

Load Shift Working Group

SEPTEMBER 17, 2018

10AM - 3PM PST

CPUC GOLDEN GATE ROOM

https://gridworks.org/initiatives/load-shift-working-group/



10:00AM -10:20 AM: Intros, Updates, and Purpose

- Introductions
- DR Regulatory Updates
- Today's Objective: Refine our thinking on:
 - Enhancing CAISO's Proxy Demand Response model for load shift
 - Resource Adequacy

10:20AM – 12:00 PM: PDR Enhanced

12:00 PM – 1:00 PM: Lunch

1:00-2:30 PM: Resource Adequacy and the Load Shift Product: Perspectives from the CPUC and CAISO (Michele Kito, CPUC and Karl Meeusen, CAISO)

2:30 PM – 3:00 PM Next Steps

- Recap of meeting
- Update on Future Sessions

Introduction and Purpose

Introduction: Roll call

DR Regulatory Updates

Today's Objective:

- Enhancing CAISO's Proxy Demand Response model for load shift
- Resource Adequacy



PDR-LSR Load shift product for behind the meter (BTM) storage

Jill Powers Infrastructure and Regulatory Policy, Manager

Load Shift Working Group September 17, 2018

CAISO PUBLIC

ESDER3 Review of Load Shift Product for PDRs utilizing sub-metered behind the meter energy storage

PDR-Load Shift Resource (PDR-LSR) will allow for the provision of grid services for both the decrease and increase of load.

- Requires direct metering of behind the meter energy storage
- Resource pays full retail rate for all charging energy

Key features

- For load curtailment
 - Maintains RA capacity eligibility
 - Non-exporting rule applies
- For load consumption
 - Ineligible for RA capacity and ancillary services
 - Ability to bid a negative cost for energy services



PDR-LSR will be two separate resource IDs

- Load curtailment can bid from the net benefits test threshold price up to the bid cap
- Load consumption can bid < \$0 to the bid floor</p>

Bidding

- Both PDR-LSR bidding options must be uniform
 - 15-minute or 5-minute dispatchable
- Will be eligible for bid cost recovery
- PDR-*LSR*_{curt} can bid from NBT price to Bid Cap
- PDR- LSR_{cons} can bid from Bid Floor to < \$0

Energy Services

- Energy
- Flexible Ramping Product
- Day-ahead FRP (DAM enhancements initiative)



PDR-LSR Performance Evaluation Methodology

• Will measure and net out "typical use" to define incremental value of load shift provided

– LSR-curtailment

•
$$LSR_{curt} = [|G(t)| - G_{LM}]$$

– LSR-consumption

•
$$LSR_{cons} = [G(t) - G_{LM}]$$



Key takeaways from performance evaluation methodology of PDR-LSR

- Both methodologies will incorporate consumption/curtailment values when calculating "typical use"
- The net-export rule will only apply under curtailment
- When choosing non-event hours for both curtailment and consumption, events from either resource will be taken out.
 - An event from either resource creates "non-typical" behavior of those resources.



Review LSWG Evaluation Framework for ESDER3 Approved PDR-LSR



Grid Needs: Oversupply and Ramps Flatten The Duck: "Less Deep and Steep"

	Grid Policy Need	Value	Market Mechanism	Revenue for Shift DR	Operational Requirements	Good fit for Shift?	Notes
	Low cost dispatch (with low pollution)	Fuel and other marginal cost operational savings while balancing dispatchable generation with net load Economic response to negative pricing in oversupply	Day-ahead Energy	Energy market price arbitrage Resource pays full retail rate for all charging energy, ability for resource to charge at times of negative pricing to offset this cost.	 15 minute or 5 minute dispatchable -symmetric resource dispatchability 100 kW minimum size BTM Energy Storage Sub-metered 2 resource IDs LSR-curtailment LSR-consumption Bidding rules apply to mitigate conflicting dispatch 	YES	Value includes providing additional economic response to negative pricing in oversupply conditions Net beneficial system response from curtailment and meeting peak demand.
		conditions along with productive consumption stored for shifted return. Net beneficial system response from curtailment and meeting peak demand.	Real-time Energy	Same as above	Same as above	YES	Same as above
Califc			Ancillary services (DA/RT) Spin and Non-Spin	Capacity and Energy service (DA/RT) payments Energy Payments Offering A/S meets RA-MOO	In addition to above PDR LSR- curtailment requirements: • 500 kW minimum size • telemetry	YES	PDR LSR-curtailment Only
	Lower cost dispatch in RTD to meet RT imbalance		Flexible Ramping Product Day-ahead FRP (DAME initiative)	FRP up and down Compensate resources based upon the marginal opportunity cost from out of merit dispatch in the financially binding market interval	 In addition to above PDR LSR requirements, meet product specific requirements (some pending) RTD dispatchable resources (5-minute) 	YES	DAME policy initiative in progress
		Renewable generation capacity that is	RPS Compliance Credit	Curtailment avoidance value to resources submitting negative bids.	VER negative bid submission	YES	avoiding uneconomic non-renewable curtailment

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Grid Needs: Oversupply and Ramps Flatten The Duck: "Less Deep and Steep"

	Grid Policy Need	Value	Market Mechanism	Revenue for Shift DR	Operational Requirements	Good fit for Shift?	Notes
	Low cost dispatch (with low pollution)	Frequency Regulation	Regulation DA/RT markets	Capacity payments	 500 kW min size Auto Gen Control (AGC) Telemetry (every 8 seconds) supervisory control command responsive Continuous dispatchability DA - 60 minutes RT - 30 minutes 	NO	Regulation Services not available through PDR or ESDER3 proposed PDR. Reg Up/Down can be provided by dispatchable DR through NGR
		Voltage support	Distribution system voltage regulating and VAR equipment investment.	?	Not established	NO	Not applicable at this time Require CPUC jurisdictional evaluation
	High Reliability Installed System	Serve peak system capacity need Minimize impact of ramp	Forward procurement DA/RT energy (A/S meeting RA MOO)	Capacity procurement payment DA/RT energy	PDR-LSR curtailment only : RA MOO Minimum response 4 hours/day for 3 consecutive days and 24 hours/month	YES	CPUC jurisdictional procurement mechanisms e.g., Demand Response Auction Mechanism pilot, bi-lateral procurement contracts.
		Serve the ramp (up/down)	Flex RA	Same as above	In addition to above PDR LSR requirements, meet product specific requirements (some pending)	?	Note this market mechanism is evolving, with detailed categories including: Category 1 (Base Flexibility), Category 2 (Peak Flexibility), Category 3 (Super-Peak Flexibility).
or alife		Transmission Alternatives	Storage as Transmission Asset (SATA)	Not applicable	Not Applicable	NO	SATA policy initiative in progress Scope: enable storage providing cost-based transmission services to also participate in ISO markets and receive market revenues to provide ratepayer benefits and provide greater flexibility to the grid.

Evaluation Framework

PDR-LSR Framework

https://gridworks.org/initiatives/load-shift-working-group/

Technology Neutral Enhanced PDR

Load Shift Working Group

September 17, 2018

Our Lens Today

- Looking at narrow construct of CAISO load shift PDR
 - Expanded from ESDER 3 battery storage only product to allow all DR resources to participate
 - Lessons may be learned in the SSWG that could come into play in implementation
- We continue to believe that additional efforts in LSWG should address:
 - RA value for both sides of load shifting behavior to capture fuller range of services and value being provided
 - Load shifting constructs outside of CAISO market dispatch
 - Additional ways load can provide flexibility services to the grid
- Value for Load Shift is (still) not properly recognized in any process

Tech Neutral Load Shift Product

- Only minimal changes are needed to the CAISO Enhanced PDR Model in ESDER 3 to create a technology neutral load shift product for integration in the CAISO market.
- All other aspects of the PDR-LSR can remain the same
 - Bidding requirements, energy services, RA eligibility and MOO requirements

	ESDER 3	Technology Neutral
Who can participate? Pre Market Registration	PDR-LSR with battery storage, register with both and curtailment and consumption Resource ID	TN-PDR-LSR– Any PDR that can both curtail and consume could register PDR-LSR with both a curtailment and consumption Resource ID
Performance Methodology	Measure and net out typical use from metered output	Measure against approved baseline calculations (current and in the future the ESDER 2 Baselines) to measure both consumption and curtailment.
Dispatch Signal timing	5 or 15 minute	Should permit, if approved for DR by CAISO, RT market participation with hourly block intertie bidding timing (22 and 55 minute notice)

Value Tensions

- E3 Resolve Model
 - Resulted in limited value for load shift
- LBNL Some additional values/perspectives
- Load Shift value needs to address <u>full value of avoiding curtailed</u> <u>renewables</u> in our environment that needs RPS energy to meet state mandates.
 - Energy only payments during periods with CAISO negative pricing will not incent load shift behavior
- Value Tension continue to exist under a simple move to expand PDR-LSR to TN-PDR-LSR. Procurement, contracting and additional payments could help resolve some of these issues.

How would we get there?

- Would we need a CAISO process ESDER 4 or could this be done solely at the direction of CPUC?
 - Updates to CAISO Tariff needed?
- Other issues more detail in evaluation process

Evaluation Framework

PDR Technology Neutral Framework

https://gridworks.org/initiatives/load-shift-working-group/

Lunch Break

Resource Adequacy and the Load Shift Product

Michele Kito, CPUC and Karl Meeusen, CAISO





Load Shift Working Group Meeting September 17, 2018





Overview

- Background
- Current Proposals
- Additional Thoughts





Current Resource Adequacy Program

- > RA program developed in response to the 2001 California energy crisis
- The initial program implemented in 2006 (system)
- > Local requirements added in 2007
- > Flexible capacity requirements added in 2015
- Designed to ensure that CPUC-jurisdictional load serving entities (LSEs) have sufficient capacity to meet:
 - Peak load with a 15% planning reserve margin (PRM)
 - Local area reliability needs
 - Flexible ramping needs associated with renewable integration
- One-year forward requirement





CPUC-Jurisdictional LSEs in the CAISO



- CPUC-jurisdictional LSEs serve about 90% of load in CAISO
- Currently 37 LSEs
 - 3 Investor Owned Utilities (IOUs)
 - 20 Community Choice Aggregators (CCAs)
 - 14 Electric Service Providers (ESPs)





Resource Adequacy Requirements

- System Based *monthly* forecasted 1-in-2 load, with a 15% planning reserve margin
- Local Determined *annually* by CAISO and adopted by the CPUC based on 1-in-10 forecast
- Flexible Determined *monthly* based on largest 3-hour net load ramp





Local Capacity Requirements (LCR)



- CAISO performs an annual LCR study, based on a 1-in-10 weather year and a N-1-1 contingency
- Adopted annually by CPUC decision
- Total of 5 local areas Bay Area, Other PG&E Areas, LA Basin, Big Creek-Ventura, and San Diego
- Six of the local areas are combined into "PG&E Other Areas" to address market power -
 - Sierra, Fresno, Humboldt, North Coast, Stockton, and KernLocal RA
- Allocated based on CPUC-juridical load share in each TAC area.





2019 LCR Requirements

	2019 Total LCR (MW)	Peak Load (1 in10) (MW)	2019 LCR as % of Peak Load	Total Dependable Local Area Resources (MW)	2019 LCR as % of Total Area Resources
Humboldt	165	187	88%	202	82%
North Coast/North Bay	<mark>68</mark> 9	1465	47%	890	77%
Sierra	2247	1758	128%	2150	105%**
Stockton	777	1174	66%	633	123%**
Greater Bay	4461	10230	44%	7054	63%
Greater Fresno	1671	3070	54%	3438	49%**
Kern	478	1088	44%	475	101%**
LA Basin	8116	19266	42%	10225	79%
Big Creek/Ventura	2614	5162	51%	5073	52%
San Diego/Imperial Valley	4026	4412	91%	4358	92%
Total	25244	47812*	5 3%*	34498	73%



Source: CAISO 2019 Local Capacity Technical Analysis, Final Report and Study Results



2019 Flexible Requirements







CPUC and CAISO Accounting

Qualifying Capacity (QC) v. Net Qualifying Capacity (NQC)
 Annual v. monthly value





Changes Under Consideration

- > Multi-year requirements
- FRACMOO 2/Day-Ahead Market Enhancements





Bundling of Flex and Local

- Commission decision
 - Allows EFC to exceed QC
 - Does not allow EFC separate from NQC





Resource Adequacy in CA: Understanding RA counting and offer obligations

Karl Meeusen, Ph.D. kmeeusen@caiso.com Senior Advisor – Infrastructure and Regulatory Policy September 17, 2018

Topics to be covered during today's briefing

- 1. How resource RA capacity is determined
- 2. Bidding and scheduling requirements



How resource RA capacity is determined



ISO publishes two lists of capacity resources that are qualified to be procured for RA.

- NQC List: Published each year in July-October timeframe prior to start of the RA compliance year; resources on list are eligible to be included on yearahead and month-ahead local and system RA showings
- Effective Flexible Capacity List: Published each year at same time as NQC list; contains all flexible resources that are eligible to be included on year-ahead and month-ahead flexible RA showings



ISO takes "qualifying capacity" values and determines "net qualifying capacity" values.

- ISO determines these values annually and creates and publishes an "NQC" list for RA compliance year
- ISO tests QC value against values listed below and an NQC is established at lower of following:
 - Calculated QC
 - Latest unit testing information
 - PMax
 - Resource deliverability (energy only, full capacity, interim deliverable, partial deliverable)



How do resources and capacity "count" for local capacity?

- A resource can count as local capacity as long as resource physically sits within local capacity requirement area
- NQC list shows
 - Which local capacity requirement area each resource is physically located within
 - NQC MW value for each qualified resource



The rules for counting a resource as flexible capacity are shown below.

Start-up time greater than 90 minutes

EFC = Minimum of (NQC-Pmin) or (180 min * RRavg)

Start-up time less than 90 minutes

EFC = Minimum of (NQC) or (Pmin + (180 min – SUT) * RRavg)

Where:

EFC: Effective Flexible Capacity NQC: Net Qualifying Capacity SUT: Start up Time RRavg: Average Ramp Rate



2018 CAISO - Public

Bidding and Scheduling Requirements



RA resources have specific bidding and scheduling requirements.

- Resources participating in ISO markets under an RA contract will have RA MOO to ISO
- System and local RA have explicit 24 hour must-offer requirements
- RA capacity that is RA capacity for even a single hour in a day is considered RA capacity for that entire day



RA capacity must be made available to the ISO.

Availability and the MOO

- System capacity Must self-schedule or economically bid into market 24/7
- Local capacity Must self-schedule or economically bid into market 24/7
- Flexible capacity Must economically bid into market during assessment hours



The RA Availability Incentive Mechanism ("RAAIM") incents RA capacity to perform.

- Incents SCs to provide substitute capacity in event a resource becomes unavailable for long period of time due to long forced outage
- Creates incentive structure where resources are rewarded more for availability in months when ISO sees less availability
 - Penalizes resources that have monthly average availability less than acceptable reliability percentage
 - Rewards resources that have monthly average availability higher than acceptable reliability percentage



The assessment hours vary by type of RA capacity.

Resource performance (i.e., bidding or scheduling) is measured with respect to capacity type

- System resources must be available during peak hours
- Local resources must be available during peak hours
- Flexible resources must be available and economically bidding into market for up to 17 hours per day

For all three types of RA capacity

- Outages reduce availability
- Certain outage types will exempt a resource from being assessed a performance incentive
- ISO provides ability to provide "substitute" capacity to mitigate outage impact on availability



Use-limited resources ("ULR") have unique must offer requirements.

- A ULR is defined as resource that has physical or regulatory limitations that constrain its ability to operate
- A resource that has contractual limitations based on economics is not considered a ULR
- ULR status is conveyed by ISO after resource applies for this status
- An RA resource that is a ULR has a MOO, specifically to bid into ISO market as available



Additional helpful resources

- CPUC Compliance Materials
 - <u>http://www.cpuc.ca.gov/General.aspx?id=6311</u>
- CPUC 2018 RA Guide
 - <u>http://www.cpuc.ca.gov/WorkArea/DownloadAsset.aspx?id=644245</u>
 <u>4920</u>
- CPUC RA History
 - <u>http://www.cpuc.ca.gov/General.aspx?id=6316</u>
- CAISO Tariff (See Sections 40 and 43)
 - <u>http://www.caiso.com/Documents/Section40_ResourceAdequacyDe</u> <u>monstration_SCs_CAISOBAA_asof_Nov30_2017.pdf</u>
 - <u>http://www.caiso.com/Documents/Section43_CapacityProcurement</u>
 <u>Mechanism_asof_Sep25_2016.pdf</u>
- CAISO FRACMOO Stakeholder page
 - <u>http://www.caiso.com/informed/Pages/StakeholderProcesses/Flexibl</u> <u>eResourceAdequacyCriteria-MustOfferObligations.aspx</u>





Appendix

There are different requirements for system, local, and flexible RA resources.

System and Local RA Requirement

 Resource must <u>economically bid or self-</u> <u>schedule</u> to fulfill its RA obligation

Flexible RA Requirement

 Resource must <u>economically bid</u> to fulfill its RA obligation



2018 CAISO - Public

Flexible capacity must offer obligation for Category 1, base ramping.

Economic Bid – MOO	• 5:00 am – 10:00 pm
Energy Requirement	Minimum 6 hours at Effective Flexible Capacity (EFC)
Daily Availability	• 7 days/week
Minimum quantity of capacity allowed	 Set monthly based on largest secondary net load ramp
Daily start-up capability	 Minimum of 2 starts per day or the # of starts allowed by operational limits as determined by min up and down time
Other limitations	No limitations that translate to less than the daily requirements
Examples of types of resources	 Conventional gas fired resources, wind, hydro, storage with long discharge capabilities



Flexible capacity must offer obligation for Category 2, peak ramping.

Economic Bid – MOO	 5 hour block (determined seasonally)
Energy Requirement	Minimum 3 hours at EFC
Daily Availability	• 7 days/week
Maximum quantity of capacity allowed	 Set based on the difference between 100% of the requirement and category 1
Daily start-up capability	At least 1 start per day
Other limitations	No limitations that translate to less than the daily requirements
Examples of types of resources	 Use-limited conventional gas fired generation, solar, conventional gas fired peaking resources



Flexible capacity must offer obligation for Category 3, super-peak ramping.

Economic Bid – MOO	 5 hour block (determined seasonally)
Energy Requirement	Minimum 3 hours at EFC
Daily Availability	• Non-holiday weekdays
Maximum quantity of capacity allowed	Maximum of 5% per month of the total requirement per month
Daily start-up capability	At least 1 start per day
Other limitations	 Must be capable of responding to at least 5 dispatches per month
Examples of types of resources	 Short discharge battery resource providing regulation and demand response resources



Next Steps - Meeting recap

Next Steps - Update on Future Meetings

• October 24

- Pilots: Write Up & Presentations (July meeting)
 - Demand approach Peter Alstone
 - Real Time Product Erik Woychik / Rick Aslin
- Review of all proposed products in light of the evaluation criteria, make recommendations
- Develop a list of data access issues relevant to new models that should be addressed prior to launching new models
- Develop a proposal on how to better coordinate efforts of CAISO and Commission to integrate new models of DR into the CAISO market

Next Steps - Update on Future Meetings

• November 14

- Refine a list of data access issues relevant to new models that should be addressed prior to launching new models
- Refine a proposal on how to better coordinate efforts of CAISO and Commission to integrate new models of DR into the CAISO market
- Provide outline of written report and next steps for sharing, review, and commenting

• December 12

• Final written report – rough draft for stakeholder discussion