

# Intelligent Electric Vehicle Integration (INVENT)

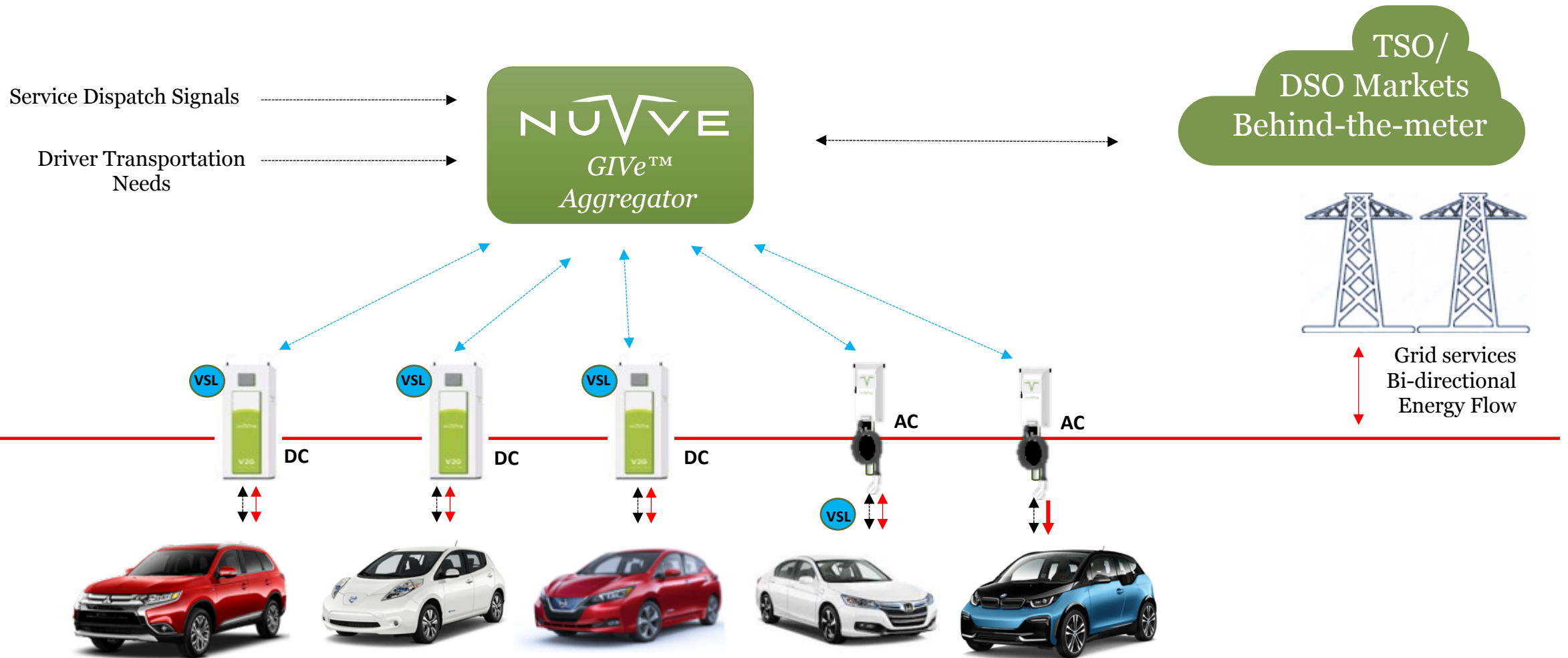
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EPC 16-061



# Project Architecture



Control signals      Bi-directional energy flow      VSL Vehicle Smart Link Software – Software Defined Charging Station



# Demonstrating a range of services and quantifying the value / stakeholder benefit



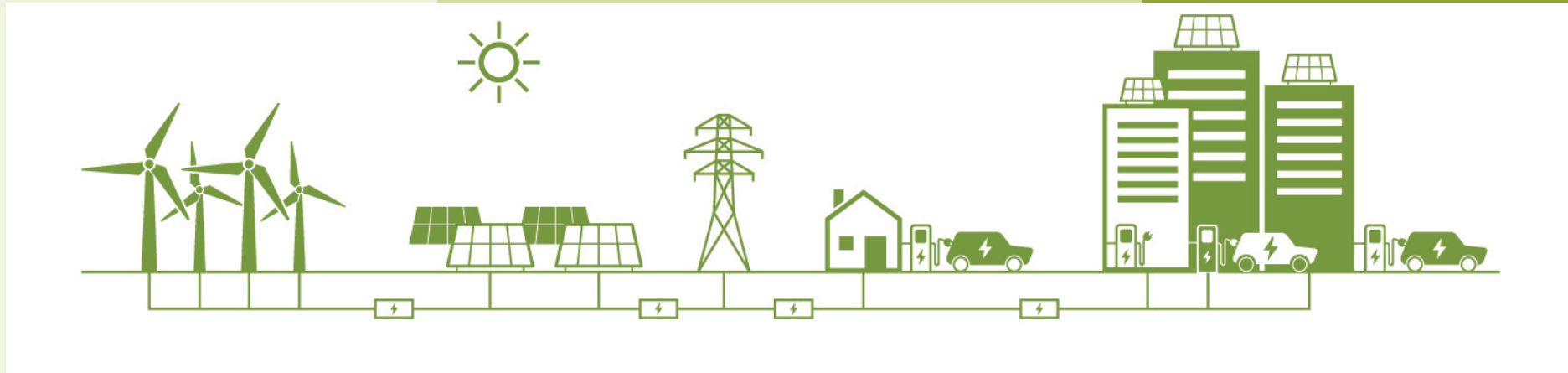
***Vehicle-to-Building  
(V2B)***



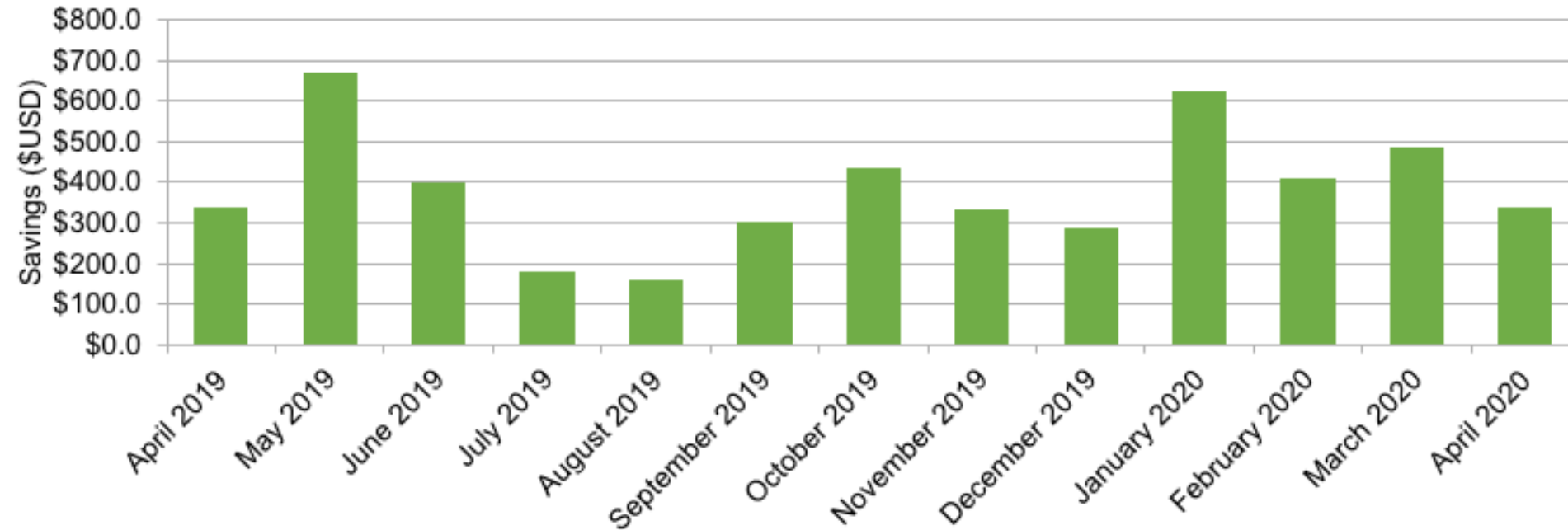
***Frequency  
Regulation***



***Demand  
Response***



# Demand Charge Management Results

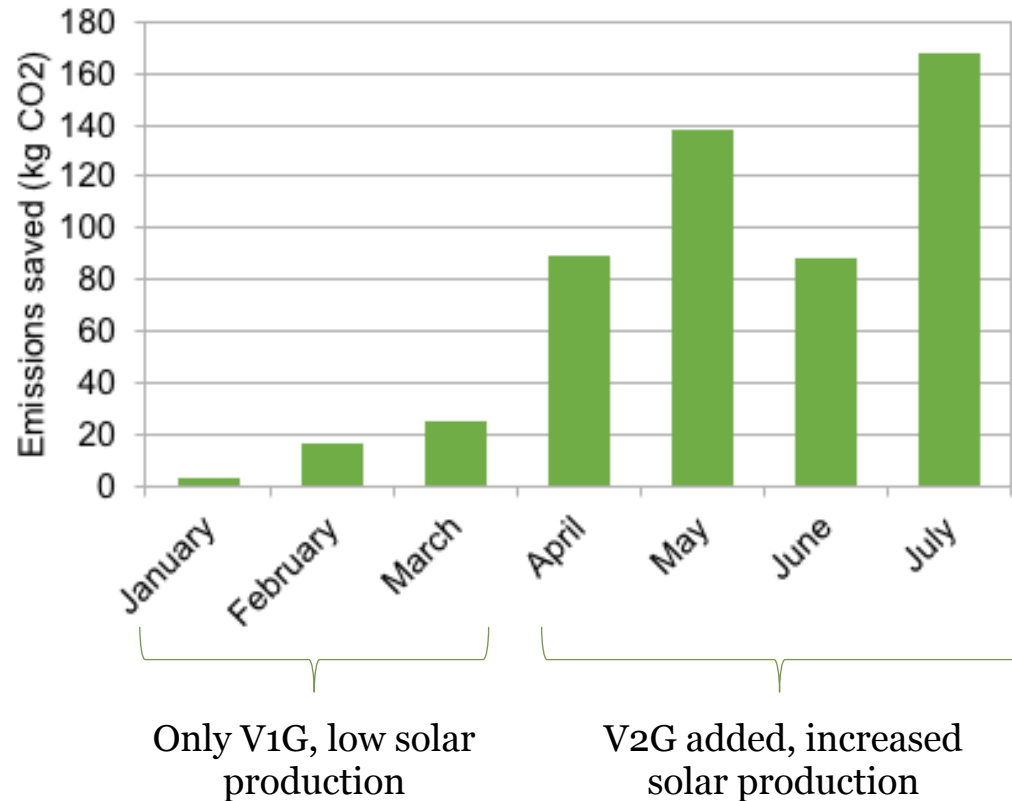


Leveraging 3 V1G (19.8 kW) and 2 V2G (20 kW) EVs + EVSEs results show:

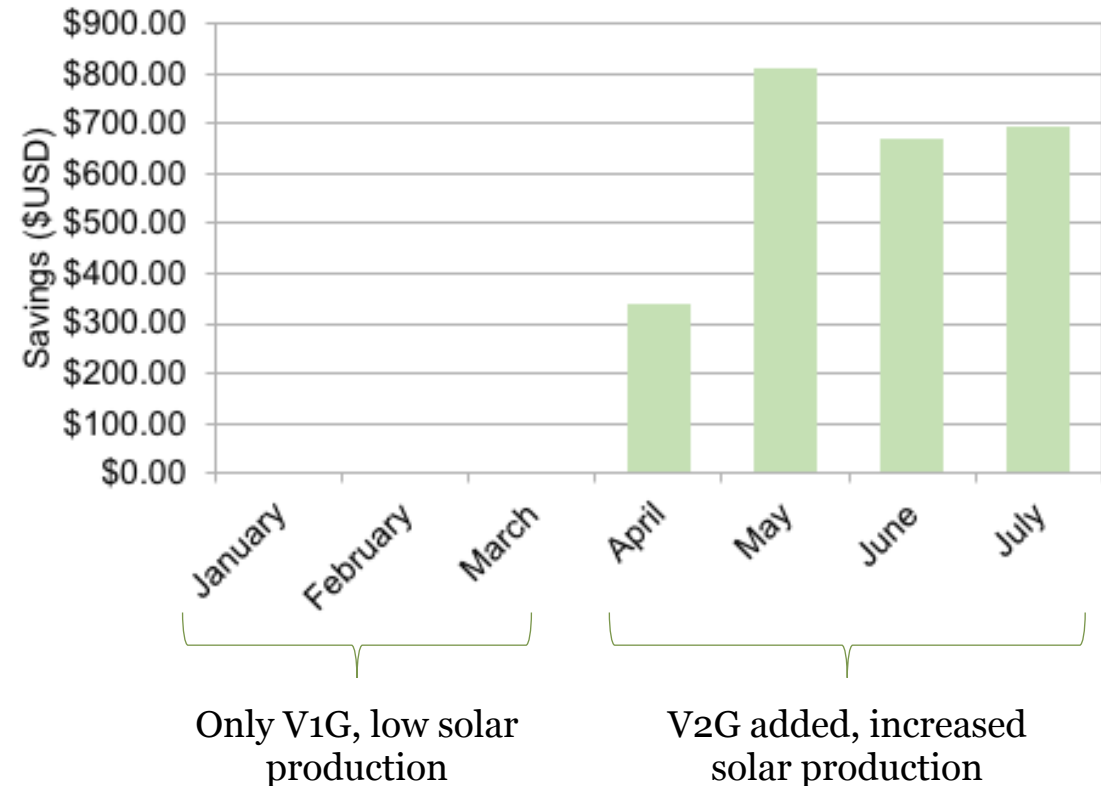
- Average ~**\$385 / month** of savings
- Average **9% reduction** of overall monthly bill
- Potential for ~**\$4,600 annual savings** for a typical parking garage (max demand ~100 kW) in SDG&E territory (AL-TOU C&I rate)

# Renewable Energy Time Shift Results

## Emissions Saved (kg CO<sub>2</sub>)



## Monthly Bill Savings (\$)



Use case leveraged 4 V1G EV/EVSEs (26.4 kW) and 2 V2G EV/EVSEs (20 kW)



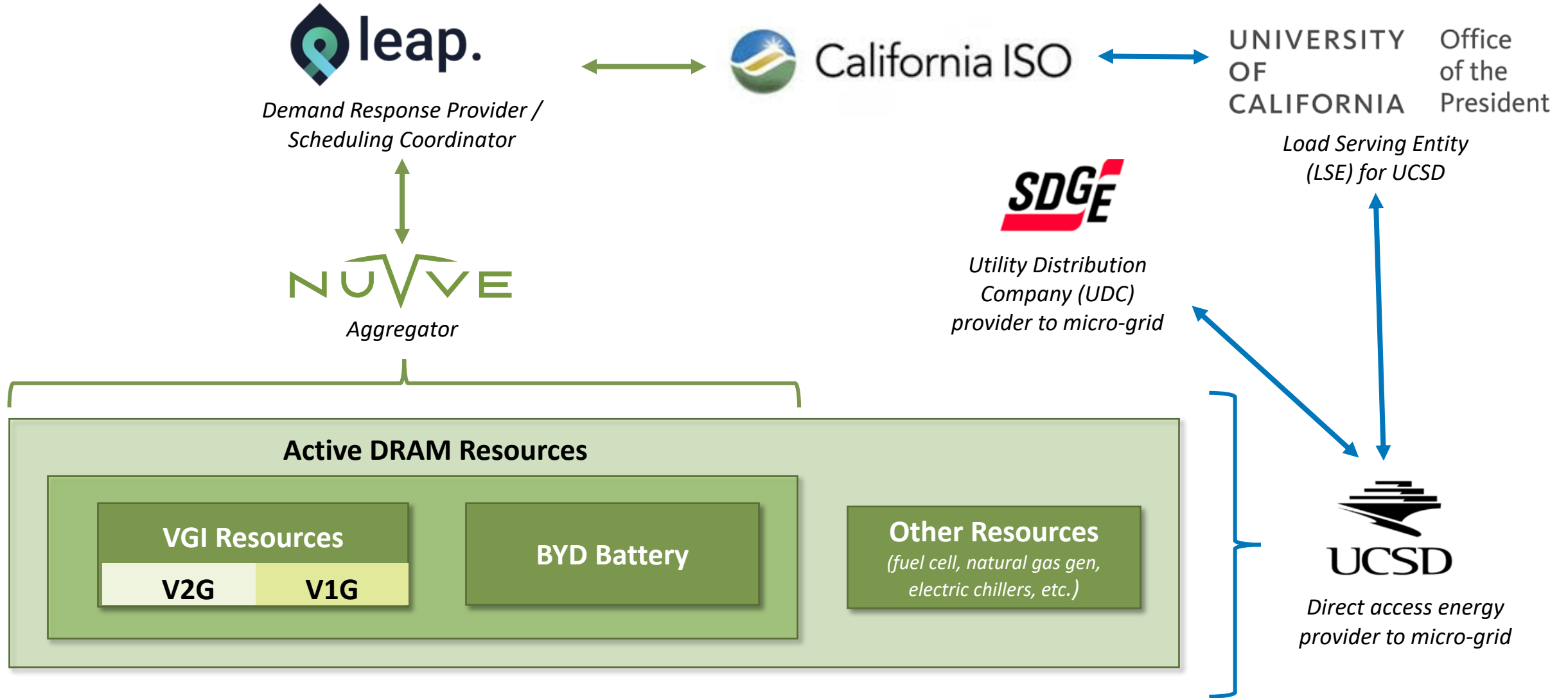
# Frequency Regulation

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- Currently, there is not a standardized process for retail and wholesale settlement for behind the meter resources providing reg up and reg down that allows for a viable business model.
- Therefore, with input from CAISO, the INVENT project decided to focus on demonstrating the technical abilities of EVs / EVSEs to provide regulation up and down within CAISO's required operating parameters.
- INVENT will build on analysis conducted under the EVSA project<sup>1</sup> and evaluate the performance accuracy of a diverse set of aggregated V1G and V2G EVs and EVSEs responding to a historical AGC dispatch signal.
- This work will further CAISO's understanding of the potential of EVs/EVSEs to participate in the wholesale market.

<sup>1</sup> [EVSA Final Report](#)

# Demand Response Auction Mechanism (DRAM)



# DRAM 2020 Market Results

	June	July	August	September
Capacity (\$)	\$ 15,660	\$ 39,161	\$ <b>28,710</b>	\$ <b>15,660</b>
Energy (\$)	-	\$ 925	\$ <b>(1,970)</b>	<b>TBD</b>
Demonstrated Capacity (MW)	1.8	3.4	<b>4.6</b>	<b>3.9</b>

— Preliminary results —





# Challenges of DR on a Micro-grid



**UCSD Micro-grid  
Load (SDG&E Imports)**

- Low loads due to COVID-19
- Notable load changes between weekends and weekdays



**Large Generators  
(natural gas generator,  
fuel cell, etc.)**

- Prohibited Resources (*per DRAM program rules*)
- Generator outages for planned maintenance



**BYD Battery  
(2.5 MW/ 5 MWh)**

- Capacity degradation (~4 MWh)

- *Impacts baseline calculations and ability to demonstrate load reduction with the project assets*

# Questions

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