

DOCKETED

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Vehicle-to-Grid System Integration Focus

February 8th, 2023



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This is our start.



PG&E, Ford to explore electric pickup truck as backup generator for home

Rebecca Bellan @rebeccabellan / 8:27 PM PST • March 10, 2022



Image Credits: Ford Motor Company

Pacific Gas and Electric Company (PG&E) and Ford Motor Company are collaborating to explore how Ford's Lightning electric pickup trucks in the California utility...

General Motors on a... abilities to send electric... an outage. The uti...



DIVE BRIEF

California approves \$11.7M vehicle-to-grid pilots in PG&E footprint

Published April 1, 2022 • Updated May 6, 2022

Kavya Balaraman Senior Reporter



Anthony Devlin via Getty Images

UPDATE: May 6, 2022: The California Public Utilities Commission on Thursday approved three vehicle-grid integration pilots, estimated to cost \$11.7 million, for Pacific Gas & Electric Co. The programs will help the utility support electric vehicle deployment and bidirectional charging equipment — technology that regulators say will help provide backup power, build resiliency, and lower the cost of EV ownership.

GM is working with PG&E to turn electric vehicles into a virtual power grid in California

And possibly the electrical grid
By Andrew J. Hawkins | @andyjayhawk | Mar 8, 2022, 8:30am EST | 4 comments



Green Car Congress

Energy, technologies, issues and policies for sustainable mobility

BMW Group and PG&E launching ChargeForward Phase 3 pilot; V2G testing

23 March 2021

BMW Group and Pacific Gas and Electric Company (PG&E) announced an expanded program to charge renewable energy to sustainably power electric vehicles. The program includes a new charging program to offer customers mobile optimizing their EV electric...

General Motors and utility Pacific Gas and Electric can be used to power people's homes during a blackout during times of peak demand. The pilot will take place during wildfires are putting strain on the state's energy infrastr...

We're focusing on technology barriers

1

Safety and transition to islanded mode

- Lab testing of CCS and CHAdeMO single-phase DC chargers with OEMs for use in homes
- UL1741 covers only on-grid performance with *gaps on transition and islanded modes*

Island transition testing

- No load, full load, and overload transitions
- Loss of communication to isolation device
- Mechanical failure or sensor failure in isolation device
- Return to grid

Island power quality

- Resistive and reactive load banks, no load to overload
- Unbalanced single phase loading
- Performance on motor loads and inrush

Fault testing

- Line-to-line fault at panel
- Line-to-neutral fault at panel

We're focusing on technology barriers

2

CCS1 interoperability and communications

- Engaged multiple vendors and OEMs on modified bi-directional DIN 70121 capability
- Focused on *single phase* inverters and retrofitting *existing light duty vehicles*

DIN 70121 discharge

- At project start no viable ISO 15118-20 solutions existed
- Modified DIN 70121 to signal discharge values
- Successful discharge of mass market LDV over CCS1

J2847-2 V2G update

- Shared our experience with the SAE
- Draft interoperable bi-directional standard update complete
- Estimated adoption Q4/Q1

Standards adoption

- Future workstream...
- Push for adoption of J2847-2 V2G with chargers and vehicles
- Harmonize J2847-2 with ISO 15118-2/20

We're focusing on technology barriers

3

Interconnection, field pilots, and programs

- Simplifying processes for DC V2H to fast-track interconnection and streamlining for V2G
- First installations on our network to identify any unknowns from lab to production state

Interconnection

- Electric Rule 21 applies to any generator that “parallels” the utility
- Exploring potential for V2H to bypass or fast-track
- Handholding first V2G applications through

Field pilot learnings

- Understanding areas of CX improvement
- Identifying valuable data types for tech dev
- Creating process connections for DR and incentive programs

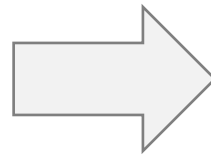
VGI pilot programs

- Data connections to OEMs for program data
- Explore capabilities of V2H, TOU, and DR
- Learnings lead to development of follow on programs

Key challenge #1: Interoperability

Challenges

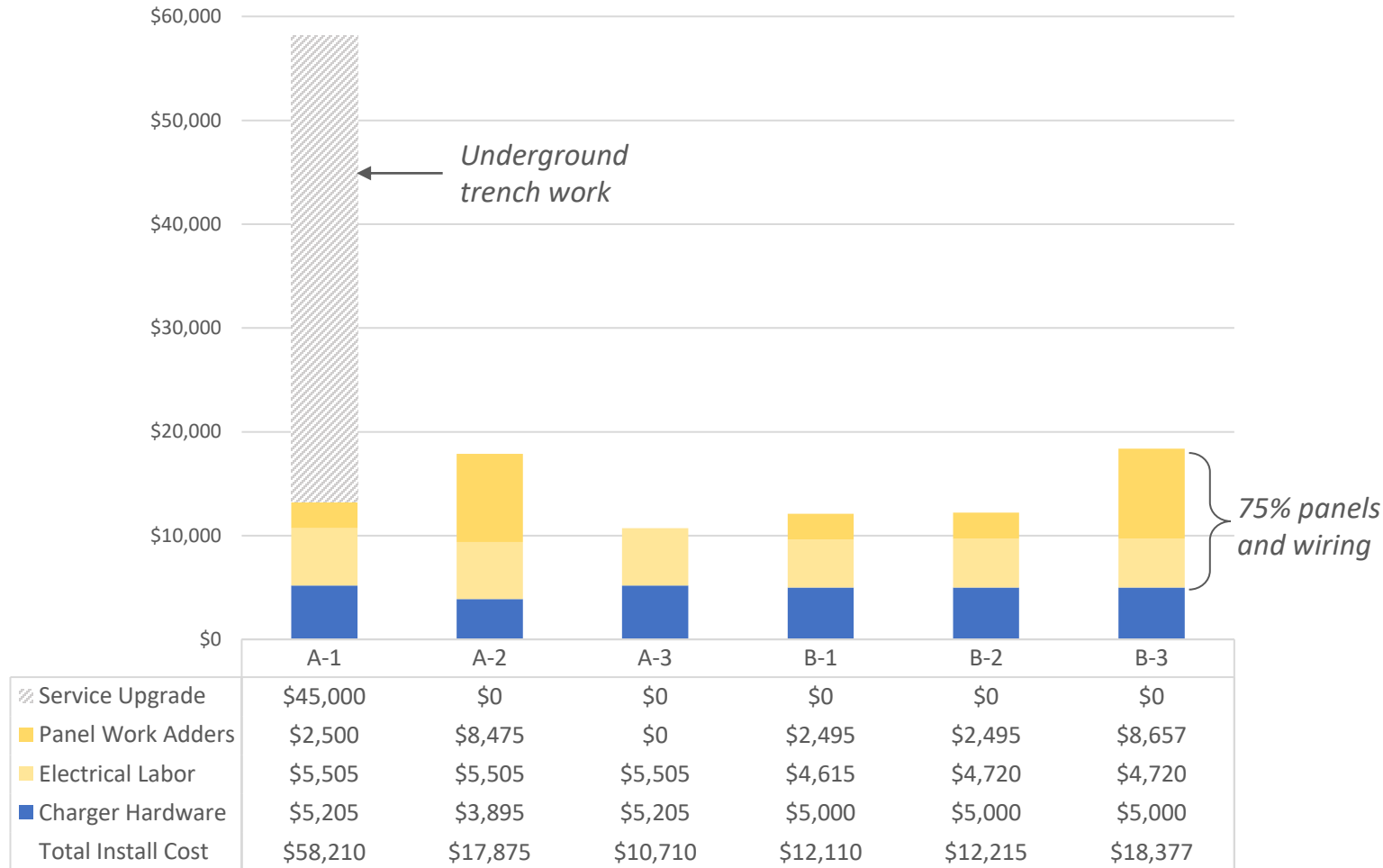
- Most *solutions are proprietary* or CHAdeMO based
- ISO 15118-20 and SAE J2847-2 *protocols nascent* and “some what” unproven
- **No requirements to support V2G** for OEMs or EVSEs
- Testing of *island transition safety* is still a “one-off” process



Proposed solutions

1. **Lab space for V2X testing**
 - Collaborative approach
 - Multiple OEMs and EVSE vendors test interoperability
 - Island transition testing
2. **CEC maintained inverter list**
 - Similar to existing solar/storage
 - Potential interoperability DB
3. **Interoperability requirements for V2G incentives**
4. **Explore pathways for V2G capability enabled by default**

Key challenge #2: Cost to install



Above: Observed costs for 6 pilot customers across two different V2H vehicle/charger solutions

Initial takeaways

- V2G installed costs can be substantial
 - 2-3x variability depending on site conditions
 - Larger service and panel incidence vs. solar/storage
- Charging technology only represents 20% to 30% of the total cost on average
- Charging vendors, OEMs, and utilities will need to collaborate to bring end-to-end cost down

Thank You!

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