Setting the Table to Discuss The Value of Solar Plus Companion Measures

August 2015

Community Solar Value Project

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U.S. Department of Energy

1. Context for the Discussion
2. Assumptions and Boundaries
3. Your Desired Outcomes

This Meeting's Goal: To Assess The Combined Value of PV+ DR + Storage In the Context of a Utility CSS Program

1) To engage participant expertise in **reviewing current methodologies** related to valuation of DPV, DR, and Storage, and **to quickly assess their relevance …**

2) To engage participant expertise in **reviewing the CSVP "Triple Play"** valuation methodology (under development) …

3) Together, to **identify issues** related to validation and use of one or more selected valuation methodologies, for designing a utility-driven, high-value CSS program. These include**…usability and acceptance by utility program designers, distribution system planners, and policymakers.**

Create Baseline Prgm. Model & Solar Designs

Catalog Options for Companion Measures

Optimize Solar Triple Play in the Program

Replicate

Community Solar Value Project • Grant Objectives

Major deliverable: A plan for deploying a total of 5 to 20 MW of community solar at SMUD, and a secondary plan for PNM

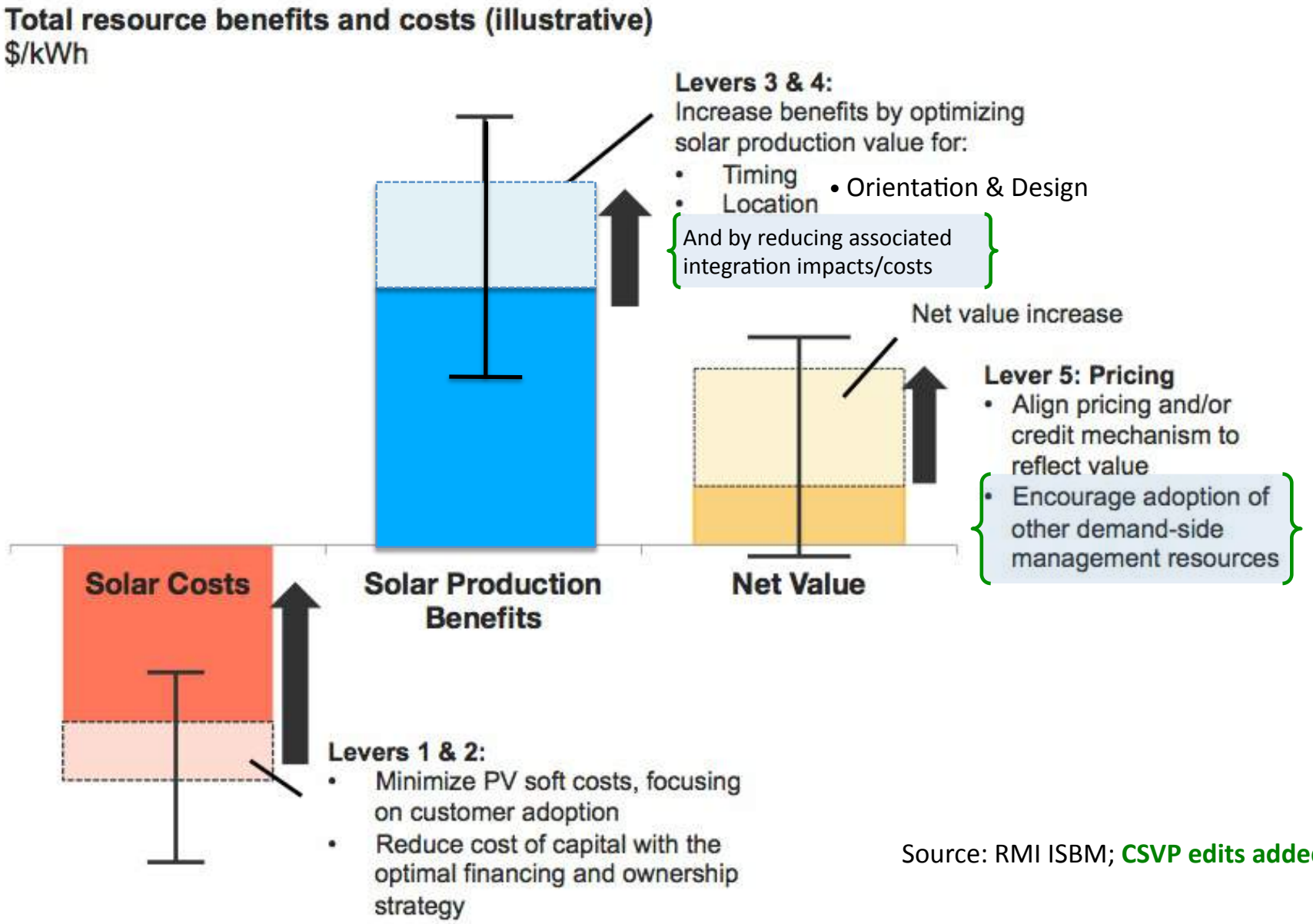
Process requirement: Involve stakeholders; primarily utility, cross-departmental team/s

Major innovations: 1) Strategic siting, design, & procurement 2) Targeted market development and customer engagement, and 3) Solar plus storage and/or DR to increase project net value and customer retention.

What is *Utility-Driven* Community Shared Solar?

- Enormous win-win opportunity to grow the DPV market
- Typically 1 to 5 MW projects; they may be larger, up to 20 MW, if connected to the distribution grid.
- Sited and specified to meet utility-value criteria.
- Ideally, projects to be replicated, creating increasingly economical and geographically diverse CSS fleets.
- Spectrum of financing and ownership options from utility-financed and -owned, to a PPA/buyout, to partial out-sourcing, or a complete turnkey project.
- The CSVP is exploring ground-mount, rooftop, and parking options.

Overall View: Distributed PV Value Levers



Source: RMI ISBM; **CSVP edits added**

Assumptions and Boundaries

1) **Distributed PV of all kinds will continue to grow,** with or without distributed CSS. As a baseline, we assume DPV integration costs that reflect penetrations of 10% on average, and sometimes much higher, in particular locations.
2) We assume DPV projects anywhere from 1 MW to 20 MW. **For discussion, we can assume a 1- to 5-MW infill PV plant.** As feasible, we would like to consider multiples of a such plants, as well.
3) We assume that companion measures are integrated into the program. For the sake of this discussion, **we also need to set the boundaries for DR and storage participation**– What is their relationship to the CSS program, and will all their technology-impacts be counted toward the the value of the "Triple Play" program?
4) **We will focus this discussion on net *value*…** considerations about monetizing these values, utility acceptance, etc. are important, but secondary (for "reality check" only) in our discussion

What is the Value to the Distribution Utility of Different Triple Play Combinations?

Typical Value Metrics:

- Energy
- Environmental
- T&D Loss
- Gen Capacity
- T&D Capacity
- Ancillary Services
- Other*

Particulars To Consider:

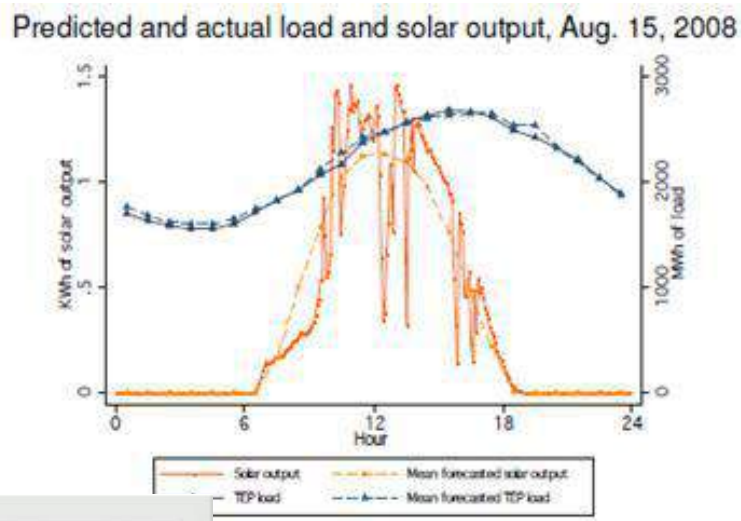
- T&D Capacity – Anytime, direct peak & end of line
- Arbitrage
- Resiliency
- Smoothing
- Interconnection/ramping
- Customer retention

*Other: Values that are **significant in community-solar program design, e.g., customer-retention value, combined-program marketing advantages, economic development value, more strategic use of regional markets reducing utility risks, reduced arrearages, reduced water use/cost (discuss)**

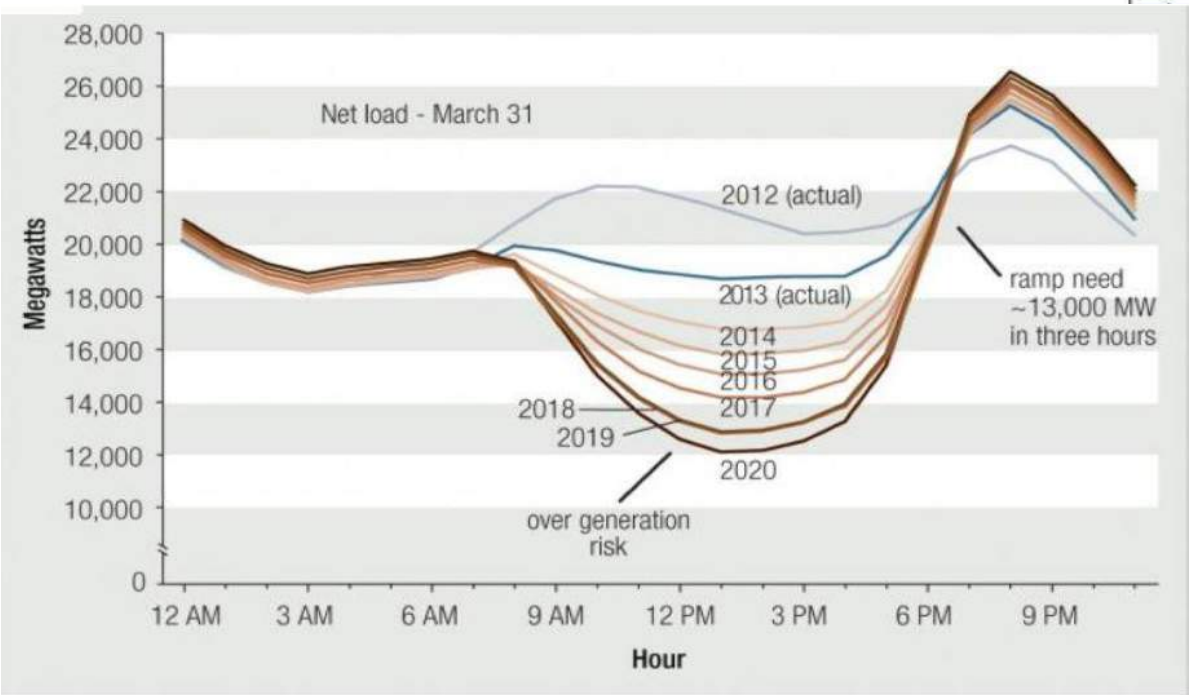
Key Assumption: The Laboratory Looks Like SMUD

1) When specific questions arise, we will reference **a hypothetical California municipal utility, *which resembles SMUD*.**
2) At this utility, customer-driven DPV is growing at ~1 MW/month. **Overall load-management concerns today are dominated by summer peaking** and the mis-match between the peak and DPV production. A range of renewables-integration challenges loom, including over-production in low-load periods. A CSS program with companion measures would provide more leverage to increase net DPV value.
3) **This is a self-balancing utility,** so regional (CAISO) balancing strategies are of relatively little value.
4) While value-of-solar methodologies are familiar and helpful, the utility is **not pursuing VOS tariffs in rate design.** The utility needs to economically justify CSS program cost, but to what extent **might it be preferable to characterize rather than to set a value?**
5) PNM New Mexico will be the second laboratory… similar in many ways

Shape of the Challenge In Different Time Domains



Tucson PV Plant Performance
EnergyStorage.org



Source: CAISO 2014

Question: If the utility is most concerned today about peak-shaving, does that affect how we address other time domains for variability?

Specialized approaches to addressing renewables variability, using DPV plus Storage and/or DR, identified to-date, are instructive if not fully relevant to our project.

- **Clean Power Research (Hoff), Using Efficiency and Load Management to Reduce Solar Variability Impacts.** Micro analysis of how integrated strategies can reduce both “duck curve” impacts and net carbon impact of near-zero energy buildings.
- **Regulatory Assistance Project (Lazar) Teaching a Duck to Fly.** Ten strategies, which together improve the load factor with high-penetration solar and wind, from 63% to 83%. Assumes regional integration perspective.
- **Various Regional Power Markets** (e.g., CAISO), also studied extensively by NREL. These show real or modeled values of aggregated solar-plus strategies. There are differences between “what counts” on a regional vs. local-utility basis, but also lessons in these studies and reports.
- **Case Studies** in various local utility territories. Micro-grid projects, projects designed for resilience-value, and Brooklyn-Queens Demand-Management Project, planned to offset $1 billion in grid upgrade costs.

Despite useful lessons from each, typical DER analyses do not address our needs to assess distributed solar plus DR and/or storage, its combined impacts, and opportunities deploy them together, for added synergy.

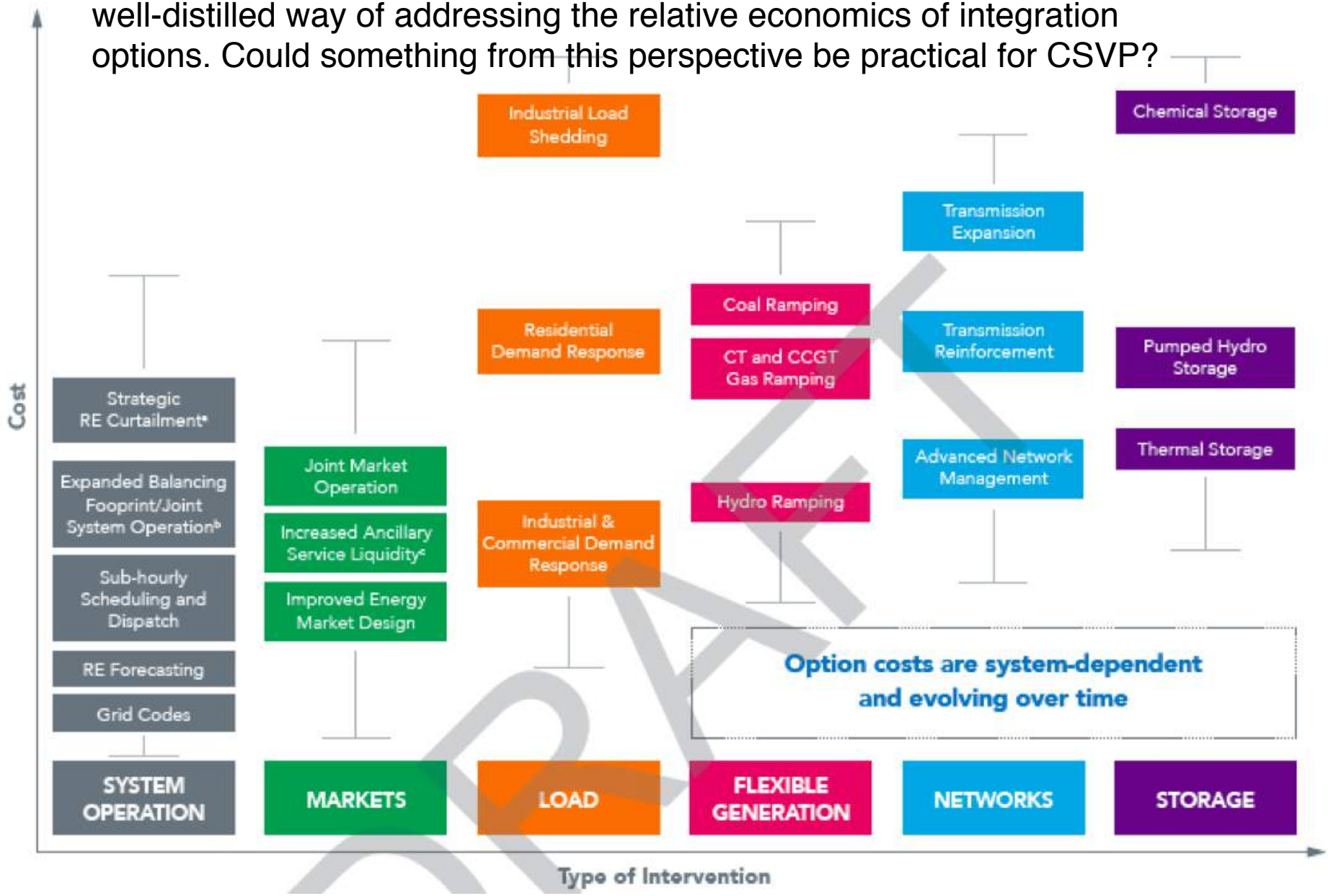
- **Integrated resource planning** (guidance on meeting future energy needs with supply- and demand-side resources, but generally without much granularity)
- **DSM program design** (cost tests)
- **Resource Value Framework** (proposed as a universal DER cost test)
- **Production-cost modeling** (detailed, time-consuming, costly)
- **Resource-bidding into ISO markets** (market as proxy value; regional)
- **Solar Rider proceedings** (difficult to assign costs and benefits, as they may apply to more than one resource or need on the grid)
- **EPRI Integrated Grid Methodology** (focuses on identifying high-value locations and *mitigating* DER impacts on the grid)
- **RMI EDGE model** (not widely available; designed to test PV impacts, and secondarily other DER impacts, on the distribution grid, limited investigation of net value)

Our Starting Point for an Analysis of Solar+DR+Storage Utility/Grid Operational Value

- Extensive groundwork in Value of Solar analyses
- Methods taken from Denholm et. al., Hoff, etc.
- Perspective: Value of Solar generated output to the utility
- 3 to 5 year time frame (preliminary)
- Solar DPV
  - Modeling **strategic solar design**
  - … Plus storage
  - … Plus DR
  - … Plus DR + storage
- Takes SAM Generation Output as an input, ignores all other SAM economics, as SAM provides costs, and this model provides utility/grid operational value

Your Intended Outcomes?

This draft work from NREL (Hummon and Arent, January 2105) suggests a well-distilled way of addressing the relative economics of integration options. Could something from this perspective be practical for CSVP?



Long-term Aspiration: To Bridge the Gap

Accurate, inclusive modeling,
e.g., NREL, a “coin of the realm.”

Reasonably accurate, widely acceptable tool for high-value community-solar program design

About the Project and the Presenter

The Community Solar Value Project is focused on improving community-solar program value, through solar + storage + demand-response and other strategies, at electric utilities in Sacramento and beyond. It is led by Extensible Energy, LLC, and draws on expertise from three energy consulting firms. Contact Project OfficerJohn Powers, john@extensibleenergy.com

Jill K. Cliburn is Program Manager of the CSVP. She brings long experience in the utility industry, including work in solar and wind market development, solar "buy-side" consulting, utility integrated resource planning, and DSM and load management program design. Contact: jkcliburn@cliburnenergy.com.

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