GRIDWORKS

Load Shift Working Group

JUNE 18TH

10:00AM – 3:00PM

CPUC GOLDEN GATE ROOM

Agenda

10:00AM -10:20 AM: Intro and Purpose (Gridworks)

Purpose: refine our thinking on:

- How the LSWG should think about load bidding and alternative pathways for DSM participation.
- Variations on the PDR enhanced model.
- How the LSWG can respond to the CPUC decision ordering the LSWG to, "consider an energy storage emission metric for any storage related proposal."

10:20AM – 12:20 PM: Load Bidding Overview and Alternatives

Overview of Load Bidding and Associated Implementation Challenges – Gigio Sakota (SCE) & Alva Svoboda (PG&E)

Future Pathways: A Structured Discussion on Possible Future Pathways for Demand Side Market Participation (Peter Alstone - Humboldt/ Schwartz Energy Center/ LBNL)

12:20 PM – 1:20 PM Lunch

1:20 – 1:50 PM: PDR Enhanced

PDR Enhanced Proposal: Nuo Tang (SDG&E)

1:50-2:40 GHG Emissions Metric for Storage

GHG Emissions Metric for Storage – Ted Ko (STEM)

Background: On May 15, 2018 the CPUC issued their Decision Modifying D. 16-09-056 as a part of the Prohibited Resources proceeding which states in Ordering Paragraph 3 that, "The Load Shift Working Group established in Decision 17-10-017 should consider an energy storage emission metric for any storage related proposal."

2:40:3:00 PM Next Steps (Gridworks)

Recap of meeting, update on future meetings

Introduction and Purpose

Introduction: Roll call

Purpose: refine our thinking on:

- How the LSWG should think about load bidding and alternative pathways for DSM participation.
- Variations on the PDR enhanced model.
- How the LSWG can respond to the CPUC decision ordering the LSWG to, “consider an energy storage emission metric for any storage related proposal.”

Notice: Compliance Report filed July 16

Demand Bidding in the CAISO

Load Shift Working Group

July 18, 2018

Gigio Sakota (SCE) & Alva Svoboda (PG&E)

Reminder on FERC Rules of Conduct

- FERC rules of conduct prohibit market participants from discussing their respective bidding strategies with each other as to avoid potential market manipulation
- This presentation is intended to provide a general review of Demand Bidding in the CAISO market for the benefit of the LSWG
- Participants are asked to limit questions and comments to general market rules and concepts, and not discuss market sensitive information

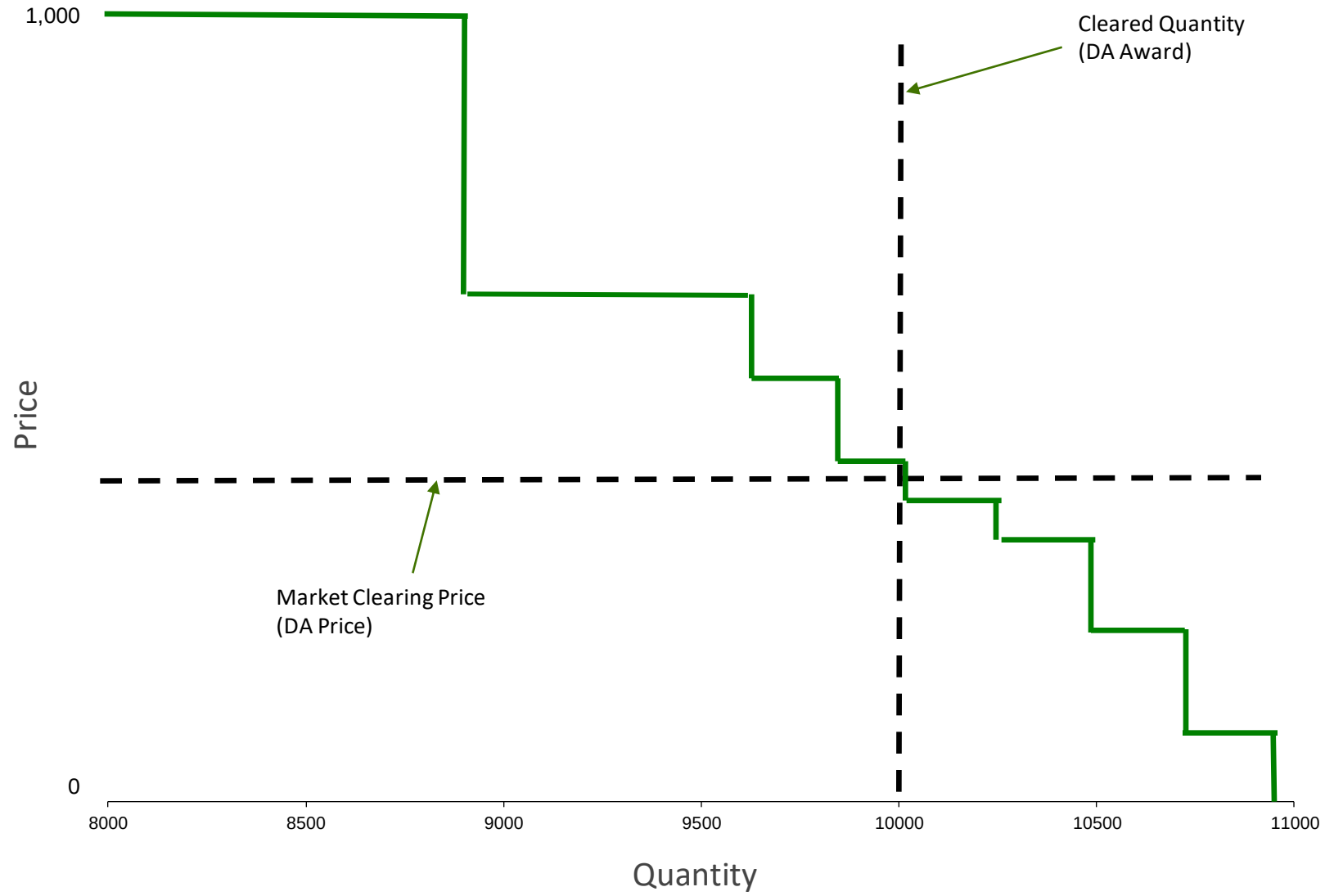
Review of Demand Bidding

- Each LSE bids their load in the DA Market at their respective DLAP
  - Difference between DA award and actual load served settled at RT prices
  - There is no RT bidding or "dispatch signal" ; nonparticipating load is inherently unable to bid into the RT markets for two reasons:
    1. The CAISO's reliability obligation is to balance resources against actual, not bid-in load
    2. Load bidding presumes a second market after the bid market in which actual load is settled
  - Non-participating load has no obligation to respond to ISO signals
- Demand bid mechanics
  - Demand bidding is limited to LSEs
    - Third parties would need to communicate their load bids accurately to an LSE in time for the LSE to bid load unless they become an LSE. Baselines or direct metering are still needed to ensure performance.
  - Limited to 10 "bid steps"
  - DLAP only bidding (i.e. no locational granularity by SLAPs)
    - CAISO's Load Granularity Initiative in 2015 examined non-participating load to bid at sub-laps. The conclusion was that the costs of implementation did not outweigh the benefits and there was no perceived improvements.
  - Inability to represent discrete operational characteristics (i.e. no RDT)
    - e.g. pmin, pmax, ramp rate, commitment costs, use limitations, min/max run times

Review of Demand Bidding - Cont.

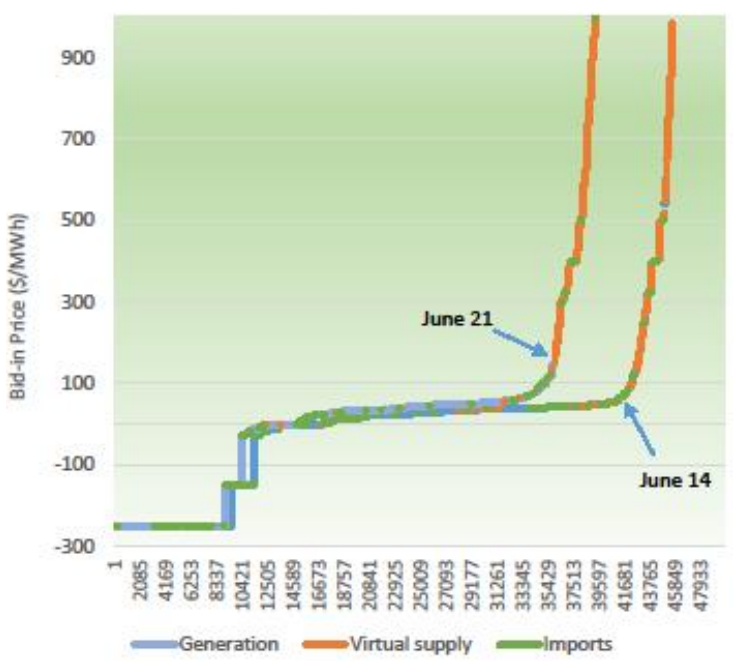
- LSE load forecasting is a key input to their demand bid
  - LSE level load forecasts are generally derived from top-down (econometric) approaches
    - Does not consider individual customer response but rather system level load response and trends
  - Load forecasting error can be significant
    - E.g. CAISO forecasts can be 4,000+ MW off from DA to RT (e.g. CAISO's forecasts for 7/24/2017).
  - A DR resource is usually smaller than the DA demand forecast error

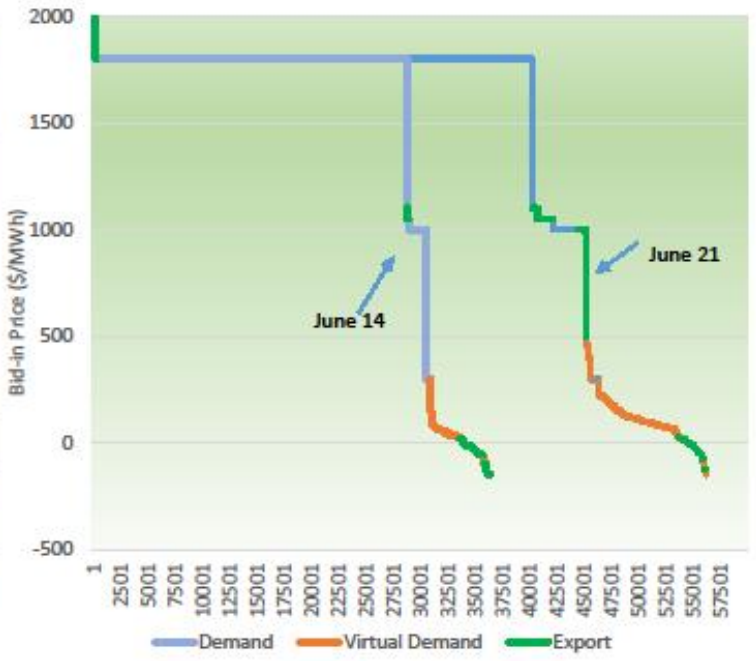
Illustrative LSE Demand Bid



Example CAISO Supply & Demand Stacks

Supply and Demand Stacks for June 21 reflected tighter conditions





California ISO

Supply stack reflects only variable cost bids

Future Pathways for Shift: A Discussion on *Demand Side* Market Participation

July 18, 2018 | Load Shift Working Group

Peter Alstone

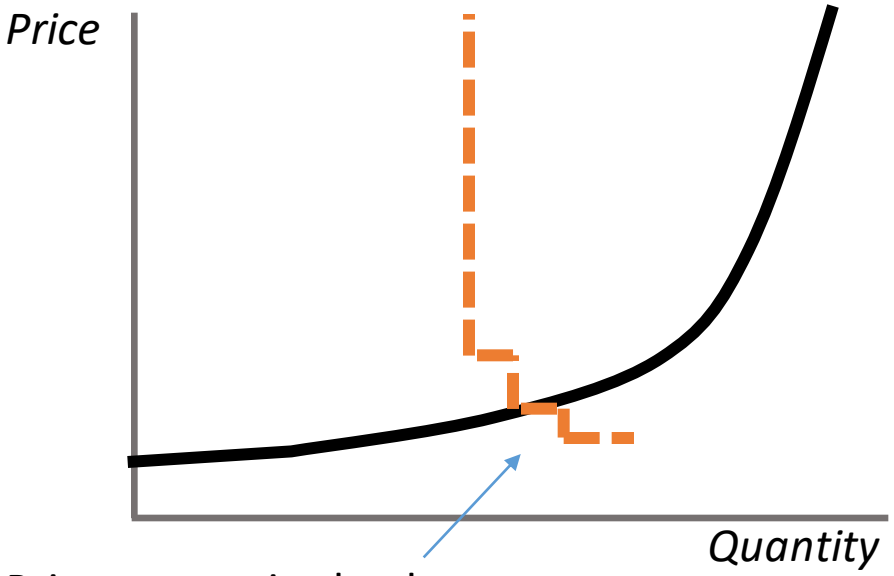
Schatz Energy Research Center

Lawrence Berkeley National Laboratory

Goal: Identify possible future DR Shift strategies on the **demand side** of the energy market

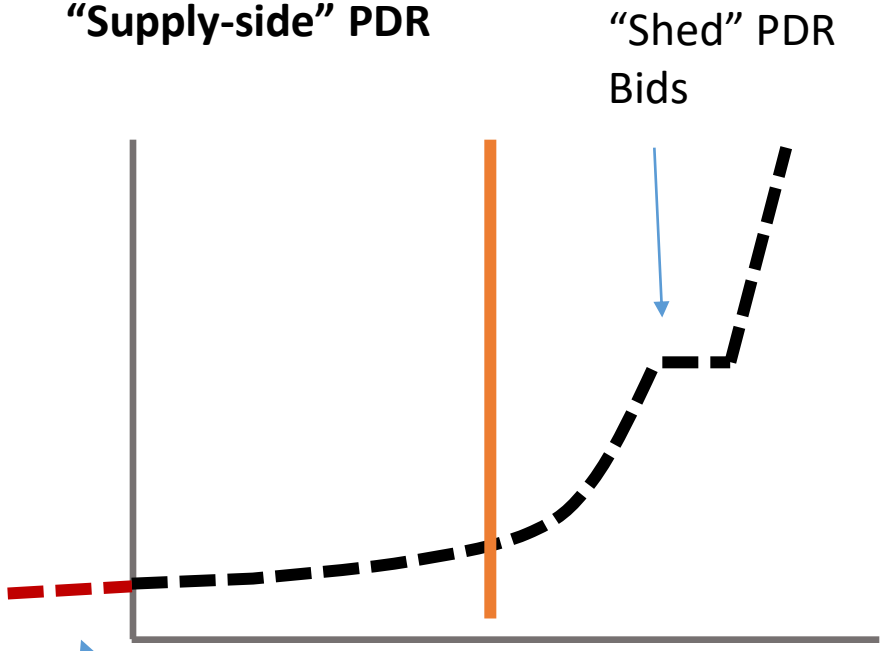
The illustration below shows “demand side” vs. ”supply side” of energy market. The PDR construct is a “supply” concept that treats loads as if they are a generation resource.

“Demand-side” Flexibility



Price responsive load uses more when cheap / less when expensive

“Supply-side” PDR



“Take” PDR Bids Effectively Shift Supply Curve Left

Why think about demand-side flexibility?
(Why have this discussion?)

- **Can we avoid complex baselines?** A known challenge of PDR and other supply-side approaches is baselines. These will be compounded with frequently dispatched resources like Shift.
- **Broaden the range of options.** The scope of this working group is "market integrated" Shift DR, and staff have confirmed that "demand side" participation is in scope for what to consider. These are NOT meant to be "instead of" PDR but are other possible options to explore in addition.
- **Towards a real-time price?.** While a true "real-time price" is not in scope, it may be possible to approach a similar response with demand-side flexibility (as it is possible with PDR). Could a demand-side approach provide a better "pathway" towards RTP?

Structured discussion plan

20 minutes **Blue Sky**: [As a whole group].
Define the ideal functional requirements for a flexible demand approach.
This is a Blue Sky exercise --- focus on what customers should do, and what "grid needs" are met and not on market / program details.

15-30 minutes **Rapid DR Design Concepts**: [In small groups].
Outline a set of possible demand-side approaches to DR.
- **Dispatch:** What is the dispatch or instruction signal?
- **Settlement:** How is the DR valued? Is there a baseline needed?
- **Organization:** Roles of LSE, Distribution Utility, ISO, and Aggregators?

Synthesis: [as a whole group].
Report back on DR designs.
Reflect on how these meet the functional requirements
What are the operational and policy challenges for each?

Blue Sky: What are the functional requirements for a demand-side flexibility approach?

(List below is from Evaluation Criteria in Draft Compliance Report)

- Is this product **technology neutral**?
- To what extent is this product **market integrated?**
  - Is this product dispatchable by CAISO?
- **What grid needs** does this product solve?
  - What are the operational requirements of this product?
    - At what geographic granularity is this product needed?
    - What frequency of dispatch is needed (i.e., x/day, x/month)?
    - What is the response time needed by the grid (i.e., RT, FMM, DA)?
    - What duration of operation is needed (i.e., 5 min, 15 min, 1 hour, 2 hours)?
    - What is the notification time to the participant?
    - What kW size is needed by the grid?
- **How is the value determined** for each of the grid needs this product addressed?
- Is the product delivering **an incremental service?**
  - How will we measure performance? (i.e., a baseline or direct metering?)
- Is this **product available to all parties** (i.e., IOU LSEs, CCAs, and third-party aggregators)?
- What is the **anticipated ability of customers to respond** to the product?

Write Key Priorities on whiteboard in workshop room

Demand-Side DR Design

Name the Approach

Day-to-day dispatch operations:
- How are customer loads dispatched?
  - time and spatial granularity
  - what is the signal?
- Is there any modification to demand bids or load forecasts?

Settlement:
- What are the energy/capacity/etc. values?
- Is a "baseline" needed? What kind?
  - Traditional premise-level baseline; class average baseline; class average cost of service, etc.

Organizations:
- What is the role of…
  - Load Serving Entity (CCA or IOU or DA provider)
  - Distribution utility / service territory LSE (IOU)
  - Third Party / Aggregator
  - CAISO
  - Customer

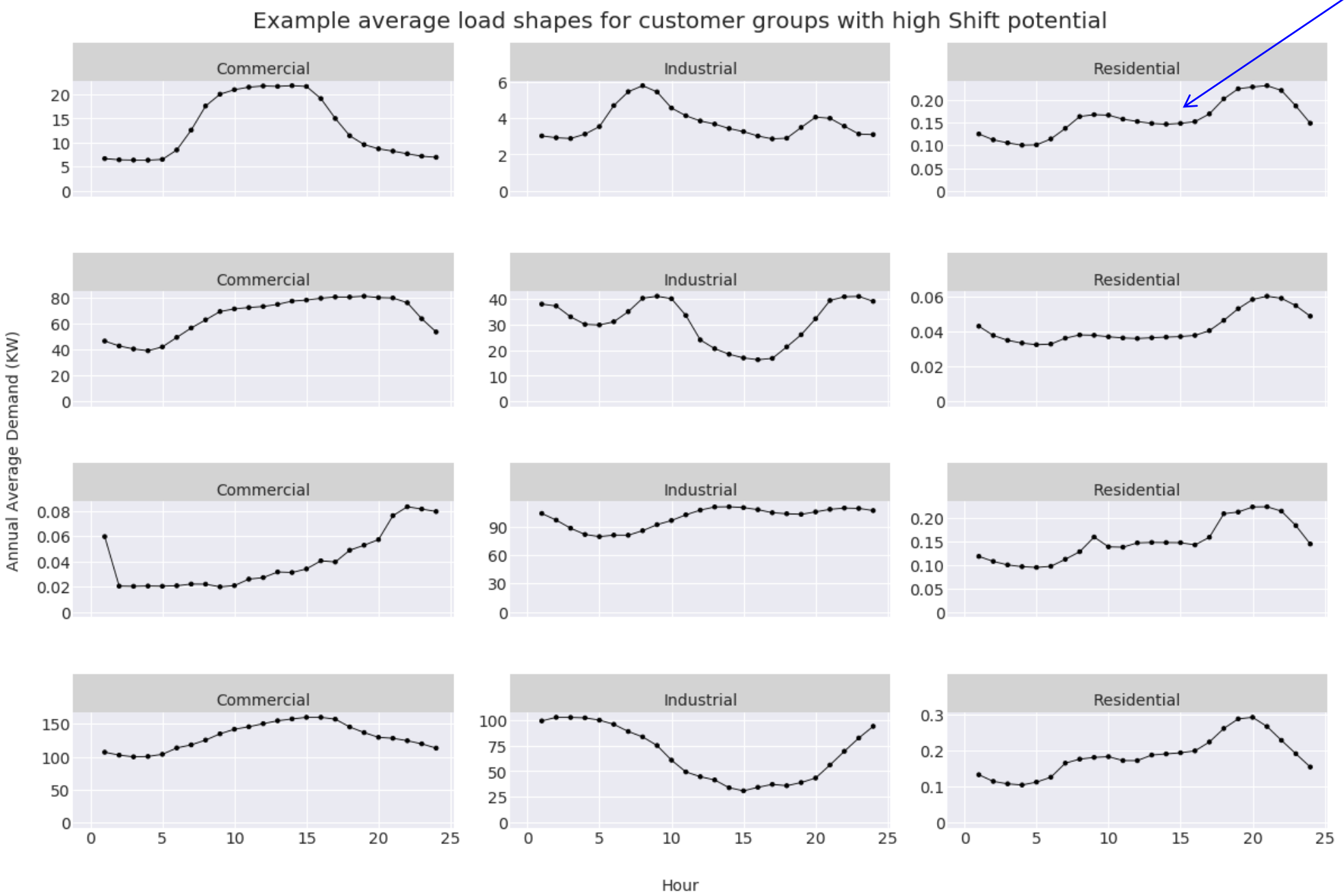
Develop your group's concept using this framework (or similar)

Group roles:
- *Leader / Organizer*
- *Note-taker*
- *Participants…*

Possible Concepts

- "**Real time price**" --- Generation component of customer bill is replaced with a real time price for energy (or, customer pays normal retail rates but faces an incentive that is equal to the difference between the generation component of their retail rate and the RTP).
- "**Load / Demand bidding**" --- Aggregators who can control customer loads provide "demand flexibility" bids to LSE, who include this in the demand bids they place. The aggregators are paid based on cost of service reduction. (Concept introduced in earlier meeting).
- "**Pay for a load shape**" --- LSEs create (or aggregators define) programs that would pay customers or aggregators for achieving some defined average (normalized) load shape that is helpful for the system needs and reduces the cost of their procurement. Some people note that this is similar to pay for performance approach to EE, but focused on the load shape.

Representative Load Shapes from Potential Study



- Figures: Average daily load shapes for selected sites with large fractional **Shift** potential
- Among customer groups with large **Shift** potential, load shapes are very diverse especially commercial & industrial (C&I) sites,
- Identifying best customers to target for **Shift** DR may be challenging

Synthesis:

Report back on DR designs.

Reflect on how these meet the functional requirements

What are the operational and policy challenges?
…given today's structure
…in future years

Lunch break

Enhanced PDR – SDG&E perspective

GHG Emissions Metric for Storage

Background: On May 15, 2018 the CPUC issued their Decision Modifying D. 16-09-056 as a part of the Prohibited Resources proceeding which states in Ordering Paragraph 3 that, “The Load Shift Working Group established in Decision 17-10-017 should consider an energy storage emission metric for any storage related proposal.”

Storage and GHG Emissions

Load Shift WG - July 2018

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Basic Concepts

Storage has no on-site emissions

Storage does not inherently increase or decrease emissions

- Different than fossil generators
- Different than solar and wind

Emissions impact depends on storage *operations* and *marginal generating unit*

- Charging storage *can* increase emissions
- Discharging storage *can* decrease emissions
- Emissions impact is the net impact over time

Round-trip Efficiency

- Single Cycle RTE (includes regular operational losses)
- Time-based RTE (includes ongoing parasitic losses)

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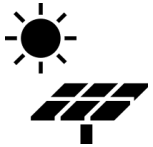
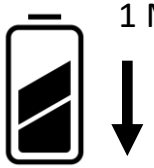
has the same GHG emissions as



1 MWh



Battery Charging

1

Charging from solar means solar energy not going to the grid

Grid Operator

2

Marginal grid generator increases output to make up for “loss” of solar

1 MWh

+ X lbs C02

Marginal Generating Unit

1 MWh

+ X lbs C02

Increased output of traditional generators means increased emissions

3

Increased output of clean generators means zero increased emissions

Grid Operator

1 MWh

Battery Charging

1

Standalone storage charges from the grid, increasing demand

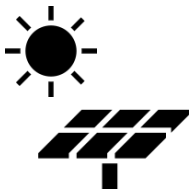
2

Marginal grid generator increases output to meet increased demand

3

1 MWh

+ Zero lbs C02



1 MWh

+ Zero lbs C02

Solar is marginal during times of overgeneration or curtailment

SGIP Background

Statutory requirement to reduce GHG emissions to become an eligible technology

- All other SGIP technologies: GHG impact based on **hardware**
- Storage impact is based on **software**
- *Storage is the only technology where eligibility should be based on actual operations*

SGIP RTE Mistake

- Based regulation on erroneous assumption: All storage would buy low, sell high based on wholesale energy prices
- Calculation based on further bad assumptions: Marginal unit is CT when prices high, CCGT when prices low
- Then calculated time-based RTE that would achieve zero or decreased emissions

Results

- Most SGIP funded storage is increasing emissions. (But not a lot)
- CPUC recognized need to give storage a signal, data stream of marginal GHG emissions
- CPUC GHG Working Group met for 6 months to produce recommendations for SGIP changes

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DR Prohibited Resources

DR Prohibited Resources Decision 16-09-056

- Created list of resources prohibited from operating to provide demand response
- Made the same eligibility threshold mistake – other tech emissions based on hardware
- Decision acknowledged all the reasons why storage is beneficial as DR and it shouldn't be prohibited
- *Pointed to SGIP GHG Methodology as eligibility criteria for storage*

Stem PFM and Commission Decision

- SGIP GHG methodology proven to be flawed wrt storage
- The link between DR Prohibited Resource Policy and SGIP should be severed
- Policies unfair to storage violate demand response principle of technology-neutral, competitive open market
- DR policies should consider other objectives along with GHG reduction
- Energy storage GHG increase miniscule relative to CA GHG emissions
- Energy should be exempt from the list of prohibited resources for now

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Load Shift Implications

Energy storage metric

- The question of “what metric” has already been decided
- Open question is if and how that metric should be used
- How to balance GHG performance against other objectives (statute doesn’t have SGIP hard line)

Broader Load Shift product

- *DR providing Load Shift is no longer automatically “clean”*
- *Rules applied to storage should apply equally to load shift DR*

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Next Steps

Recap of meeting

Update on future meetings:

- August 22
  - Market product triggered/influenced by the wholesale market
  - Grid Needs: forecast of location and duration of need
  - Operational attributes
  - Distribution constraints
- September 17
  - RA issues
- October 17