



# Joint Agencies Vehicle-Grid Integration (VGI) Working Group

## WORKSHOP #3

NOVEMBER 14-15, 2019

10 AM – 5:30 PM AND 9 AM – 12:30 PM

CPUC GOLDEN GATE ROOM,  
SAN FRANCISCO, CA

# Agenda

Thursday 11/14

- 10:00-10:20 Agenda, participant introductions, and objectives of workshop
- 10:20-10:40 Update on Working Group extension and revised workplan
- 10:40-11:25 Report on methodology updates and review of draft Stage 2 Report
- 11:25-11:40 Subgroup B report on use case intake, screening, and scoring
- 11:40-12:00 Address by Commissioner Rechtschaffen
- 12:00-1:00 Lunch

# Agenda

- 1:00-4:00 Screening results review and confirmation
- 4:00-4:10 Break
- 4:10-5:30 Pilot scoring process review, insights, and recommendations
  
- Friday 11/15
- 9:00-10:00 Scoring process design and plan for completing
- 10:00-12:00 Exercise on ranking and prioritization and design and plan for completing
- 12:00-12:30 Conclusion, action items, going forward with revised workplan



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# Participant Introductions

# Workshop Objectives

1. Review use case submission and screening results and resolve screening disputes to the extent possible
2. Review experience with pilot scoring process and confirm plan for full scoring before next 1/16-1/17 workshop
3. Conduct an exercise on ranking and prioritization and confirm plan for full ranking before next 1/16-1/17 workshop
4. Confirm status of methodology updates and review draft Stage 2 Report

# Preliminary Principles and Priorities from Gridworks VGI Framing Document

Our methods of evaluating VGI's value should be:

- Inclusive without prejudice
- Able to leverage available information, identify and narrow any information gaps, and adapt to new information
- Reasonably efficient to implement, balancing progress, consensus building, time and accuracy
- Technology and business model neutral
- Transparent and clear
- Allows quantifiable analysis and assessment of benefits and costs
- Capable of recognizing the needs and interests of a broad constituency

# Update on Working Group Extension

- Final Report is now due June 30, 2020
- October 24 ALJ email ruling:

“Given the substantial complexity of the VGI Working Group scoping questions, in addition to the broad stakeholder participation in this working group, an extension of time is both reasonable and necessary to accomplish the reporting objectives of the VGI Working Group.”

# Work Plan – Revised Schedule



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Stage	Content	Sub-Group Working Schedule	Workshop	Follow-up Working Group Call(s)	Draft Report for Review
1	Kick-off	---	8/19	8/26	---
2	Vet and finalize PG&E VGI Valuation Methodology	8/20-9/20 (3 weeks)	9/26	10/3	11/1
3a	PUC Question 1	9/26-11/12 (5 weeks)	11/14-11/15	11/21	11/26
3b	PUC Question 1 (continued)	11/15-1/9 (5 weeks)	1/16-1/17	1/23	1/28
4	Interim Report	---	---		12/10
5	PUC Question 2 (compare to other DERS)	1/23-2/20 (4 weeks)	2/27	3/5	3/10
6	PUC Question 3 (policy recommendations)	3/16-4/23 (6 weeks)	4/30-5/1	5/7 5/14	5/19
7	Final Report	---	6/4	6/11 6/18	5/19



# Report on Methodology updates and Review of Draft Stage 2 Report

- Methodology discussions and resolutions took place during:
  - Work of Subgroup A (2 calls)
  - Methodology discussions during 9/26 workshop (all-afternoon brainstorming) and 10/3 Working Group call
  - Work of Subgroup B (7 calls and much offline work)
- Methodology issues addressed, resolved, and incorporated into screening and pilot scoring (see Table 1 in draft Stage 2 Report)
- Any further methodology issues for scoring and ranking; let's address during those sessions later today and tomorrow

## Remaining comments on 10/11 version of methodology not yet considered:

- CPUC: It is still unclear how this valuation method provides a path to accomplish [PUC Question 2 on DER Comparisons]
- CPUC: For Step 6, “Make Recommendations on Policy, Market, or Technology”, Energy Division staff has several recommended modifications.
- GPI: While the early scope of this working group is on single point charging, GPI urges stakeholders to craft proposals with multiple point charging in mind – using different locations to charge the same EV & mobile inverter.
- GPI: Use cases where data is not currently available should be filtered and set aside for additional due diligence, rather than rejected.

# Subgroup B Report on Use Case Intake, Screening, and Scoring

# Address by Commissioner Rechtschaffen



# Lunch

# Screening Results Review and Confirmation

Of the roughly 1,100 unique use cases submitted by parties and screened by Subgroup B:

“Pile A”: 306 “Pass” results

- 72 residential, 115 commercial, 119 MHV
- Including 64 V2G results across all sectors

“Pile B”: 672 “Fail” results

“Pile C”: 136 “Disputed” results

- Some of the disputed results might be resolved through consensus assumptions (rules)

# Possible Consensus Assumptions (Rules) – PG&E/SCE/Enel X



	V1G - Indirect	V1G - Direct	V2G - Indirect	V2G - Direct
FAILS SCREEN IF....				
Resource alignment is...	Misaligned		Misaligned	
Or Sector is....	SFH - Fragmented	SFH - Fragmented	SFH - Fragmented	SFH - Fragmented
	MUD - Unified	MUD - Unified	MUD - Unified	MUD - Unified
	Public-Commute - Unified	Public-Commute - Unified	Public-Commute - Unified	Public-Commute - Unified
				Public-Commute - all grid services
				Fleet -Tansit-Bus - all grid services
				Rideshare - all grid services
Or Application is....	RA-flex	Frequency regulation	RA-flex	RA-flex
	RA-local	Spinning	RA-local	RA-local
	Real-time	Non-Spinning	Real-time	Day-Ahead Energy
	Voltage support	Backup	Voltage support	Real-time
	Frequency regulation		Frequency regulation	Voltage support
	Spinning		Spinning	Frequency regulation
	Non-Spinning		Non-Spinning	Spinning
	Backup			Non-Spinning

# Possible Consensus Assumptions (Rules) – Team 3

- No clear market rules or financial incentives for renewable integration.
- Rule 21 rules and EV/EVSE certification issues for discharging EV power to the grid would not be resolved in near-term except for separately metered EVSE managed DC V2G.
- V2H or V2B without export to the grid will be feasible for BTM use cases in near-term
- System voltage support will not have sufficient retail/interconnection rules in place and adoption will be too low
- Distribution upgrade deferral not feasible in near term for LDV. Not enough penetration of participating EVs at particular circuit/feeder.
- Small penetration of EV at MUD and limited/no public data available on MUD (as opposed to SFH) driving and charging patterns.
- Self Generation Incentive Program (SGIP) plans on providing GHG signal for energy storage that could also be used by EVs for GHG emissions reduction.
- ESDER 3 and ESDER 4 notwithstanding, CAISO market rules will be technically and cost prohibitive for BTM LDVs to provide frequency regulation with either V1G or V2G in near term.



# Possible Consensus Assumptions (Rules) – Team 6

- Fail combination of Sector and Resource Alignment that is not reasonable, logical, or possible. This includes:
  - Residential – Single Family Home // Fragmented
  - Commercial – Public-Commute // Unified
  - Commercial – MUD // Unified
  - V1G Backup-Resiliency
- Fail the following:
  - Indirect // Fragmented – Misaligned
  - System, Real-Time Energy // Indirect
  - System, Real-Time Energy // Direct
  - System, Frequency Regulation Up/Down
  - System, Voltage Support
- Overall, the team believes that most V2G in the “now” timeframe will likely be V2B or V2H. Therefore, the team filtered out most of V2G use-cases that result in net-export back to the grid.
- The team PASSED V2G // Backup-Resiliency use-cases

# Possible Consensus Assumptions (Rules) – Team 8

- Assume aggregation is an option in all cases
- Assume V2G-DC interconnection will be allowed in the “now” but V2G-AC interconnection may not - did not consider V2G in storage RFOs but maybe should have
- Assume V2G can represent vehicle-to-building / site in some cases
- Assume “misaligned” still allows for some level coordination
- Assume indirect implies some sort of price signal from utility, CCA, charging network, or aggregator (there will be difference in network costs, but that is not relevant in this preliminary screening stage)
- Assume indirect also can be purchase of lower level charging equipment at home or commercial site (could be attributed to incentives or education)
- Assume Commute represents DC fast charging “gas station” / charging plaza model. Assume low adoption of many use cases due to time-constraint of “commute” category
- Assume day-ahead and real-time use cases may have some adoption due to CCAs possibly pursuing this.
- RA use cases fail screens due data availability (RA contracts/bids are sealed)
- V1G is not technically capable of providing both Frequency Regulation Up and Down. Assume it is providing only one service, in which case it may pass. Even so, adoption may be low given economics.
- Assume Customer – Upgrade Deferral implies the upgrade would be on the customer-side
- For Backup/Resiliency: V1G, of course V1G is not able to provide backup power. However, managed charging could help to improve resiliency in the event of rolling blackouts. This depends on the definition of resiliency.

# Possible Consensus Assumptions (Rules) – Team 9

- Fleets unlikely to engage in fragmented resource alignment
- MD manufacturer not making V2G capability in “now” timeframe.
- Some Applications require V2G (eliminate use cases where application and V1G incompatible).
- Voltage support unfeasible in “now” timeframe due to lack of program (direct) or rate design (indirect).
- Customer may not participate in both retail and wholesale markets with V2G under FERC/CAISO rules
- V2G indirect and direct are not feasible in the "now" timeframe for separately metered EVSEs
- Resource Adequacy (RA)—no resources have been successfully “accepted” as meeting the 4 hour availability or must-offer obligation under ESDER. In the short term, RA is unlikely to be adopted because of 24 hour advance bid requirement.
- Demand Response, Non-export (PDR) applications cannot participate in frequency regulation. There is no frequency regulation market product for CASIO
- EV chargers and vehicles are not technologically able to meet System - Spinning Reserve requirements to drop service based on frequency thresholds.



# Pilot Scoring Process Review, Insights, and Recommendations

[[Pilot Scoring Process Results to be Added]]

# Some Pilot Scoring Insights (And Other Insights from the Pilot Scoring Team?)

- Clarifications of sectors (i.e., residential multi-family dwellings are generally on commercial rates)
- Reference and baseline levels (i.e., total population of EVs by 2022, managed vs. unmanaged charging)
- Customer vs. system applications for benefits
- Combine GHG reduction & renewable integration?
- Including cap and trade values?



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# VGI Grid Benefits Estimation

CPUC VGI Working Group

November 14, 2019

Eric Cutter, Director

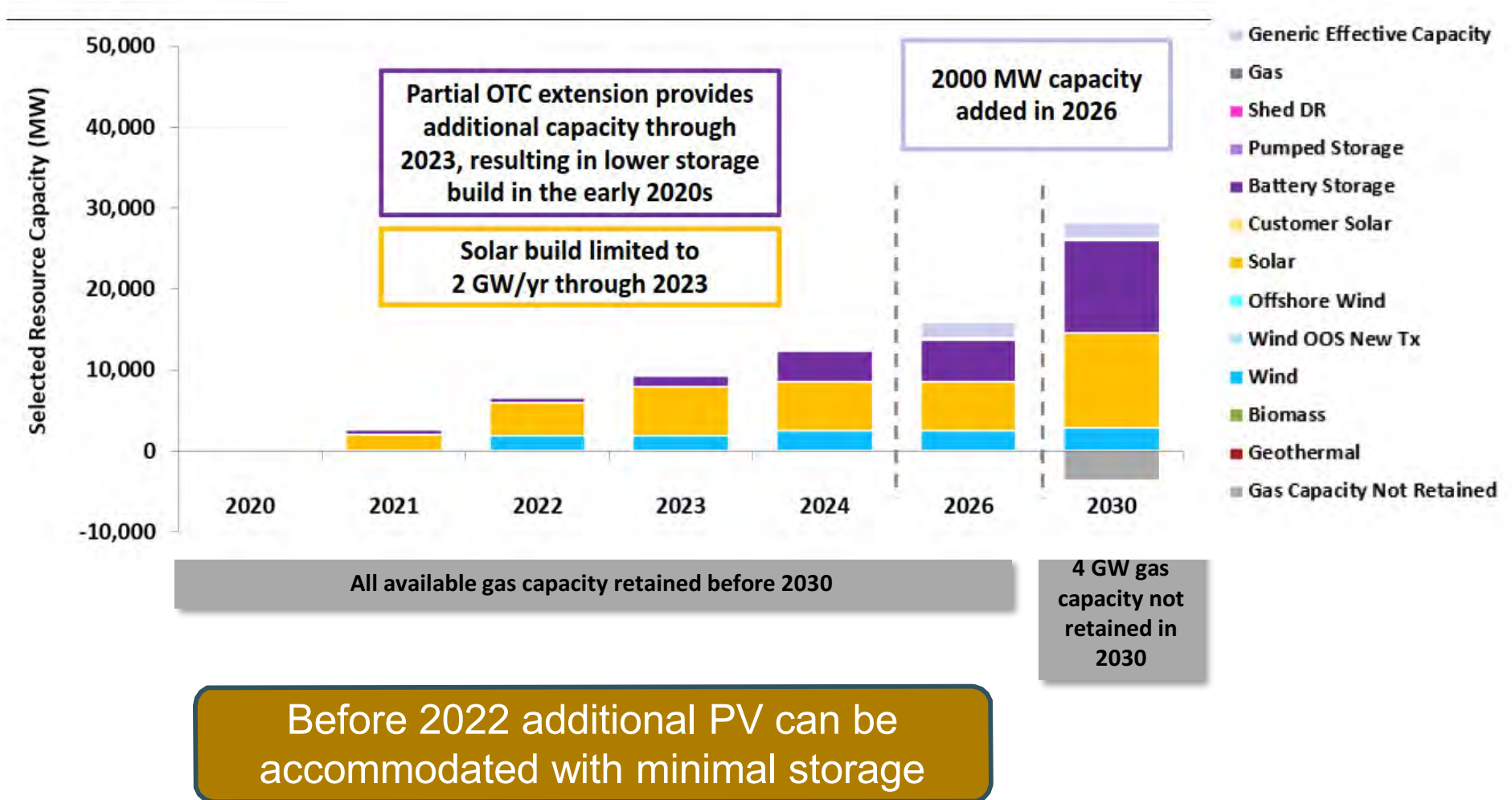


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# IRP Near Term Market Outlook

# 2019 IRP Proposed Reference System Portfolio

## 46 MMT Alternate

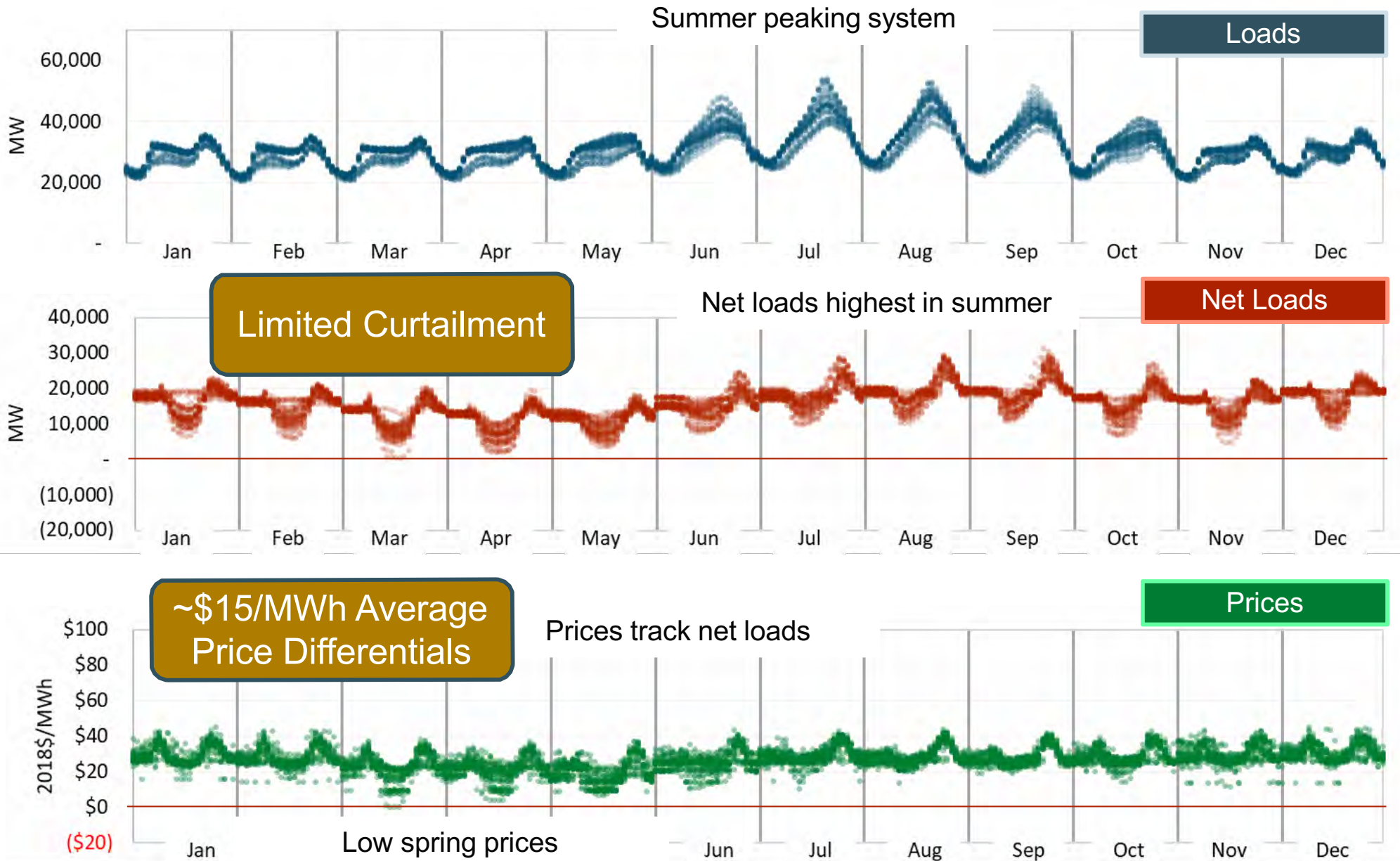


Note: resources shown in this chart are in addition to baseline resources



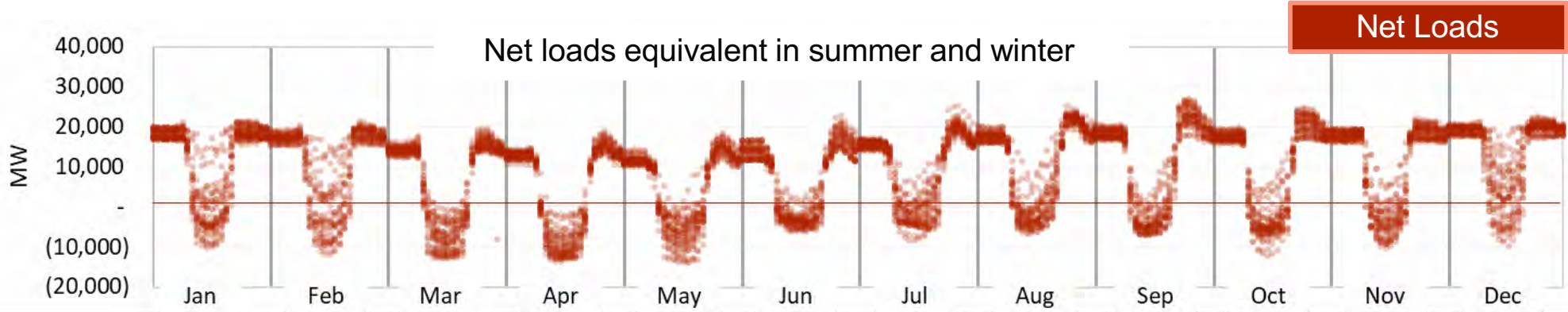
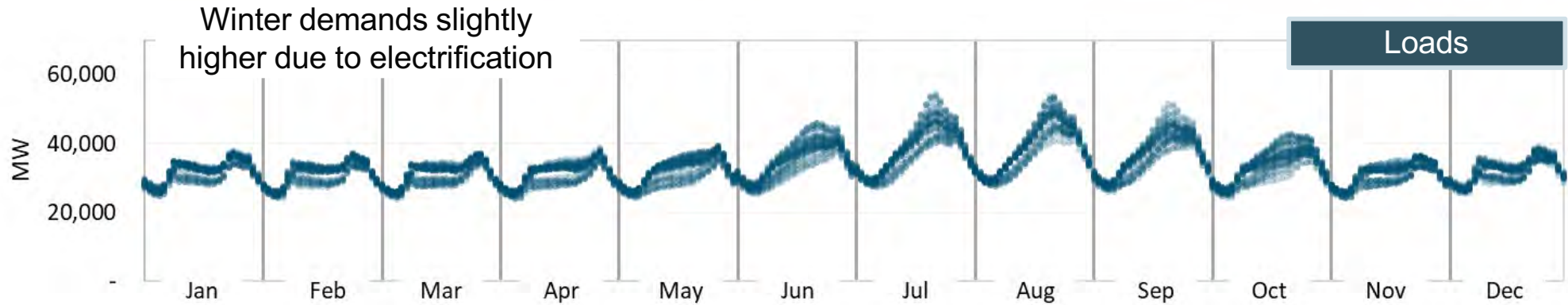


# 2020 Snapshot: Loads, Net Loads, Prices

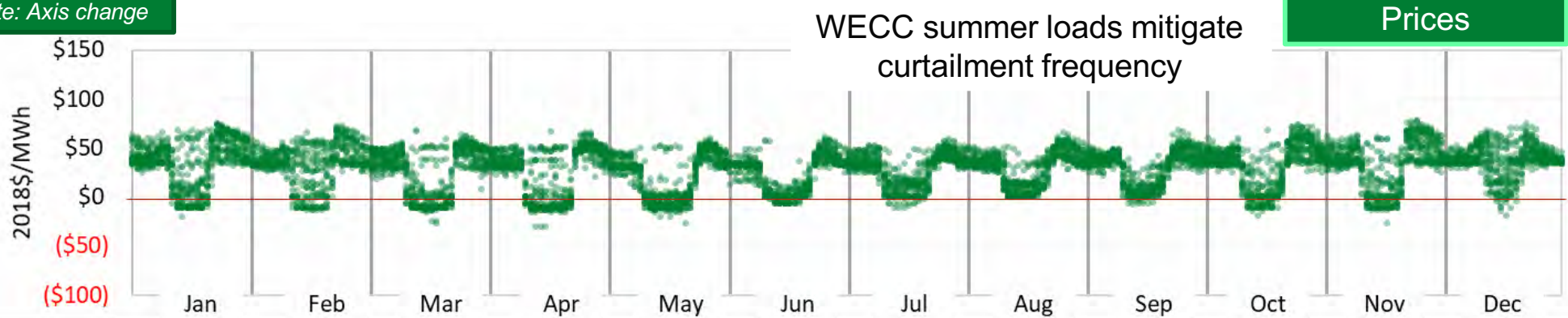




# 2030 Snapshot: Loads, Net Loads, Prices



Note: Axis change





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# Example Benefit Calculations



# Example Calculation of Day Ahead Energy Use Case for BEV

Charge per Day

Value of shifting

$$\$383 = 70 \text{ kWh} \times \frac{\$15}{\text{MWh}} \times 1 \text{ MWh} \times 365 \text{ days} \times 1,000 \text{ kWh} \times 365$$

% Charge per Day

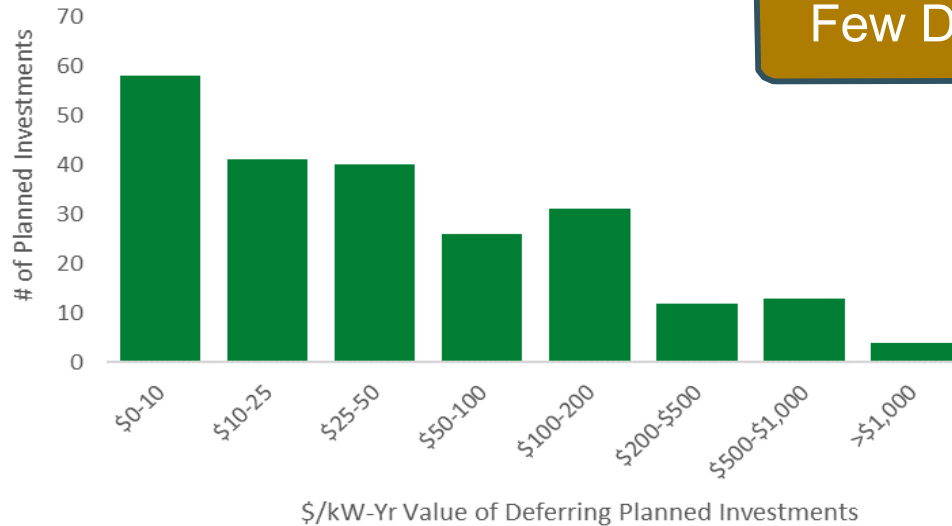
$$\$191 = 70 \text{ kWh} \times \frac{\$15}{\text{MWh}} \times 75\% \times 30\%$$

% Access to Daytime Charging



# Estimating Low Value for Grid Upgrade Deferral

Most upgrades < \$200/kW-yr.



Few Deferrable Grid Upgrades

# of EVs on Feeder?

4,263 circuits (PG&E territory)

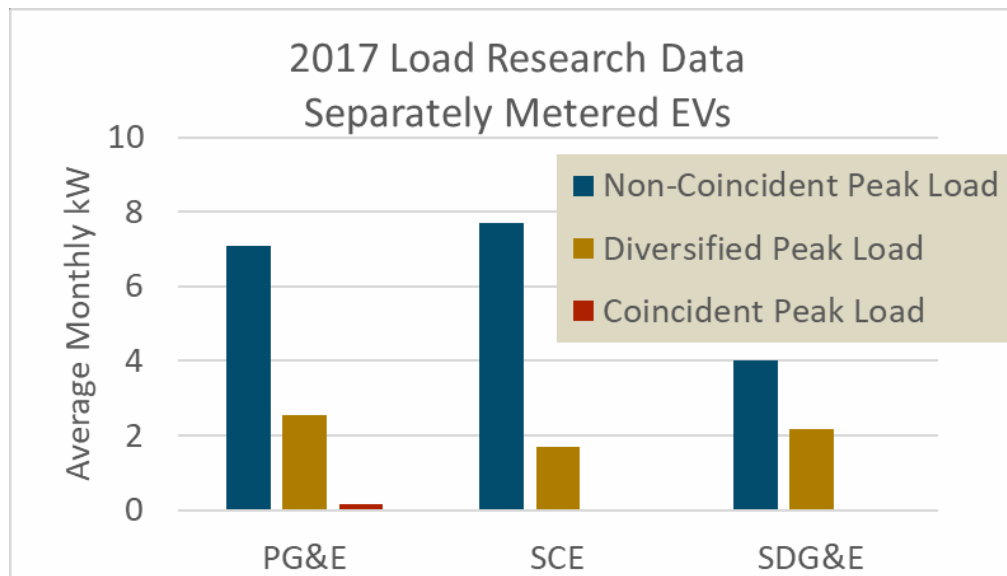


276 planned investments



30 identified as "Deferrable"

% of EVs charging on peak?



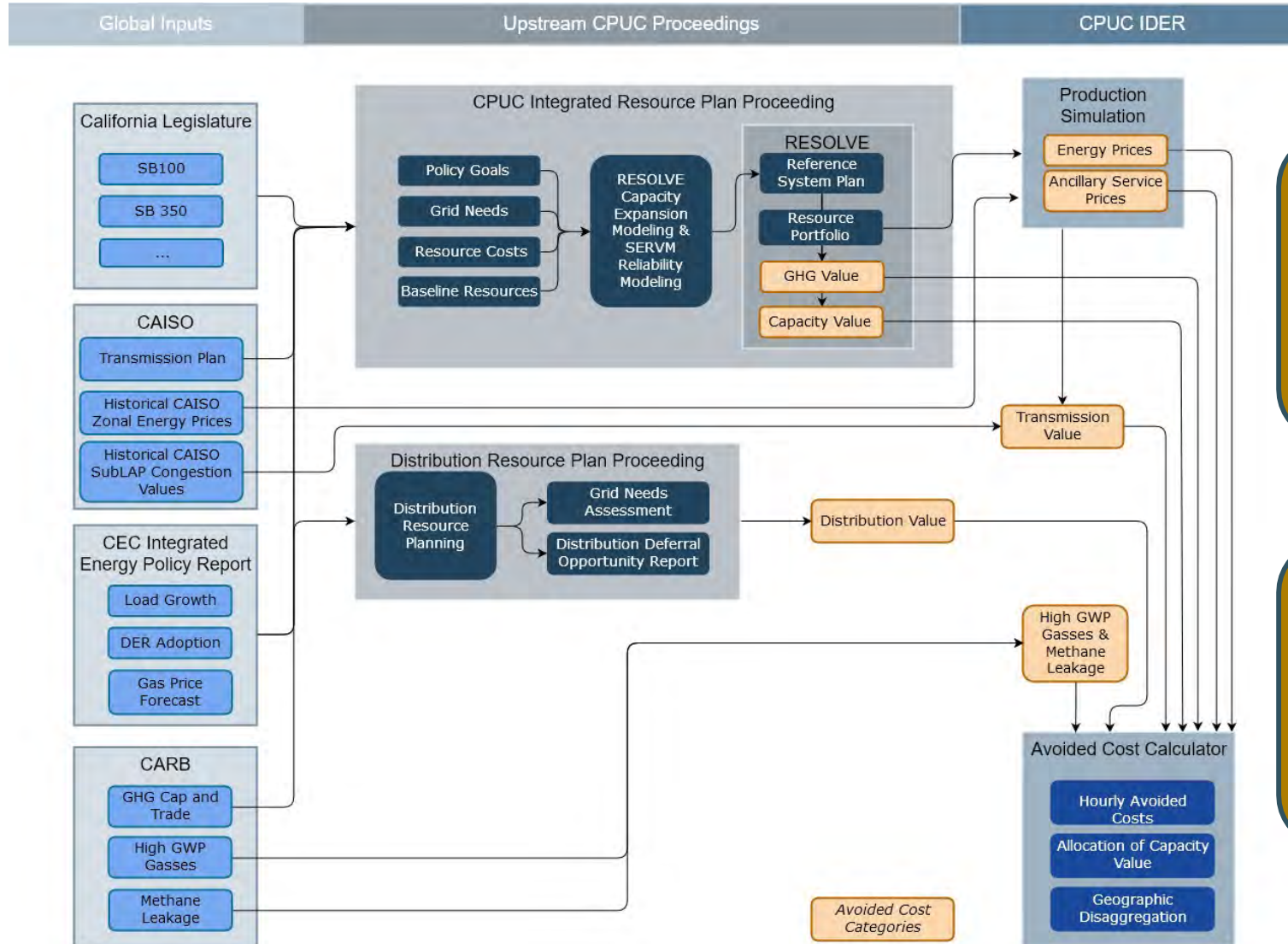


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# 2020 Avoided Cost Update



# Plan for 2020 Avoided Cost Update

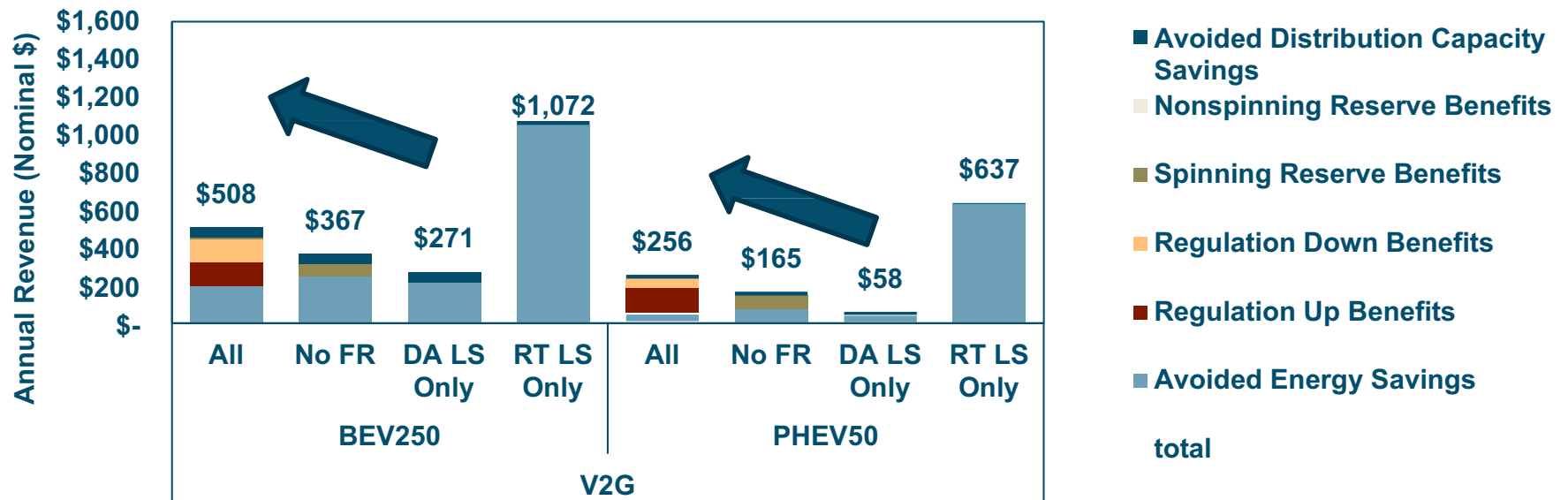


2020 Avoided Costs aligned with IRP to value grid services from VGI

Potential for more detailed analysis of selected use cases



# V2G Revenue for BEV250 and PHEV50



DA – Day Ahead Energy  
RT – Real Time Energy

FR – Frequency Regulation  
LS – Load Shifting

- + Increasing revenue potential with additional market services
- + Potentially high revenues in real-time energy market, but harder to forecast and capture

*Price taker, perfect foresight co-optimized dispatch with market prices derived from 2018 42MMT Case*



# Scoring Process Design and Plan for Completing

- Possible process: separate use cases by Sector, then divide into “Customer” and “System” Applications, and then further divide into V1G vs. V2G
- For Benefit assessment:
  - Focus on Sector, Application, and Type dimensions
  - Do one benefit metric for all use-cases, then do the other metric for all use-cases; this helps comparing and benchmarking among use-cases
  - When done with scoring on both metrics: review all scores and see if considering Approach or Resource affect your results
  - Throughout: Document assumptions!
  - Develop consensus assumptions, such as Indirect use-cases are likely to have higher {EV Population} than Direct, and Direct use-cases are likely to have higher {\$/EV} than Indirect

# Scoring Process Design and Plan for Completing

- How to divide the use cases to be scored? By sector? (11 sectors) And/or by application?
- Scoring done in small teams for a group of use cases. Team can select one or more sectors, does not have to score every use case in that sector, can score a subset of a sector.
- Scoring process could be time-extensive you are encouraged to focus on the sectors/sub-sets you feel most able/interested in contributing to
- How to ensure consistency for a given metric across all use cases?

# Exercise on Ranking and Prioritization and Design and Plan for Completing



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# Plan for Ranking and Prioritization

# Wrap Up

## General

- Recap action items
- Confirm revised work plan
- Other items?
- Next Workshop: 1/16-1/17 in San Francisco

## Subgroup “B”

- Sub-group work schedule: 11/17 to 1/9
- First sub-group planning call: (Date and time)
- Sub-group progress calls: TBD