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Vehicle-Grid Integration Market Status
CEC Workshop

7/28/2022

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PG&E's Vehicle-Grid Integration (VGI) Vision

PG&E will unleash the full potential of electric vehicles as resources for backup power, demand response, and reliable energy through V2X technology.

General Motors Field Demo (2022)

PG&E-led R&D effort to enable CCS bidirectional technology with retrofit GM Chevy Bolts and 3rd party chargers.

- SUMMER '22 Lab testing at PG&E's Advanced Technology Services (ATS) lab
- FALL '22 Field trial with small subset of customers to test V2H capabilities
- Collaborate on open charging standard

Ford Motor Company Field Demo (2022)

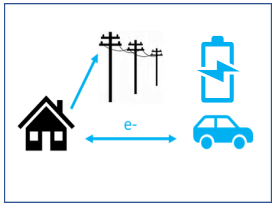
PG&E collaboration with Ford to enable first-to-market F-150 Lightning EV and bidirectional charging system.

- First commercially available residential installation in the country
- '22 –'23 Field trial with small group of PG&E customers
- Part of nationwide testing at ~30 homes

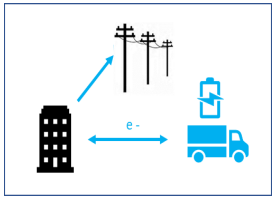
PG&E's Vehicle-Grid Integration (VGI) Pilots

Objective: PG&E's V2X pilots will help determine cost-effective V2X solutions and pathways to scale deployment.
Timeline: 2022 Q3 – 2025 Q3

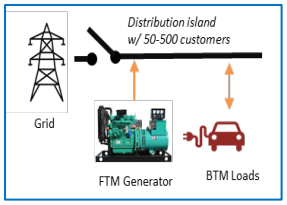
V2X - Residential



V2X - Commercial



V2M - Microgrid



	V2X – Residential	V2X – Commercial	V2M – Microgrid
Objectives	Give residential customers access to V2X technology, determine pathways to scale and enable the following services: Phase 1 - V2H Backup power Phase 2 - V2G Bill management - V2G Real-time energy (via dynamic rate) - V2G RE integration	Give commercial customers access to V2X technology, determine pathways to scale and enable the following services: Phase 1 - V2H Backup power Phase 2 - V2G Bill management - V2G Real-time energy (via dynamic rate) - V2G Dist. upgrade deferral	Enable BTM-sited vehicles to charge/discharge in a PSPS-formed microgrid to support community resiliency.
No. of Pilot Participants	1,000	200	Hundreds
Total Budget	$7.5 million	$2.7 million	$1.5 million

PG&E's Vehicle-Grid Integration (VGI) Pilots

Objective: PG&E's V2X pilots will help determine cost-effective V2X solutions and pathways to scale deployment.
Timeline: 2022 Q3 – 2025 Q3

Pilot	Upfront Incentive(s)	Performance-Based Incentives (PBI)
Pilot 1 – V2X Residential	• $2,500 for non-DAC • $3,000 for DAC	• Up to $2,000
Pilot 2 – V2X Commercial* ***[Originally Proposed]***	• $2500 for non-DAC • $3,000 for DAC	• Up to $3,625
Pilot 2 – V2X Commercial* ***[Revised in July 5th AL – Pending Approval]***	• $2500 for non-DAC w/ < 50 kW • $3,000 for DAC w/ < 50 kW • $4,500 for non-DAC w/ ≥ 50 kW • $5,000 for DAC w/ ≥ 50 kW	• Up to $3,625
Pilot 3 – V2M PSPS Microgrid	• Obtained from Pilot 1 or 2 participation	• Up to $3,750

*Per AL 6637-E: "Incentives will be offered based on the total number of chargers (regardless of the number of dispensers each charger has). Every charger must have at least one unique bidirectional EV that can discharge at it to qualify for the per charger incentive."

Other VGI Pilot Programs at PG&E

- ELRP
- DRP DIDF and Partnership Pilot
- Electric School Bus Renewables Integration Pilot
- EV Charge 2 (EVC2)
- Medium or Heavy-duty Fleet Customer Demonstration
- PG&E Commercial electric vehicle day-ahead hourly real time pricing pilot (DAHRTP-CEV pilot)
- ChargeForward Stage III

Barriers to Widespread V2X Adoption

- Challenges with existing compensation frameworks/rates
  - Unlike solar, we don't know if the vehicle was charged from renewable sources so NEM would not apply
  - Compensation beyond baseline usage is not defined for V2G resources

- Challenges with customer enrollment, tech, or backend integration
  - Required changes to billing systems
  - Long process for bidirectional EVSE to get UL certified
  - Chip shortage has delayed both EVSE and V2X compatible EVs

Barriers to Widespread V2X Adoption (cont)

- Interconnection
  - Lack of a pathway to enable participation using the AC approach
    - Inverter is in the vehicle, so it can discharge in more than one location so creating
    - Lack of a UL standard for AC approach

Barriers to Widespread V2X Adoption (cont)

- Cost of equipment and electrical upgrades/retrofits
  - Residential, costs for electrical upgrades/retrofits should be similar to other drivers (Solar, EV Charging, etc)
  - EVSE equipment is significantly more expensive due to:
    - New technology, lower volumes = more expensive
    - Currently, bi-directional chargers must use the DC approach which are more expensive than AC level 2.
    - For DC, a UL 1741 (SA) inverter is required at additional expense
  - Installation is more expensive
    - Rule 21 (small generator) study/agreement is required
    - Installation may include separate inverter
    - DC chargers often require a higher capacity circuit than common level 2 chargers

Thank you! Questions?

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