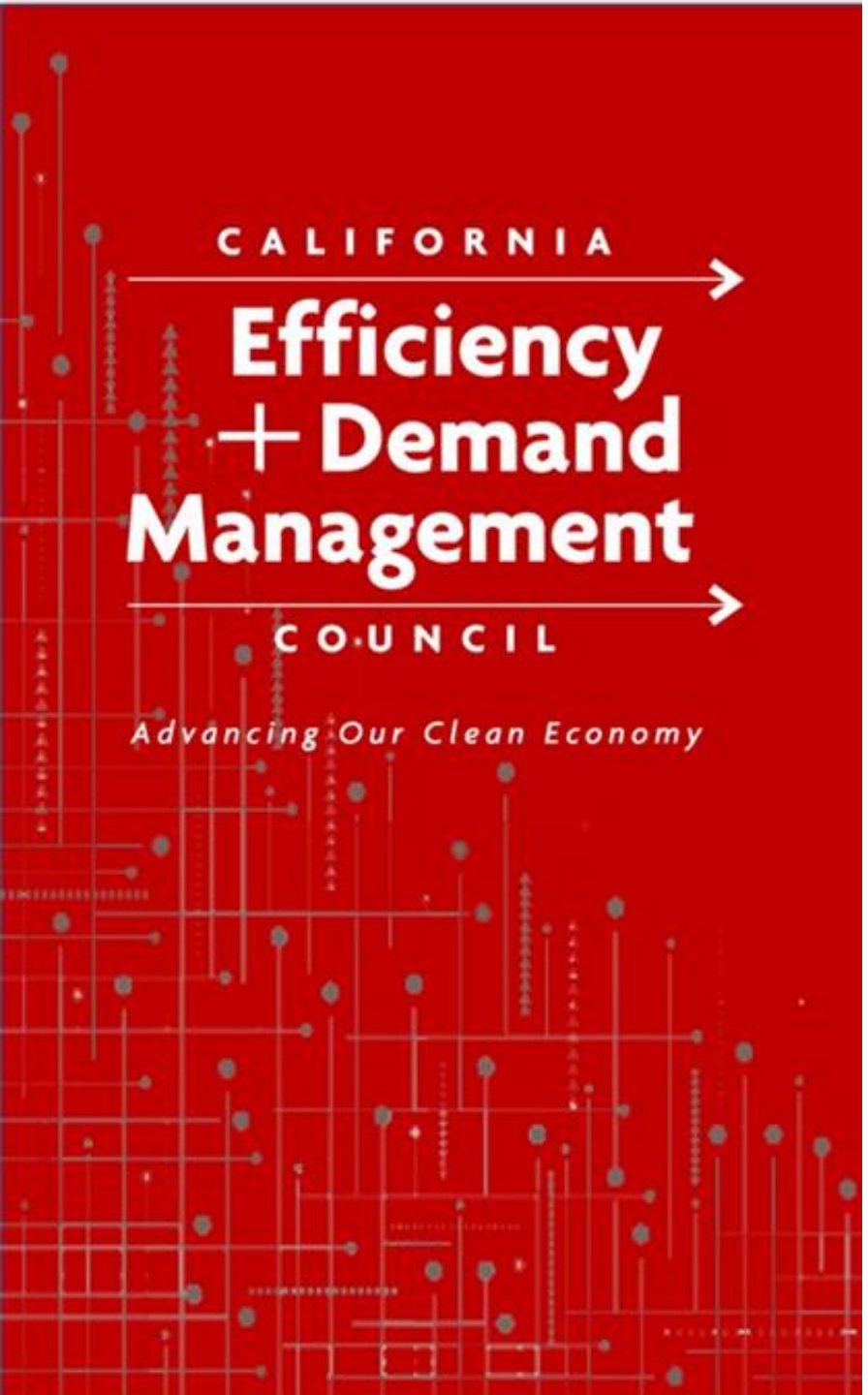

Modified Proxy Demand Resource:

A New Tool to Credit Battery Exports in DR Performance

April 22, 2024

Current PDR construct does not effectively accommodate BTM batteries

DR participants with battery storage do not receive credit for exported energy

Existing measurement options require additional meters and/or assign a zero value to intervals with exports

CAISO does not have visibility into exporting BTM assets participating in DR

Resource visibility will be critical in a high-DER future

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DERs are rapidly growing…

Falling prices are driving increased adoption

- ➔EV sales: 845k to 2.7M by 2028 (**34% CAGR**)[1]
- ➔Battery storage: 3.5 GW to 9.8GW (**23% CAGR**)[2]
- ➔CA expecting **770% increase** in BTM battery deployments from 2019-2030[3]

…but CAISO may not be able to leverage them

- Several programs in California already allow battery exports (e.g. DSGS, NEM 3.0)
- These programs are "out-of-market" and won't show up on CAISO Supply Plans
- **Wholesale market integration should allow battery exports to be visible & dispatchable to CAISO**

1. U.S. EV Sales Forecast, EVAdoption.com/Loren McDonald (2019-2028)
2. U.S. Energy Storage Monitor, Woodward McKenzie (2021-2026)
3. CEC Integrated Energy Policy Report (2020)

Crediting exports is needed to fully integrate batteries with wholesale market

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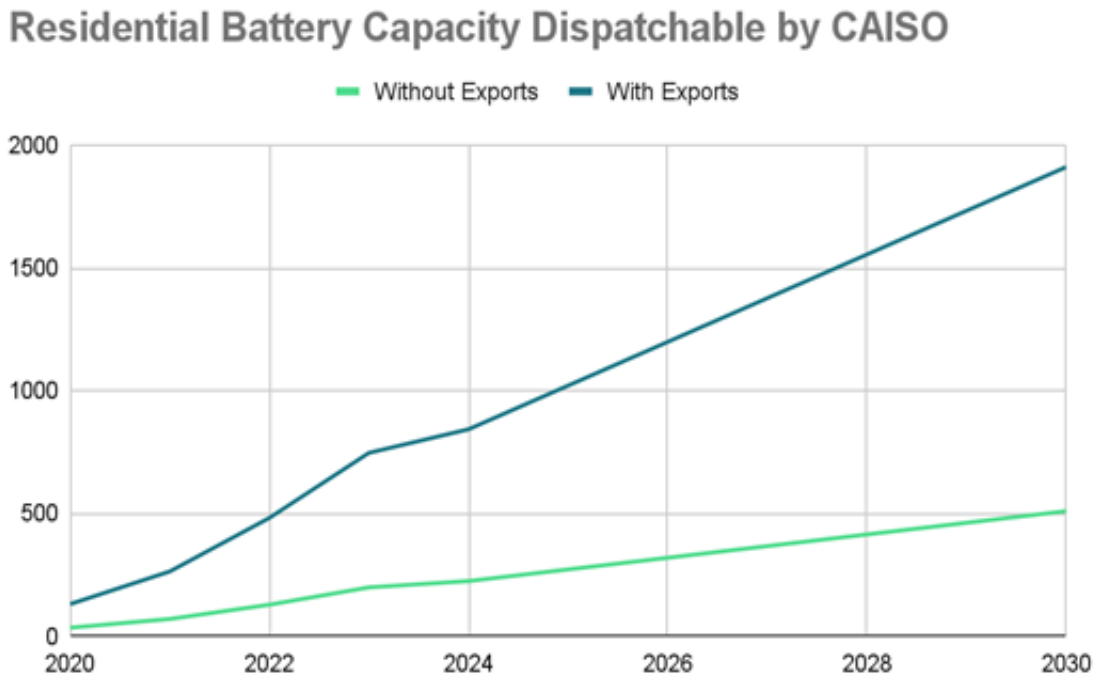
Batteries have significantly more capacity than they are nominating

- Tesla Powerwall can discharge **4.5 kW** against an average afternoon household load of **1.2 kW**
  - Lack of export credit & low baselines can push storage customers to cut nominations by over **70%**
  - Many customers could discharge their full battery - **but CAISO only has visibility into the portion of the battery output that was bid into the market as DR**

This impacts customer revenue and participation in RA

- Export credit can increase compensated output for each battery by over **3.5x**
- California had **843 MW** of residential battery storage in 2023.
  - **<10 MW** participated in 3rd party wholesale integrated programs
  - **10.4 MW** participated in DSGS **in the first year of the program's battery offering**

Battery capacity in CA is growing, but most of it will be hidden from the market



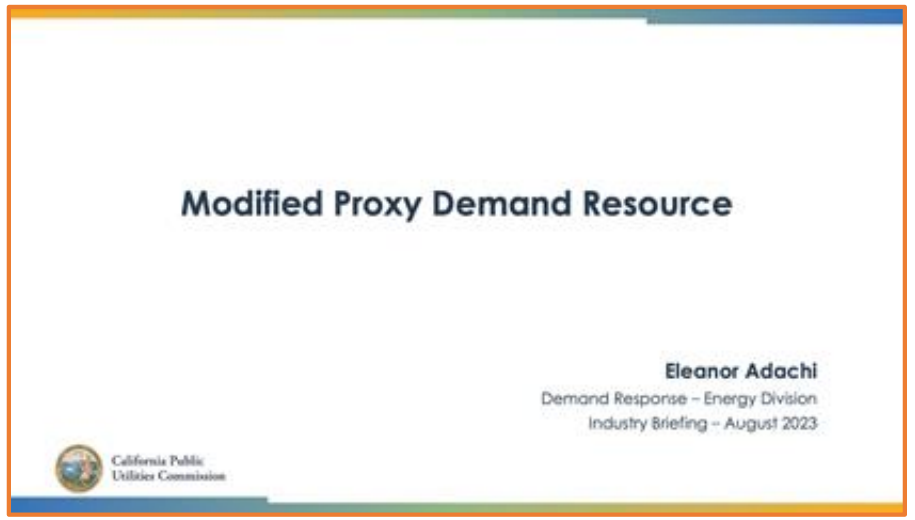
- Lack of export credits "hides" a substantial amount of residential battery capacity from CAISO
  - In 2024, roughly **620 MW** is "hidden" from markets - even assuming 100% customer participation
  - This "hidden" capacity is likely to grow to at least **1.4 GW** by 2030
- C&I batteries and bi-directional EVs likely to have an even larger impact
  - EVs expected to represent at least **5 GW** of "hidden" capacity by 2030

Modified PDR provides a potential solution

- In August 2023, Energy Division introduced a proposal for a **Modified Proxy Demand Resource** (mPDR)
- mPDR would **allow individual Service Accounts to export** so long as the total load at the SubLAP level is ***positive***

Benefits include:

1. CAISO awareness of exporting resources
2. Additional energy supply
3. Potential for additional capacity if recognized by the CPUC



PDR vs. mPDR Performance Calculations

With conventional PDR,
DR performance excludes
negative (export) intervals

Location	Baseline	Metered Load	Floored Load	PDR DREM	mPDR DREM
	A	B	C	= A - C	= A - B
1	5	**-1**	0	5	6
2	5	**-2**	0	5	7
3	5	3	3	2	2
4	5	2	2	3	3
Aggregation	20	2	5	15	18

With mPDR, customers are credited for their exports,
while net load at the sub-LAP remains positive

mPDR structure designed to address deliverability concerns

- DRP ensures aggregation load will remain positive at the sub-LAP level, so there's **no net export to transmission system**
- Resources will be interconnected under Rule 21, which will address any reliability concerns on the distribution system

With these conditions in place, a WDAT study should not be required

Discussion and Q&A

Thank You!

Please contact us if you have any questions.

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