Report on Workshop on the Value of the Solar Triple Play

CSVP Integration Workshop, August 28, 2015

Prepared by John Powers, Prime Contractor, CSVP

1 EXECUTIVE SUMMARY:

The Community Solar Value Project (CSVP), a Solar Market Pathways project under prime contractor Extensible Energy, recently took on a challenge that is looming before the utility industry, as distributed-solar market penetration continues to rise. That is, to explore the potential value of matching distributed PV with demand response (DR) and energy storage options, in order to address solar variability and related integration costs.

The development of a replicable approach to community solar program design, which will include DR and storage "companion options," is a major objective of the CSVP. In addition, the CSVP is focused on ways to improve utility-led community solar project design, procurement, and target marketing.

In late August, the CSVP team called together leading thinkers on the value of solar, the value of demand response and storage, and local and regional markets in order to move their preliminary understanding of the value proposition forward. A summary of workshop objectives included:

- To determine the relevance to the local utility of matching DR and storage to load variability, which is driven by increasing solar/renewable resources
- To outline a methodology to determine the range of values for DR and storage "companion" measures
- To explore how the local utility can realize the value (from DR and possibly storage measures) needed to create a highly competitive, strategically valuable community solar offer
- To ensure that a version of this methodology is sufficiently simple and flexible for use by utility program staff (not R&D staff)

The SunShot program, through the Institute for Sustainable Communities (ISC), helped the CSVP team to arrange for technical assistance (TA) from the National Renewable Energy Laboratory (NREL). After the team submitted its request, the ISC arranged an initial brainstorming session with staff from NREL, resulting in an agreement that Bryan Palmintier, Senior Research Engineer from the Energy Systems Integration Group, would provide technical assistance at the workshop. In addition, the CSVP team arranged a collaboration with Mary Ann Piette and staff at Lawrence Berkeley Laboratory who are also interested in the value of DR for renewables integration. They agreed to host the meeting at LBL in Berkeley, CA. One more leader in the field, Tom Hoff, of Clean Power Research, volunteered his time to advise on site. Other participants included CSVP Team members from Olivine and CSVP utility partners from Sacramento Municipal Utility District and City of Palo Alto Utilities.

In order to use limited time efficiently, the CSVP team prepared a detailed "pre-read" document and a draft presentation on its work-in-progress, informally called the Solar Triple Play value estimator tool. As

the day unfolded, it became clear that assessing the synergistic value of combined measures, in addition to recognizing the role that careful and flexible grid operations play, is no easy challenge. Yet all participants agreed that this value is in fact significant and crucial to understand as utilities move forward.

Palmintier's contributions were keenly appreciated. Recent work from NREL recognizes many new, market-ready approaches to managing the grid that can accommodate greater solar penetration more simply and at lower cost than engineers imagined just a few years ago. For example, managing existing generation, grid storage, and renewables curtailment, in light of better forecasting and advanced inverter capabilities, can cost-effectively accommodate a 20% portfolio of variable renewables, according to NREL. However, demand response, existing storage technologies, and new storage are on a short-list of forward-looking strategies to increase renewables beyond that level. Palmintier warned that some market solutions, such as siting solar regionally at locations with high-LMP values, may work less well in time, as solar market penetrations increase and all kinds of market dynamics come into play. He confirmed the CSVP team's hunch that a focus on the distribution utility will pay off in time. "There are lots of opportunities for to create synergy on the local grid, and some of those just aren't visible from a regional perspective," Palmintier said.

One point that the Team stressed in this discussion was that most utilities today can accommodate community solar at anticipated penetrations without companion measures. But according to project director John Powers, "It is not too soon for utilities to develop these strategies, and community solar, with its emphasis on voluntary participation, is a good place to start." He also stressed significant value-added for utilities that develop attractive service bundles, including solar plus DR or storage.

Some feedback on the Triple Play value estimator is already having an impact, helping refine the tool as the CSVP team completes it, especially to show the value of DR in the mix. Some work on solar-plus-storage has been published, but solar-plus-DR has, to date, barely been addressed in the literature. One bit of advice that the Team is taking into serious consideration is to develop the tool internally first, and then to release a simplified version of it. Workshop participants recognized the lessons of earlier value-of-solar model development, demonstrating, for example, that a shared understanding of what drives the value of a Solar Triple Play may be more important in the end than fixing an exact number to the value of combined measures.

Some of the insights gained at the Workshop were shared in a September webinar, hosted by the CSVP. A recording of that webinar and related resource materials will be available in coming months on the new CSVP website, www.communitysolarvalueproject.com.

2 INTRODUCTION

The Community Solar Value Project (CSVP), a Solar Market Pathways project under prime contractor Extensible Energy, held a workshop to explore the potential value of matching distributed PV with demand response (DR) and energy storage options, in order to address solar variability and related integration costs. The CSVP Team assembled a group of experts from solar, demand response, storage, and utility program design at the Lawrence Berkeley National Laboratory (LBL) in Berkeley, CA. These experts provided feedback on CSVP progress to date, and helped the CSVP team refine its approach to developing guidance and tools for community solar program designers.

3 ATTENDEES

The following individuals attended the workshop.

Attendee	**Organization**
John Powers	Extensible Energy, LLC
Ari Halberstadt	Extensible Energy, LLC
Jill Cliburn	Cliburn and Associates
Erich Huffaker	Olivine, Inc.
Spence Gerber	Olivine, Inc.
Chris Robertson	Chris Robertson & Associates, LLC
Stephen Frantz	SMUD
Bryan Palmintier	NREL
Aimee Bailey	City of Palo Alto
Tom Hoff	Clean Power Research
Mary-Ann Piette	LBNL
Michael Berger	LBNL

4 AGENDA

Below is the agenda for the workshop.

Workshop on the Value of the Solar "Triple Play"
Lawrence Berkeley National Laboratory (Building 90)
August 28, 2015

8:30 am	**Registration, Coffee, Introductions**
9:00	**Objectives, Assumptions, and Boundaries** Jill Cliburn, CSVP Project Manager, Cliburn and Associates
9:30	**CSVP Preliminary Approach to DR Companion Options** Spence Gerber / Erich Huffaker, Olivine, Inc.
10:00	**CSVP Preliminary Approach to Adapting an Existing Solar Value Framework to this Project** John Powers / Ari Halberstadt, Extensible Energy
10:45	**Break**
11:00	**Evolving Thoughts on Value of Solar in a Dynamic Local Utility** Bryan Palmintier, Senior Research Engineer, NREL
12:00 pm	**Lunch** Participants are invited to add items to the discussion board for the afternoon. The agenda will be adjusted just prior to the afternoon session.
1:00	**Discussion** What Are Your Thought on the Morning? Question to Tom, Mary Ann, Others • Chris Robertson, Robertson Associates Utility Program Design Considerations • Jill
2:00	**Aligning and Realigning: Triple Play Model / Alternative Approaches** ▪ Strategic DPV ▪ Demand Response ▪ Storage ▪ Grid Issues ▪ Conclusions and Next Steps
3:00	**Break**
3:15	**Very Small Groups: Worthy Alternatives and Challenges** 1: Detailed Modeling Questions • John 2: Broader Findings and Applications: What's the Story and How to Tell It? • Chris 3: Program Design Questions: Who's In, What Counts, and More • Jill
4:00	**Wrap-Up**
4:15	**Adjourn**

5 NARRATIVE

Ms. Cliburn presented introductory remarks, which were followed by a general discussion. This discussion touched on the value of resiliency, business models for a triple-play system, and on sizing and siting of installations. [1]

While the ability of a community solar project to enhance resiliency was of significant interest and value to the participants, there was no model for how to pay for it. Palo Alto's main interest in community solar is in the possibility for increased resiliency. However, since resiliency probably cannot be included in a ratemaking cases, paying for it is challenging. The perspective used to analyze cost effectiveness of resiliency is also important. Further, scale and integration are considerations for resiliency, yet the ability of a system to counter grid failure is limited. If entire feeders go down, solar won't help, but correct placement could increase resiliency. Forming a grid requires specialized equipment with added cost, so that consideration must be given to whether such a system is cost effective. Mr. Powers explained that CSVP is focused on the value to the utility, not the value to other parties such as the community at large.

Several approaches to developing a community solar offering were discussed. SMUD's current model was characterized as complex and disorganized. SMUD is intending to bundle DR with a customer deal. For SMUD, a big battle is in customer service, the need to compete on price, and to make a competitive project for the future.

The idea that utilities should invest more in new products was raised. For instance, businesses outside of utilities act like startups, investing money in new products. DR measures should be viewed as a long-term investment by the utility, since they might be a money-losing proposition in the first few years.

From a utility's perspective, since DR would not sell on its own, it would need to be an option associated with a community solar system. Mr. Hoff advocated a strategy to use community solar as an entrée to sell DR and other load shaping products to customers. Thus, rather than bundle companion measures with the new solar offering, they would be sold over time to enrolled customers.

The group discussed tightly versus loosely coupling DR and storage with a community solar program. Three approaches were suggested by Mr. Robertson:

1. Co-located on the same feeder with the community solar generator facility.
2. Offered within the business structure and customer offering in developing the program, but not necessarily located on the same feeder.
3. Within the balancing authority.

There was discussion about how, in California, utilities may prefer to operate and control the DR in order to avoid control from the ISO.

The issue of scale and sizing was also addressed. Dr. Palmintier pointed out that larger systems are built in multiples of 500 kW units. Siting smaller projects at the distribution level could increase geographic distribution, operational flexibility, and other benefits. Regarding economies of scale, since large plants

[1] This narrative is based on the presentation slides and on notes from Ms. Cliburn, Mr. Huffaker, and Mr. Robertson.

are just multiples of 500 kW modules, there might be limited economies of scale at large remote sites compared to 500 kW facilities nearby. Ms. Bailey said that Palo Alto is focused on smaller infill projects and that it is difficult to place anything larger than 1 MW in such projects. Given Palo Alto's flat load, they did not feel that there was a problem with feeder capacity.

5.1 Community Solar Value Project: Approach to DR Companion Measures, Spence Gerber and Erich Huffaker, Olivine, Inc.

Mr. Gerber and Mr. Huffaker presentation was on integration of demand response with community solar. The main topics discussed were:

- examples of new demand response models
- the approach being developed for the CSVP for local utilities
- a decision matrix to assist utilities in selecting demand response measures
- real-world examples of innovative demand response systems

Several examples of new demand response models were reviewed, including microgrids, behind the meter storage, electric vehicle charging, and mass-market programs. A microgrid at the Santa Rita Jail in Alameda County, CA was mentioned. For storage, an example of behind-the-meter battery storage using Stem's systems was shown. BMW's iChargeForward pilot project with PGE was used to illustrate the management of electric vehicle charging based on load requests from a utility. Examples of mass-market programs that were discussed included thermostats, behavioral measures, and auctions.

The approach being developed for the CSVP project was presented next. First, the value of demand response would be assessed from the value it provides to a local utility. This value would include factors such as procurement and peak management, as well as wholesale market value, such as system capacity and spot markets. Second, a road-map for utilities to integrate new demand response capabilities was discussed. This may include assessment of existing portfolios and consideration of new demand response measures. Third, a two-step matrix of demand response companion measures will assist utilities with selection of measures that would enhance the value of a community solar project.

A two-step decision matrix process was shown. First, measures were characterized according to a variety of parameters. Second, each measure was characterized by its ability to address different grid flexibility needs. Utilities would use the matrices to select options and target them based on the utilities' specific needs and existing portfolios. Both matrices use generic measures (such as "Auto-DR"), rather than specific implementations or products. In the first matrix, a utility would review a variety of measures with characteristics such as cost ranges, load impact, and seasonal availability. In the second matrix, a utility would be shown, for instance, that direct load control for smart thermostats is suitable for intra-hour fast ramp regulation, but not for duck curve smoothing or frequency regulation.

Lastly, Mr. Gerber and Mr. Huffaker presented three examples of innovative uses of demand response by three utilities. First, PowerShift Atlantic in New Brunswick created an integrated platform for managing residential, commercial and industrial loads. Second, Steele Waseca Cooperative Electric's Sunna Project provided members of its community solar program with electric water heaters (at no additional cost to the members). The Sunna project uses the grid integrated electric water heaters to shift loads away from peak hours. Third, Pacific Gas & Electric's IRM2/SSP pilot integrates distributed energy resources and demand response directly into the CAISO wholesale market using bids similar to

resource-adequacy bids. Participants in PG&E's program use newer DR models, including microgrids and flexible end-use loads.

5.1.1 Discussion notes

Some of the comments in the discussion were:

- Referring to the Santa Ana Jail Microgrid example, it was noted that microgrids may be too complex and site-specific to be a relevant example for the CSVP.
- On the storage example, it was noted that STEM uses a big data approach rather than utilities installing batteries.
- On the vehicle grid integration, utilities are working on vehicle grid integration, and this may be an area for the CSVP to look at more closely.
- On the matrix, there was a question on the criteria used for low-medium-high value, and whether this could be refined yet kept simple.

The difficulty in including certain program aspects, related to companion measures like DR, in ratemaking was raised again, but these aspects should be considered when designing programs. There was also a discussion of system capacity and spot markets compared to local utility value, as well as resource adequacy rules.

5.2 From "Value of Solar" to the "Triple Play", John Powers / Ari Halberstadt, Extensible Energy

Mr. Powers and Mr. Halberstadt presented ongoing work on developing a methodology to value the triple-play approach in the CSVP project of solar in combination with storage and demand response.

- the purpose and overall approach taken in developing the value model
- review of the value model, including approaches taken for each value category
- a model for the value of distributed generation on feeder systems
- examples of output and analyses enabled by the tool

Mr. Powers discussed the purpose and overall approach taken in developing the value model. The tool helps to test the hypothesis that the solar triple-play exceeds the value of solar alone. The approach taken in the tools development included: valuation from the utility perspective, use of best-practice approaches for valuing distributed generation, and value categories. Mr. Powers also discussed the approach to incorporate storage and demand response into the value model.

Mr. Halberstadt next presented more specific detail about the value model. This included the approaches taken for each value category (e.g., energy, environment, etc.). The rationale for choosing a particular approach was presented for each value category. Generally, a balance between accuracy, utility, simplicity, and feasibility was struck in selecting each approach. For instance, use of public data and avoidance of a power dispatch model meant that some simpler, yet reasonable, approaches had to be used. An example was the use of Garver's approximation to calculate the expected load carrying capacity (ELCC) of a distributed generator.

A model for evaluating the value of distributed generation on distribution feeder systems was presented. Locating a distributed generator on a feeder can affect the need to upgrade the feeder. Previous work on the value of solar has typically considered the effects of a large number of small

generators spread out over many distribution feeders. However, community solar projects are more "lumpy", since a 1 MW to 20 MW system connected to an individual distribution feeder is different than a fleet of small generators. The model presented used certain distribution feeder characteristics to calculate a value for deferred expansion of individual feeders, and to rank multiple feeders based on the most cost-effective location.

One of the challenges addressed in the methodology was how to synchronize load to solar generation. The solution presented involved matching historic monthly typical meteorological year (TMY) data to the corresponding year and month's load data (from FERC public filings), escalating the load data to the modeled year, and aligning it with predicted solar output using the full TMY year data.

Finally, examples of output and analyses enabled by the tool were presented. These included:

- A graph of ELCC versus storage size, showing how relatively large batteries are needed to significantly increase ELCC.
- A graphic showing the correlation of system load and output of a solar system incorporating storage and DR measures, against overall solar generation and utility load.
- A graph of the maximum ramp rate experienced by the utility grid with different solar penetrations; this .showed that a solar penetration of 30%, without any other triple-play measures, would significantly increase maximum ramp rates.

5.2.1 Discussion notes

The topic of resilience was raised, in particular whether it would be worth the additional cost to do a system that could island. The Palo Alto office of emergency services is interested in resiliency, e.g., for Red Cross shelters, but cannot charge this value to ratepayers, so who pays for the extra cost of resiliency?

Questions were raised about how TMY data was synchronized to load and generation data in the model. The explanation provided during the presentation satisfied the questioners that the approach was reasonable. It was suggested that other weather data sets might be useful, e.g., solaranywhere.com which uses a 10 km^2 grid, and weathershift.com. Evaluating different data sets may be useful.

It was pointed out that many of the values are not dependent on location, so the model could be simplified. Additionally, there may be too much focus on the tool, rather than the resulting information. Another potential simplification would to use a rule of thumb on value per hour for different combinations of measures. Conversely, different types of DR and storage require different levels and metrics, e.g., a smart thermostat differs from storage.

It was suggested that the model can be extended to other value measures, such as additional pollutants and emergency resilience. What other values might be hidden within an "other" category? In response, Mr. Powers said that the tool addresses metrics that utilities could bring to regulators; while the tool could be expanded to include other values, what would be the value to the utility in doing so?

The group agreed that a value of solar model is needed. There was some discussion, raised by Mr. Hoff, on the need for developing a full value model, and that instead a simple table of values along with a business case presented to the utility might be sufficient. A more detailed model could be run later. However, it was also discussed that while a full generation dispatch model would produce a potentially more realistic set of numbers, there was still value in a spreadsheet model that could be run by a utility

analyst. Further, it was stated that a simple presentation based on sound analysis and sound business case could get executive action.

Mr. Powers asked how to value ancillary services, such as regulation of frequency and voltage, if a utility is not connected to an ISO. Dr. Palmintier said that it is always good to work with the utility, at the utility level and not the market level. Some utilities, such as PNM, don't assign values to ancillary services.

John also asked how others are valuing feeder upgrades. The answers varied, from zero or less to Palo Alto, to dependence on specific characteristics. Further, the system could be set up to have multiple redundancies, but even a single project would not have a single point of failure--a design approach that Dr. Palmintier has seen used.

Also, for the distribution feeder analysis, it was asked if the model is able to compare one lumpy generator to a fleet of smaller generators--currently, the model looks at one lumpy generator. Dr. Palmintier mentioned some of the work he would go over.

For fleet and ramp simulation, geographic distribution affects ramp rates, e.g, microclimates affecting central systems versus a fleet.

5.3 Mary Ann Piette presented her work on a 2025 model for a California DR option

Mary-Ann Piette presented on a set of DR products for the CPUC to consider, including emergency DR, peak management, etc. The ensuing discussion touched on differences in the relationship with the ISO between IOUs and municipal utilities. Ms. Piette discussed how addressing the duck-curve could first be done with rates. IOUs resist dynamic rates. However, new technology such as NEST thermostats makes it even easier to use dynamic rates. Even though the IOUs create dynamic rates they don't know how to administer them. Mr. Gerber added that with current excess generation capacity in California, DR only has profit potential in a centralized capacity market.

5.4 Evolving Thoughts on Value of Solar in a Dynamic Local Utility, Bryan Palmintier, Senior Research Engineer, NREL

Dr. Palmintier presented on the integration and valuation of variable distributed generation and storage with the grid. Some of the main topics presented were:

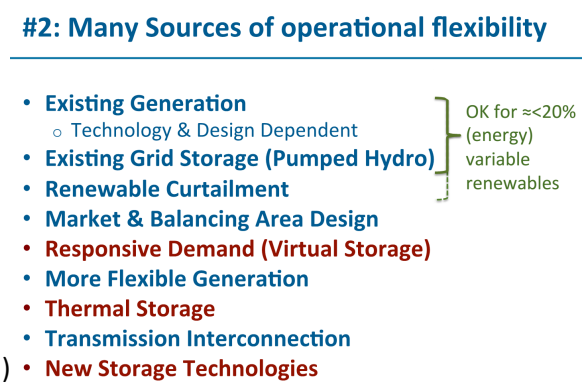
- ten issues related to storage and variable distributed generation
- interactions of distributed energy resources with distribution systems
- research on out-of-voltage constraints and their mitigation using advanced inverters
- categories of value for distributed systems

Dr. Palmintier set the stage with ten points on storage and variable renewables. He addressed the need for increased operational flexibility to integrate intermittent and variable renewables (see Figure 1a). Intermittent and variable renewables require increased operational flexibility, with additional ways to manage generator output. There are many sources of operational flexibility, such as existing generation technologies, market and balancing area, and responsive demand. Existing solutions, i.e., existing generation technologies and storage, can handle about 20% variable renewable penetration, but

additional solutions are needed for higher penetration. These additional solutions are not all DR or storage and should be evaluated to find the most cost-effective alternatives for a given situation.

Additional points discussed included capacity versus distribution limitations, saturation of ancillary service markets, and opportunities for storage to meet utility interconnection requirements. Dr. Palmintier also pointed out that there is a range of storage controllers, such as home energy management systems and bulk aggregators, each having different signal rates and objectives. Different storage sizes and capacities are best suited to handle different needs, such as small storage systems to address inertia and ramp limits, and medium storage systems supporting peak shifting.

(a)



(b)

Utility Concerns for Distributed Generation

Identified Issues	Relative Priority	Identified Issues	Relative Priority
Voltage Control	High	Equipment Specs	High
Protection	High	Interconnection Handbook	Medium
System Operations	High	Rule 21 and WDAT	Medium
Power Quality	High	IEEE 1547/ UL 1741	Medium
Monitoring and Control	Medium	Application Review	High
Feeder Loading Criteria	High	Clarification of Responsibilities	High
Transmission Impact	Medium	Integration with Tariffs	Medium
Feeder Design	Medium	Coordination with Other Initiatives	Medium
Planning Models	Medium		

Source: Southern California Edison

Figure 1 Slides on operational flexibility and utility concerns from Dr. Palmintier's presentation.

Dr. Palmintier next discussed integration of distributed generation on feeders and how this can be addressed by incorporating advanced inverters. He presented prioritized concerns raised by Southern California Edison (see Figure 1b) as examples of issues utilities may face when integrating variable renewables. Dr. Palmintier reviewed basic distribution systems from the perspective of distributed energy resources, focusing further on voltage regulation as a key concern for distribution systems. He discussed how a typical rule-of-thumb that limited distributed generation to 15% of feeder capacity, or even a more sophisticated approach that used a limited set of feeder attributes to determine maximum capacity, were not particularly useful approaches to analyze capacity limits. Instead, he presented research in which he analyzed individual feeders to identify those with a risk of exceeding voltage limitations given some amount of distributed generation, and showed how advanced inverters can dramatically reduce the number of feeders at risk of out-of-voltage conditions.

Finally, Dr. Palmintier discussed potential categories of value relevant to the community solar value project. These included T&D services, resiliency, arbitrage, and smoothing. Integration of storage can increase value by improving alignment with peak load levels. He also discussed considerations applicable to analyzing integrated systems incorporating storage.

5.4.1 Discussion notes

A question raised in discussion was who is the competition for the triple-play approach? Is it other community solar solutions or is it alternative methods and providers of balancing services?

Additional discussion touched on

- Inertia in the system due to weather.
- Dr. Palmintier also discussed how storage has a surprising value in reducing the ramp rate, related to controllability and net exports.
- Who would be in charge of a community energy storage system is important. This is related to operation as a virtual power plant or part of a larger utility system.
- Dr. Palmintier's focus on smart inverters suggests that the CSVP decision framework should incorporate a treatment of these technologies.

John asked about how to find or calculate intra-hour ancillary services values for utilities where an ancillary services market does not exist. Brian's response was twofold; work with the specific utility, or run a big model.

5.5 WRAP-UP DISCUSSION NOTES

Mr. Hoff led a 20-minute discussion of how community solar, plus co-measures like DR, storage, energy efficiency, smart building HVAC controls, EVs, heat pump water heaters, and other measures can be the foundation for the utility business model going forward. Mr. Robertson pressed him about whether customers would spend their capital to solve a utility's duck curve issue, and Mr. Franz volunteered that the utility would facilitate the investment by lending the customer money on their utility bill. Mr. Hoff was quite effusive about his perspective that community solar is the key to the future for utilities. It provides a way to compete with third party solar vendors while cementing customer relationships with the utility.

The value of customer retention was emphasized by Mr. Hoff, with a community solar program being a means to recruit and keep customers. The value of customer retention is very, very high. If customers go to others, that's not what utilities want. He returned to the idea of starting with solar and introducing companion measures at a later time.

With solar, utilities can gain market share first then add on additional services once they have customers in a program. Utilities tend to be risk-averse.

There was some discussion of interconnection requirements. This was noted as a useful follow-up item.

<u>Final Discussion Notes</u>

Electricity pricing and peak demand can be in conflict. Dr. Palmintier mentioned a conflict between TOU pricing and precooling. It can be a challenge changing peak demand and people try to take advantage of TOU rates.

Some other items raised in discussion:

- Customers delegate demand response decisions to an aggregator.
- Utilities/aggregators can pay customers to change their load--but payment is not always necessary.
- For modeling, useful to determine a mix of companion measures that increase value.
- Ongoing work shows promise for statistical approach with different homes.
- Perhaps the best approach is a dynamic price response.

Smart inverters

Following the workshop, Mr. Robertson provided analysis of issues around advanced inverters, and suggested that the CSVP incorporate smart inverters. This analysis was created as a result of Dr. Palmintier's presentation on the value of advanced inverters to managing distributed energy generation. Mr. Robertson discusses the changes in inverter functionality and referenced reports from EPRI and SEPA, as well as Dr. Palmintiers work, on the ability of inverters to regulated voltage and reactive power. The incremental cost of new advanced inverters may be less than the cost of feeder system upgrades, as well as enabling improved asset utilization of existing distribution equipment.

6 CONCLUSIONS AND NEXT STEPS FOR CSVP PROJECT

- The theme of value calculation was discussed at multiple points throughout the Workshop. An important question (originally raised by Tom Hoff) is how far into "Value of Solar" analysis does this project really have to go? The methods (and controversy) of Value of Solar analysis are well established. Should this project focus instead exclusively on the incremental value of DR and storage options? While tempting, this path was rejected for two reasons. First, some baseline information is critical in assessing the incremental value of DR and storage options in the context of a solar program. Second, there may be synergies in combining DR and storage options with strategic solar design options (e.g., some solar inverter choices could reduce the size or complexity of storage configurations); attempting to isolate DR and storage analysis from solar analysis could miss these synergies.
- The first conclusion lead directly to a second – that there is a need for consistency in the framework used to analyze the economic benefits of solar, DR, and storage options. To date, such a framework remains largely theoretical. There is a need for simple tools (simpler than those discussed and presented at this workshop) that allows community solar program designers to assess options with rigor and consistency but without needless complexity. The CSVP Team will pursue such a framework next, emphasizing usability over precision.
- Another conclusion that became clear though the discussion of Demand Response options (especially during the presentations by Erich Huffaker and Mary Anne Piette) is that there are many opportunities for collaboration between the solar industry and the DR industry. This collaboration is in its infancy – while some individuals and teams are thinking about these issues in each respective silo, the CSVP Team appears to be the first true interdisciplinary team working on specific recommendations for how to combine strategic solar options DR options in a single program design. One action item suggested by this discovery is to work within solar organizations (e.g. SEIA, SEPA, the National Community Solar Partnership) and within DR organizations (e.g., PLMA) to form interest groups in distributed energy resource integration. Additional events (online and in-person) will be scheduled by the CSVP Team to expand this collaboration.