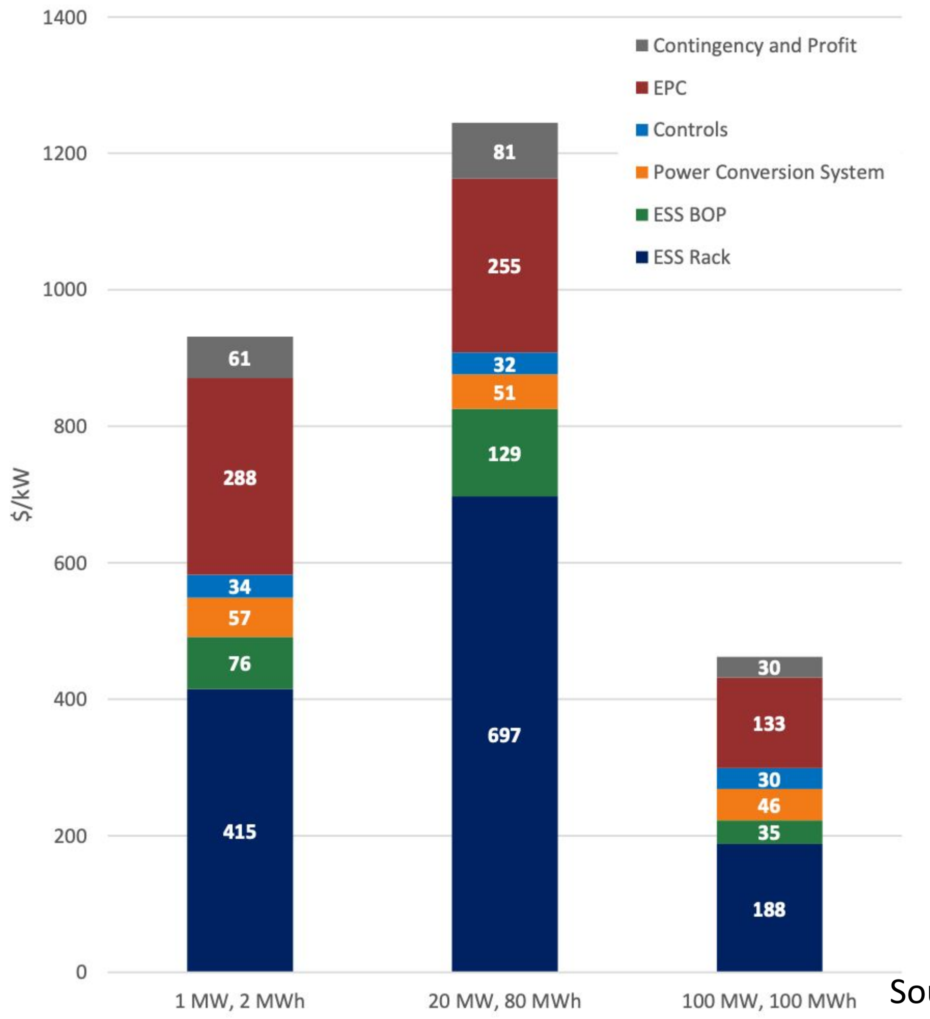
### Li-Ion BESS Unit Cost Breakdown ($/kW) for Different Use Cases and Project Scales

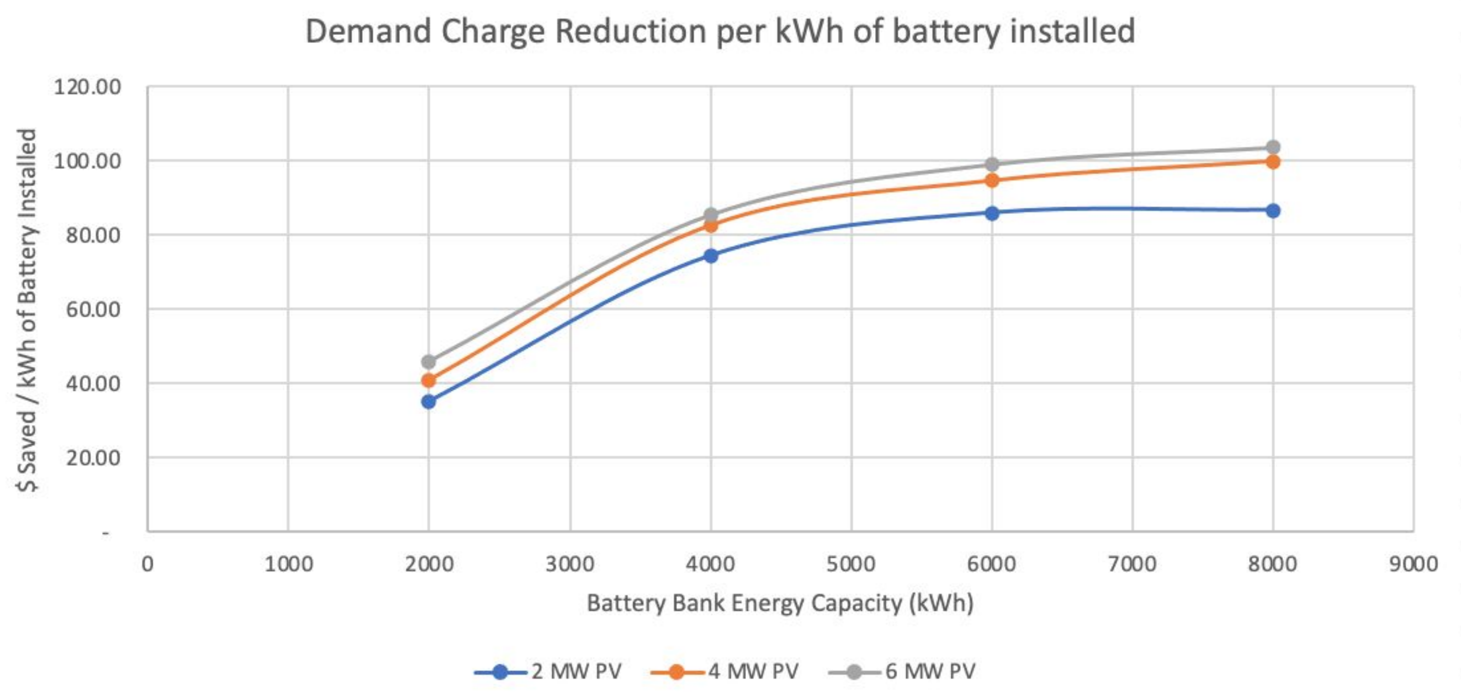
Scale always has a cost advantage, yet other cost drivers are project-specific. Examples:

- Cell requirements and costs (ESS Rack) differ based on chemistries and on power vs. energy needs. In turn, different projects have different balance-of-plant (BOP) requirements, including relatively fixed costs, such as permitting and code-related costs, e.g., fire protection.
- Engineering, procurement and construction (EPC) costs vary based on factors, such as the requirements for field assembly vs. factory prep and the impact of project fixed costs.
- Control costs (PCS) vary based on integration needs, use of advanced AI system, and other factors.




Source: Minear, E., (2020) EPRI

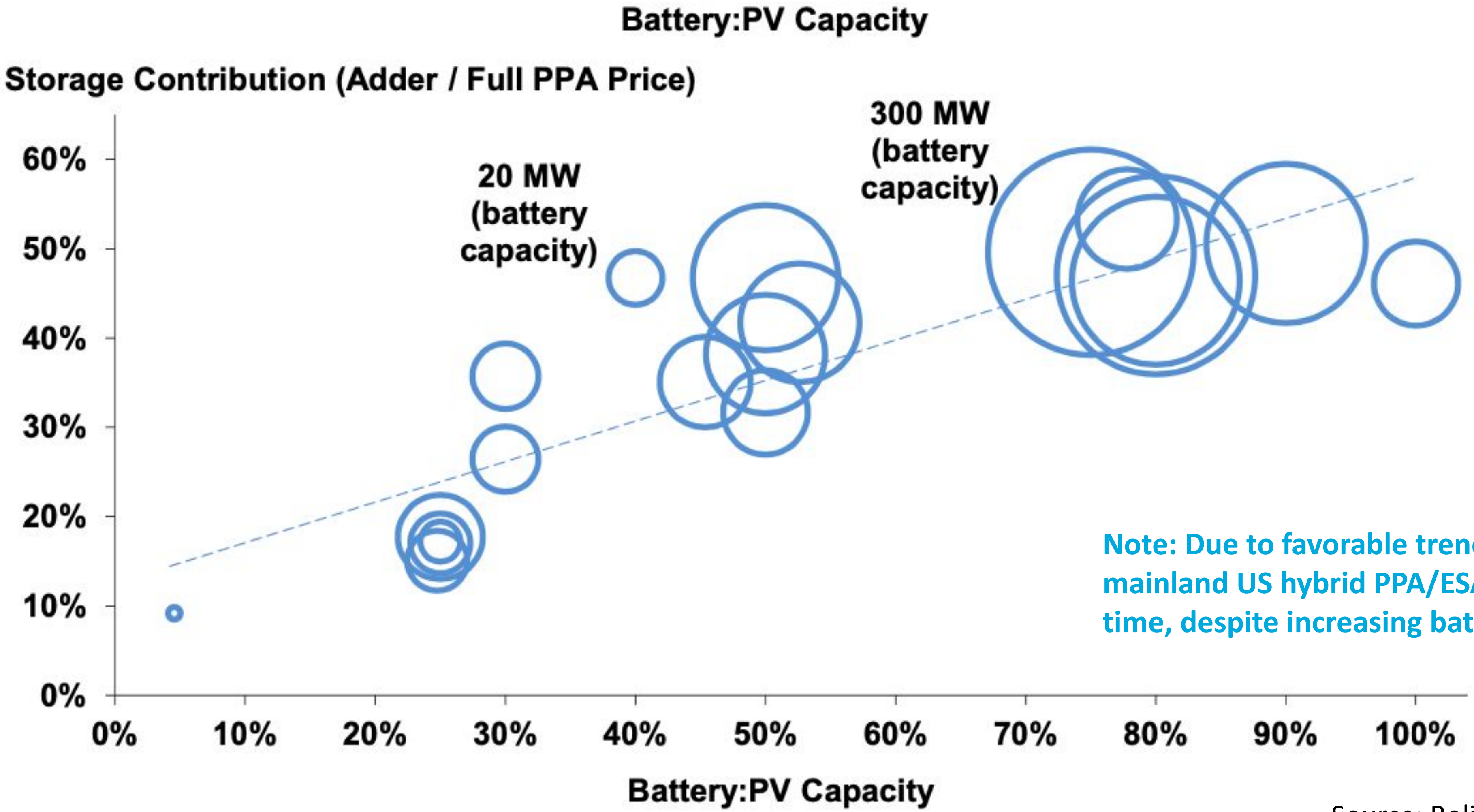
# Sizing the Battery for Specific Project Needs




*Above: SAM modeling results using the parametric tool to assess annual demand peak shaving for different scales PV systems and storage battery power systems modeled at 2, 4, 6, and 8 MWh durations. PV system impact on demand reduction is subtracted out. The financial benefit from peak shaving was estimated, assuming a relatively low $5/kW demand charge and 10 year battery life.*

- Here, local demand savings increase most between 2 MWh and 4 MWh; plateau by 8 MWh
- **In this case, the most likely cost-effective combination would be 2 MW PV, with 2 MW battery capacity, and 4 hours of storage duration—i.e., an 8 MWh BESS.**
- Increasing battery *power* (not shown) between 2 MW and 6 MW made no difference in peak shaving capability
- Caution: This assessment is based on only one value stream (demand reduction). Using the battery to capture other value streams could affect battery sizing requirements.

# What's the Storage-Adder?




**Note: Due to favorable trends in PV and battery pricing, mainland US hybrid PPA/ESA prices have declined over time, despite increasing battery to PV capacity ratios.**

Source: Bolinger, et al (2021) Berkeley Lab

# Recommended Reading

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## SPECs Early-Stage Decision (ESD) Model:

- Screens storage value streams and use cases for a FTM, local utility project
- Educates non-expert decision-makers about use case options and economics
- Offers better ways to reflect strategic values (distribution deferral, resliency)
- Provides output that could be directly included in a solar-plus RFP
- Explains battery degradation and other technical considerations in an appendix.

# Recommended Reading!

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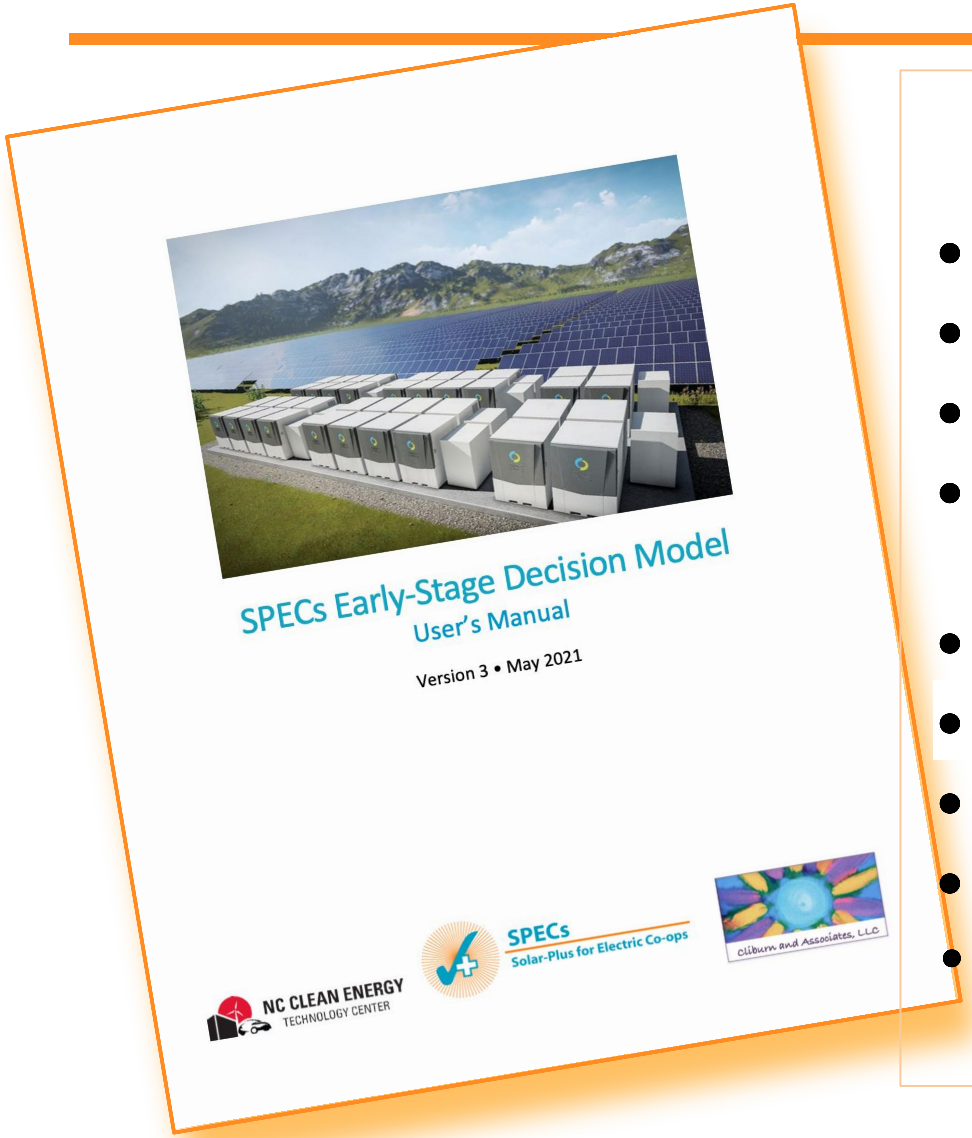
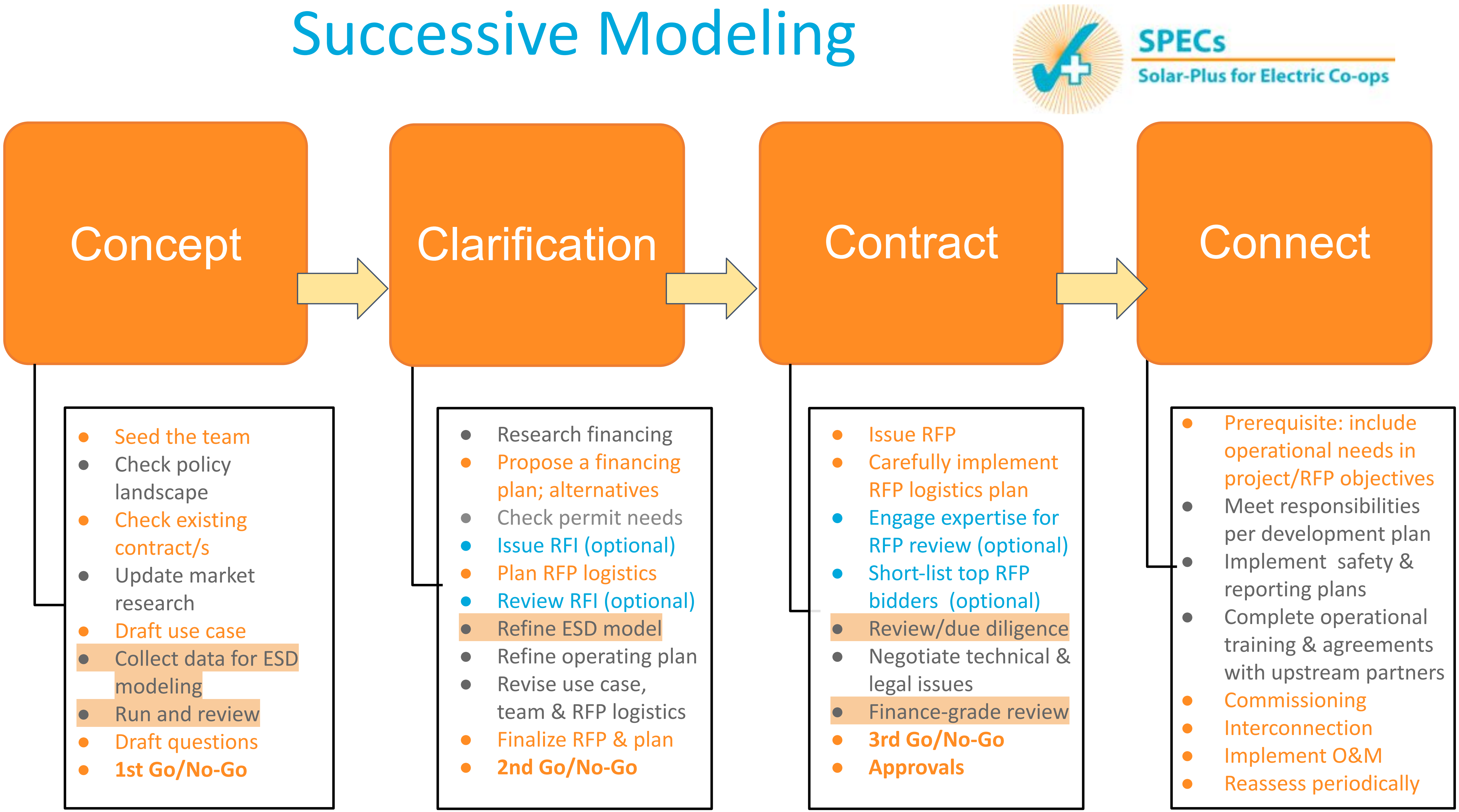



## Practical Guidance in the ESD User's Manual

- Intro to Battery Operations & Charging Parameters
- Intro to Value Streams & Use Cases
- How to Dovetail the ESD Model with NREL's SAM
- Preparing Utility Battery and Solar-Plus Assumptions & Data
- ESD Results and Analysis
- Optional Gap Analysis, Reflecting Strategic Values
- Optional Sensitivity Analysis to Speed Fine-tuning
- ESD Model Logic for Optional Customization
- Detailed references on battery degradation considerations.

# Successive Modeling



# Modeling Is a Big Part of the Process

- **Early-stage decisions** benefit from a streamlined planning and screening model, e.g. SPECs ESD model, to tell if the project concept is worth pursuing and to reveal value streams and project flexibility that can strengthen the utility's case.
- **Refine the ESD model throughout the early procurement process.** As the utility understands battery operational capabilities and market opportunities better, it can refine its use case and use the model to help write an RFP or RFO.
- **Expect to learn from RFI and RFP/RFO responses.** Providers have their own models, which are more advanced. Ask questions to learn where your modeling may have been flawed by misundertandings, and where the provider's modeling may reflect their misunderstandings of your needs and expectations. Providers typically do not share their models, but they welcome questions from informed potential buyers.
- **Upgrade your modeling as the process continues.** Tap expertise from upstream partners and consultants that have up-to-date utility storage models and skills. As you approach a final deal, advanced financing grade modeling is likely to be required.

# A Range of Storage Valuation Models

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| Valuation Tool | Developer | Access | Comments |
|---|---|---|---|
| StorageVET | EPRI | Public/Free | Relatively complex, python-based. Aimed primarily for asset purchase. Analyzes storage for pre-dispatch and market optimization values |
| DER-VET | EPRI | Public/Free | Relatively complex, python-based. Analyzes portfolios of DER strategies; residential to C&I |
| QuESt | Sandia Labs | Public/Free | Python-based, focused on benefits (not costs) of storage, market value and BTM value |
| Energytoolbase | Payson Systems (parent co.) | Commercial | A range of products for economic modeling, storage operation/control, and asset monitoring |
| SAM and RE-Opt Lite | NREL | Public/Free | Focused originally on solar, now all renewables and storage. SAM is strong on storage for demand reduction; RE-opt Lite for buildings, campuses, customer microgrids. |
| MASCORE | PNNL | Public/Free | Models DERs (inc. PV, ESS, and generators) considering underlying economic and technical aspects and resiliency goals. |
| SPECs Early-Stage Decision Model | Cliburn/NCCETC | Public/Free | Excel-based. Screens and fine-tunes distribution utility storage use-case options; works w SAM. Stresses PPA/ESA or ESA-only procurements. |

Based on Nguyen, T.A. and Byrne, R., (2021) Sandia National Laboratories. https://doi.org/10.1007/s40518-021-00186-4

# Introduction to the ESD Model

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Scenario Definition → Data Collection → Data Entry → Results & Comparison

Data Entry → Value Stack Selection → Primary Value Stream → Secondary Value Stream → Tertiary Value Stream

| *Value Stack Priority* | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| *1st* | Local Demand | Local Demand | Local Demand | Local Demand | CP Demand | CP Demand | CP Demand | CP Demand |
| *2nd* | Energy Arbitrage | Ancillary Services | CP Demand | CP Demand | Local Demand | Local Demand | Energy Arbitrage | Ancillary Services |
| *3rd* | Ancillary Services | Energy Arbitrage | Energy Arbitrage | Ancillary Services | Energy Arbitrage | Ancillary Services | Ancillary Services | Energy Arbitrage |

Optional Gap Analysis, adding Strategic Values: Deferral, Resilience

See more at https://www.communitysolarvalueproject.com/decision-model

# Sneak Peek: ESD Inputs

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## GENERAL INPUTS

| Yellow Boxes: Inputs that must match SAM | Green Boxes: User Inputs | Red Boxes: Calculated |
|---|---|---|

| PV system | | |
|---|---|---|
| PV Size (DC) | 1,999 | kW DC |
| DC/AC Ratio | 0.9 | |
| PV degradation rate | 0.5% | /yr |
| PV first year energy | 3,108,372 | kWh |
| Total AC Capacity (Battery + PV) | 2,340 | kW AC |

| Battery system | Yes | |
|---|---|---|
| Battery power (AC) | 2,107 | kW AC |
| Min State of Charge | 0.15 | |
| Max State of Charge | 0.95 | |
| Battery capacity (AC) | 8,000 | kWh AC |
| Round Trip Efficiency | 0.92 | |
| Effective Battery capacity (AC) | 6,400 | kWh AC |

| Energy System Contract Prices | | |
|---|---|---|
| PV PPA price | 0.040 | $/kWh |
| Battery ESA price | 0.045 | $/kWh |
| Contract price escalator | 0 | /yr |
| PPA + ESA Price | 0.085 | $/kWh |

| Battery Degradation and Lifetime | | |
|---|---|---|
| Calendar degradation rate | 1.0% | % / yr |
| End of Life (% of initial cap) | 80% | |
| Turnovers to reach 90% of capacity | 1,300 | |
| Cycle degradation rate | 1.0% | % / yr |
| Battery Throughput Per Year | 1,041,295 | kWh/yr |
| Battery Turnovers per Year | 130 | /yr |
| Battery Bank Lifetime | 10.0 | years |

| Wholesale Energy/Demand Costs | | |
|---|---|---|
| Wholesale energy cost 1 | 0.040 | $/kWh |
| Wholesale energy cost 2 (Off Pk) | 0.028 | $/kWh |
| Electricity cost escalation rate | 2.0% | /yr |
| Utility local demand charge | 10.25 | $/kW |
| Utility demand escalation rate | 1.0% | /yr |
| Utility coincident peak charge | 3.00 | $/kW |

| Frequency regulation | No | |
|---|---|---|
| Capacity Payment | $ 0.011 | $/kW-hr |
| Nominal Price Decline | 5% | % per yr |
| Hours per day Available | 24 | Hrs |
| **Operation Day Selection** | Weekends | |

| Coincident Peak Inputs | Yes |
|---|---|
| **Date of Peak** | **Hr of Peak** |
| 1/2/20 | 9:00 |
| 2/8/20 | 6:00 |
| 3/13/20 | 18:00 |
| 4/1/20 | 18:00 |
| 5/12/20 | 18:00 |
| 6/12/20 | 18:00 |
| 7/12/20 | 18:00 |
| 8/12/20 | 18:00 |
| 9/12/20 | 18:00 |
| 10/12/20 | 6:00 |
| 11/12/20 | 6:00 |
| 12/12/20 | 6:00 |

| Energy Arbitrage TOU | Yes |
|---|---|
| TOU on-peak definition | Late afternoon peak (all year) |
| TOU Day Selection | Weekdays |

| General Financial parameters | | |
|---|---|---|
| Inflation rate | 0.025 | /yr |
| Utility's nominal discount rate | 0.070 | /yr |
| Utility's nominal cost of capital | 0.060 | /yr |
| REC price | 0.002 | $/kWh |

**ADDITIONAL VALUE STREAMS**

| Infrastructure Deferral | Yes | |
|---|---|---|
| Est. Capital Cost (today) | $ 1,000,000 | |
| Years Deferred | 5 | yrs |
| NPV of Deferral | $ 154,546 | |

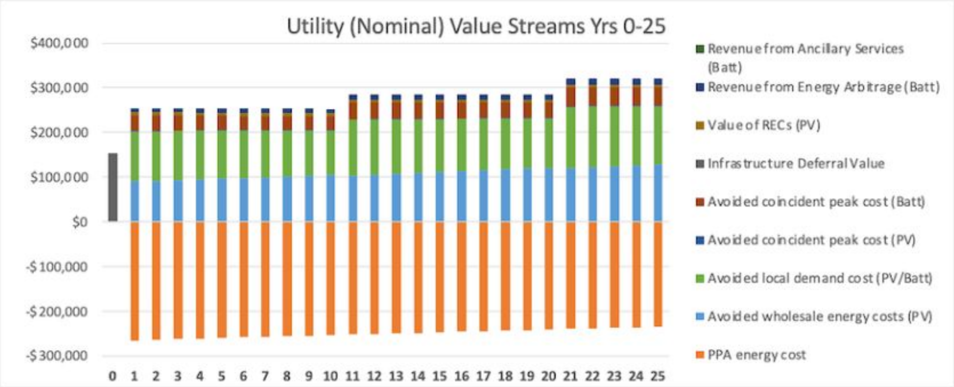
| Microgrid system | No | |
|---|---|---|
| Controller Unit Cost | $ 300,000 | $/MW |
| Total capital cost | $ 632,052 | |

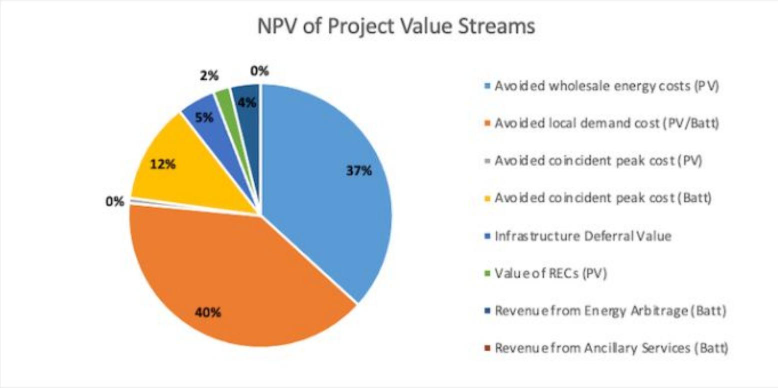
| Resiliency Capability | No | |
|---|---|---|
| Outage duration | 6 | hrs |
| Peak Lost Load | 1500 | kW |
| Ave Lost Load | 750 | kW |
| Total kWh of Outage | 4500 | kWh |
| % of Pk Lost Load Battery Can Meet | Need Microgrid | |
| % of Outage Battery Can Meet | Need Microgrid | |

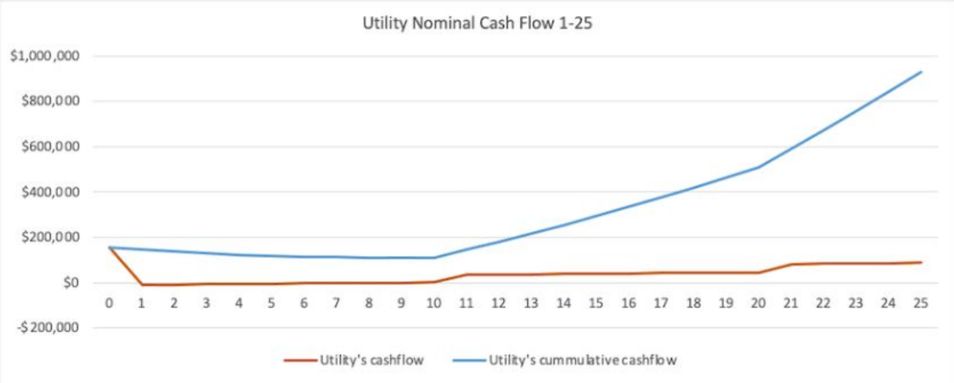
# Sneak Peek: ESD Results

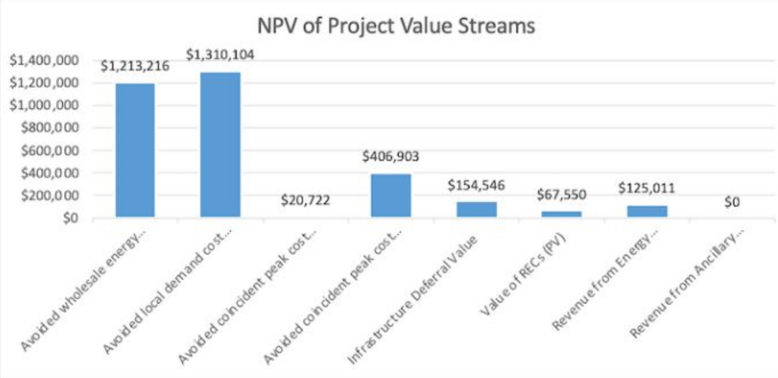
**RESULTS**

| Utility benefits and costs | - |
|---|---|
| ROI | 12% |
| NPV | $347,860 |
| B/C | 1.12 |
| Benefits | $3,298,053 |
| Costs | -$2,950,193 |

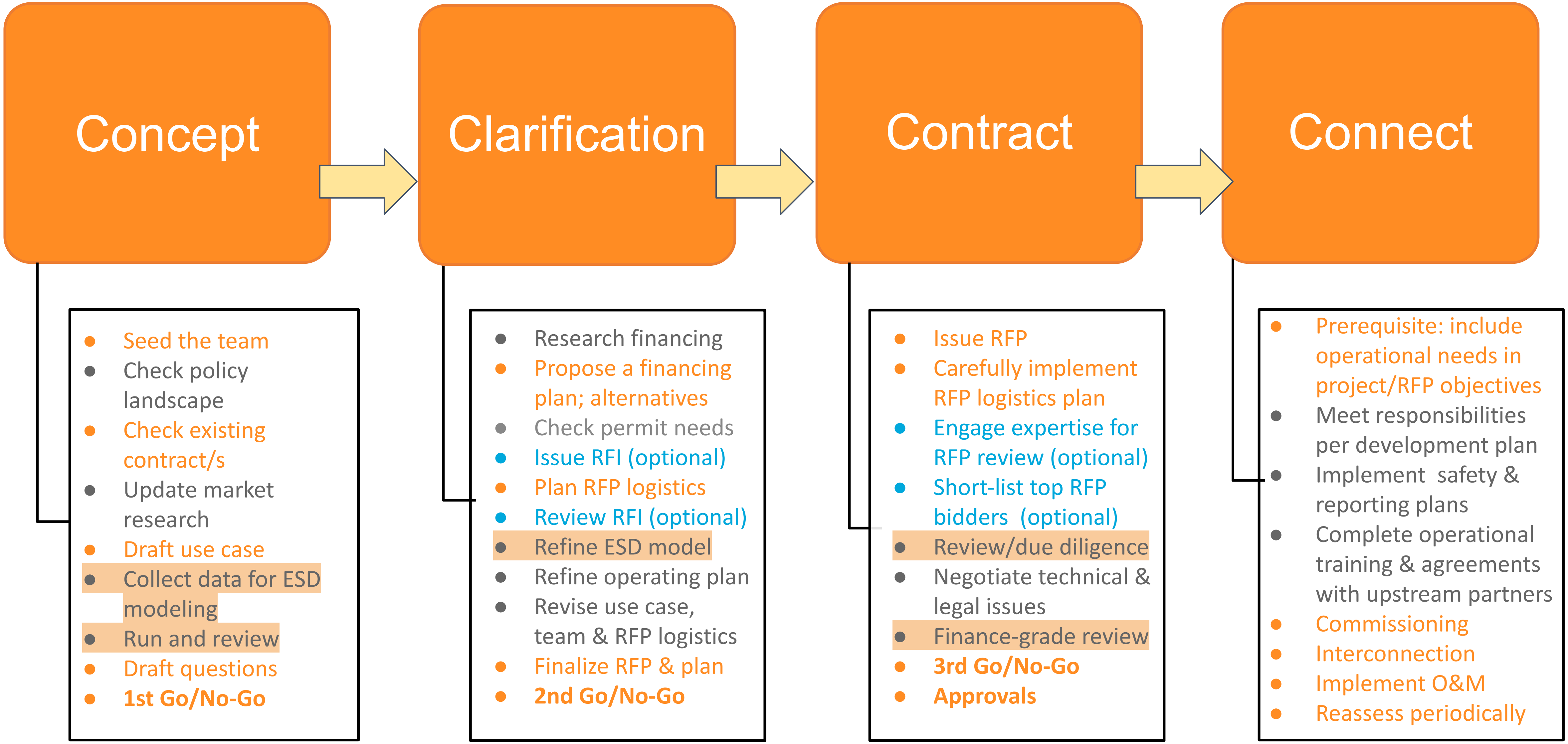


# Successive Refinement



# Getting to the Ask

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## Clarification

- Research financing
- Propose a financing plan; alternatives
- Check permit needs
- Issue RFI (optional)
- Plan RFP logistics
- Review RFI (optional)

- Refine ESD model
- Refine operating plan
- Revise use case, team & RFP logistics
- Finalize RFP & plan
- **2nd Go/No-Go**

## Contract

- Issue RFP
- Carefully implement RFP logistics plan
- Engage expertise for RFP review (optional)
- Short-list top RFP bidders (optional)

- Review/due diligence
- Negotiate technical & legal issues
- Finance-grade review
- **3rd Go/No-Go**
- **Approvals**

# Outsourcing: What, Why & When

- G&T or upstream suppliers should be informed; may become partners based on policy and mutual understanding
- Retained consultant/s & legal support (limited special expertise)
- Expert, buy-side consultant options (selective or turnkey)
- Legal and/or engineering specialists (specialized expertise is a best practice for contract negotiations)

The need for support increases with the complexity of the project and the imminence of the deal, but outside support is no substitute for a strong project vision and well-informed local team.

# Big Decisions For Your Process

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- ★ **Schedule?**
- ★ **Storage, solar-plus, or microgrid?**
- ★ **Asset acquisition or third-party model (RFO)?**
- ★ **Broad financing decisions**
  - Developer drives financing
  - Co-op drives financing (co-op bank/s?)
  - Co-op subsidiary or member/s as partners?
  - Grants, incentives… if you are buying
- ★ **Optional utility contributions (pros and cons)**
  - Land
  - Site surveys and prep ("shovel-ready")
  - Permitting support
  - Interconnection support

# Sample Schedule

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| Table X: Procurement Schedule | |
|---|---|
| Event | Anticipated Date |
| Release of RFP | Date / Year |
| Bidders express intent to bid | ≥ 2.5 weeks |
| Confidentiality agreement | ≥ 3 weeks |
| Optional virtual site visit/conference call | ≥ 3.5 weeks |
| Deadline bidder questions via e-mail | ≥ 5 weeks |
| Responses to bidder questions | ≥ 5.5 weeks |
| Proposal Submission Deadline | Date/time 8 wks |

**Speed tip:**
**Check with your peers. Find out what really happened, & learn what works.**

| | |
|---|---|
| Proposal Submission Deadline | ~ 8 wks |
| Review bidder eligibility (internal) | 9 weeks |
| Evaluation (internal w/ optional support) | ≤11 weeks |
| Announce short list & final deadline | ≤11 weeks |
| Possible interviews/presentations | 12 weeks |
| Supplemental Submission Deadline for Short-listed Bidders | ~14 weeks |
| Evaluation (internal w/ recommended support) | ≤ 16 weeks |
| Inform those not selected; also top pick & (optional) runner/s up | ≤ 16 weeks |
| Due diligence and negotiations completed | ~24 weeks |
| Targeted Commercial Operation Date | ? |

# Sample Contents for an RFO (Notes on Following Slide)

| | | |
|---|---|---|
| **Professional Background and Company Financials** | Company name<br>Company location(s)<br>Company type<br>Role in energy storage<br>Primary company contact | DUNS number<br>Bankruptcy history<br>Credit rating<br>Revenue, equity and debt<br>Other legal exposure |
| **Technology Preferences** | Classification and type<br>Maturity<br>Est. project timelines<br>Major system components | Environmental/siting risks<br>Decommissioning plan<br>Applicable codes and standards<br>Appropriate use cases |
| **Energy Storage Project Development Experience** | Capacity and energy<br>Location<br>Physical characteristics<br>Warranties/guarantees | Point of interconnection<br>Contract structure<br>Use cases response to tailored needs<br>Status |
| **Performance Characteristics and Guarantees** | Electrical and physical characteristics<br>Signal response and control<br>Sizing range | Warranty and replacement schedule<br>System availability |
| **Cost Estimates (current and future)** | Size assumptions<br>Equipment<br>Power control system<br>Fixed and variable O&M | Replacement triggers and timing<br>Technology milestones required to meet price estimates |

Source: GESA (2017)

# Notes for a Better Document

- See SPECs website for further resources, including the RFI, RFP, RFO Library. Apply judgement, as no single document from another utility will address all of your needs.
- Review your utility's standard procurement template to be sure it will accommodate the type of procurement and the kinds of companies that you wish to hear from. For some projects, companies with regional or local roots may provide add-on benefits.
- For a solar-plus-storage RFO toward a PPA/ESA agreement, focus on project objectives, siting needs, interconnection requirements and standards. Minimize detailed specifications, so respondents can apply their best judgement and supply-chain connections to meeting your needs.
- Give due consideration to each function in a hybrid solar plus storage project. Often, the respondent may be working with partners to cover the solar or storage side. Ask for statements of commitment from named subcontractors or branded components, to be sure they are available and not exemplary.

# More Lessons Learned

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- Within reason, it is fair to ask for bids on a primary and optional use case (e.g., a similar project, designed with microgrid capabilities or utilizing an advanced operating system).
- When bid requirements are onerous, many companies simply will not respond. Successful utilities sometimes reserve more detailed requests for their short-listed bidders.
- Provide a sample PPA/ESA and term sheet if available, but expect further negotiation.
- An ESA will define parameters for acceptable use (e.g., battery maintenance requirements, number of discharges per year). Many utilities find this constraining, but an asset purchase comes with a similar set of requirements, related to the warranty.
- Ask short-listed bidders for details about contract flexibility in what-if situations. Ask for a description of the bidder's economic analytic approach. Review consequential assumptions.
- Avoid a rushed process; delays will happen anyway. Check obvious questions, e.g., is the RFP language up to date regarding applicable contracts, policies, codes, standards? Are submission guidelines complete and fair? (Consider page limits and encourage tailored content.)

# To Score or Not to Score?

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| | Technical | Financial / Contractual | Operational |
|---|---|---|---|
| **Primary** | Capacity (MWh for fixed duration)<br>Depth of discharge<br>Round trip efficiency ( % )<br>Maximum charging power (MW)<br>Technology type/class | PPA price<br>Energy price<br>Performance guarantees | Permits and approvals<br>Maintenance requirements |
| **Secondary** | Discharge ramp rate (MW/min)<br>Charging ramp rate (MW/min) | Warranty<br>Maintenance costs<br>Contractor success record | Time availability<br>Forced outage rate<br>Contractor's previous experience |
| **Tertiary** | System degradation ( % /yr)<br>Self discharge rate | Method of termination<br>Invoicing and payment method<br>ROFO on defaulted debt | Size profile<br>Actionability of response |

Source: GESA (2017)

Prepare a detailed evaluation plan before your final revision of the RFP. Yet, some utilities avoid detailed scoring rubrics, because it is difficult to rate one category of bid attributes over another. The selection of a development partner must be rationally supportable, but it may be complex.

# Example from a Co-op RFP

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The principal criteria to be used in evaluating Proposals include, but are not limited to:

1. PPA/ESSA rate for the project
2. Construction schedule and COD
3. Financial viability of the respondent, including its parent or any other guarantor of services under the respondent's proposal
4. Contractual terms and conditions
5. Key team members for the respondent, relevant project management experience and capability, and related project experience
6. Possible conflicts of interest and any legal claims
7. Operational viability of the respondent and equipment warranties
8. Respondent's history of relevant projects / list of references

Each of these factors is critical to the successful integration of a solar and/or a storage resource into SSVEC's overall power supply arrangements. SSVEC reserves the right to consider any other factors deemed to be relevant to the successful integration and operation of the storage.

Source: GDS Associates, Inc., on behalf of Sulphur Springs Valley Electric Co-op (July 2020). Whether the co-op plans to use a detailed scoring criteria or a more flexible approach, the RFP should state its intention. State that the lowest priced proposal may not be selected, and include reservations. In some cases, a utility may wish to reject all bids or commence to negotiate separately with providers of solar and storage aspects of a hybrid project.

# Getting to "Go"

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**Contract**

- Issue RFP
- Carefully implement RFP logistics plan
- Engage expertise for RFP review (optional)
- Short-list top RFP bidders (optional)

- Review/due diligence
- Negotiate technical & legal issues
- Finance-grade review
- **3rd Go/No-Go**
- **Approvals**

The developer or finance agency (bank) typically requires a finance-grade review of the proposed project. Further, contracting details will differ, based on whether the procurement is for asset/ownership or a PPA/ESA contractual agreement. Electric co-ops and public power utilities may or may not have to submit to regulatory approvals, depending upon the state and the size and character of the project.

# Envision the Full Process Before You Start

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## Concept

- Seed the team
- Check policy landscape
- Check existing contract/s
- Update market research
- Draft use case
- Collect data for ESD modeling
- Run and review
- Draft questions
- **1st Go/No-Go**

## Clarification

- Research financing
- Propose a financing plan; alternatives
- Check permit needs
- Issue RFI (optional)
- Plan RFP logistics
- Review RFI (optional)
- Refine ESD model
- Refine operating plan
- Revise use case, team & RFP logistics
- Finalize RFP & plan
- **2nd Go/No-Go**

## Contract

- Issue RFP
- Carefully implement RFP logistics plan
- Engage expertise for RFP review (optional)
- Short-list top RFP bidders (optional)
- Review/due diligence
- Negotiate technical & legal issues
- Finance-grade review
- **3rd Go/No-Go**
- **Approvals**

## Connect

- Prerequisite: include operational needs in project/RFP objectives
- Meet responsibilities per development plan
- Implement safety & reporting plans
- Complete operational training & agreements with upstream partners
- Commissioning
- Interconnection
- Implement O&M plan
- Reassess periodically

# Sample Resources for Review

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- **Battery Energy Storage Procurement and Best Practices (June 2021), NRECA.** https://www.cooperative.com/programs-services/bts/Documents/Reports/Battery-Energy-Storage-Procurement-Guide-June-2021.pdf A brief guide, drawing on co-op case study experience and focusing primarily on the asset ownership model.
- **Solar + Storage: From Concept to Implementation (2019), Connexus Energy.** http://ccaps.umn.edu/documents/CPE-Conferences/MIPSYCON-PowerPoints/2019/Done/SolarPlusStorage.pdf A case study of co-op procurement using a storage as a service (ESA) model.
- **Byrne, R. H., et al, The value proposition for energy storage at the Sterling Municipal Light Department (2017), *IEEE Power & Energy Society General Meeting* (pp. 1–5). IEEE.** https://www.sandia.gov/ess-ssl/docs/journals/SterlingMA_2017PES_SAND2017-1093.pdf A case study of a municipal utility procurement using a hybrid solar-plus-storage PPA model. As an early example, some market conditions have since changed. See the SPECs website for a case study of current operations.
- **Energy Storage Integration Council, Energy Storage Request for Proposal Guide (2019), EPRI.** https://www.epri.com/research/products/000000003002017242 This guide has been updated and is part of a suite of publicly available utility procurement support materials, though geared primarily to IOUs and those using an asset ownership approach.

# Fine Print

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**Disclaimers:** A portion of the source material for this training was developed by Cliburn and Associates, LLC and subcontractors including North Carolina State University, under Subcontract No. AGR-2020-10205, as part of the Solar Energy Innovation Network, a collaborative research program administered by the National Renewable Energy Laboratory under Contract No. DE-AC36-08GO28308 funded 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.



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