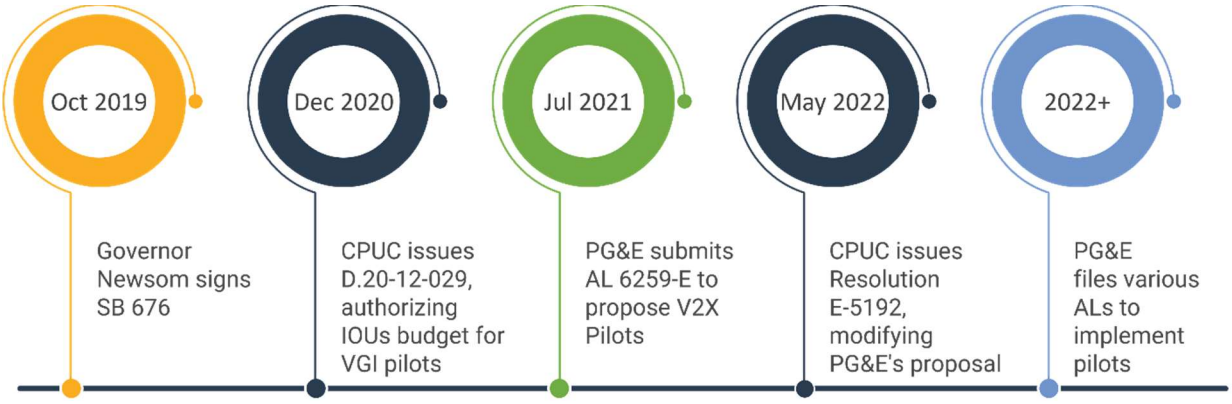
PG&E Vehicle-to-Everything Pilots

Figure 1: Regulatory Timeline



Background

On October 2, 2019, Governor Newsom signed Senate Bill (SB) 676 (Bradford, 2019) into law, requiring investor-owned utility (IOU) transportation electrification (TE) programs to maximize achievable vehicle-grid integration (VGI) benefits by 2030. The bill directed the California Public Utilities Commission (CPUC or Commission) to establish "strategies and quantifiable metrics to maximize the use of feasible and cost-effective" VGI.[1] On December 17, 2020, the CPUC adopted Decision (D.)20-12-029 to provide direction on the implementation of SB 676. Notably, D.20-12-029 adopted a definition of VGI (*see sidebar*) as well as strategies and near-term policy actions to promote VGI that are ideally cost-effective and feasible. One such strategy involves the facilitation of pilots that demonstrate the scalability of VGI technologies.[2] Ordering Paragraph (OP) 14 of D.20-12-029 authorized the large electric IOUs to submit Tier 3 advice letters (AL) to propose VGI pilots that could collectively use up to $35 million in ratepayer funding.[3]

Vehicle-Grid Integration

As defined by D.20-12-029, vehicle-grid integration (VGI) means any method of altering the time, charging level, or location at which grid-connected light-duty electric vehicles (EVs), medium-duty EVs, heavy-duty EVs, off-road EVs, or off-road electric equipment charge or discharge, in a manner that optimizes plug-in EV or equipment interaction with the electrical grid and provides net benefits to ratepayers by doing any of the following:

A. Increasing electrical grid asset utilization and operational flexibility.
B. Avoiding otherwise necessary distribution infrastructure upgrades and supporting resiliency.
C. Integrating renewable energy resources.
D. Reducing the cost of electricity supply.
E. Offering reliability services consistent with the resource adequacy requirements established by Section 380 or the Independent System Operator tariff.

[1] SB 676 (Bradford, 2019) can be accessed here: https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201920200SB676

[2] D.20-12-029 notes that three of its strategies are adopted pursuant to SB 676 as they have demonstrated a cost-effective and feasible approach to VGI. The other five have not yet been shown to be quantifiable and/or cost-effective and are therefore promoted as non-SB 676 strategies. Pilots are a non-SB 676 strategy.

[3] The large IOUs include Pacific Gas and Electric Company (PG&E), Southern California Edison (SCE), and San Diego Gas and Electric (SDG&E).

PG&E is the only IOU implementing pilots pursuant to D.20-12-029, with three pilots underway that incentivize customers to install bidirectional charging equipment and compensate customers for exporting energy from their vehicles to their home, a commercial building, a microgrid, or the utility grid. The three pilots focus on different use cases—residential, commercial, and microgrid. The pilots intend to accelerate adoption of affordable, clean transportation fueled by affordable, clean energy. The overarching objective of the Residential and Commercial pilots is to encourage adoption of vehicle-to-everything (V2X) bidirectional vehicles and technologies among PG&E customers to achieve the following goals:

- Demonstrate the value (including resiliency) of V2X/bidirectional EVs for customers and the grid,
- Reduce the total cost of EV ownership,
- Identify potential barriers to adoption, and
- Demonstrate an ability to scale.

Meanwhile, the Microgrid pilot leverages existing interconnected bidirectional EVs and electric vehicle supply equipment (EVSE) to enable charging and discharging in a microgrid. Such action achieves the following goals:

- Support community resiliency, especially during Public Safety Power Shutoff (PSPS) events, and
- Reduce greenhouse-gas emissions.

Pilot Overview

Although each pilot has unique characteristics, all three pilots are designed to test and understand how customers use bidirectional EVs that can both charge from the grid and discharge to a building, a microgrid, or the utility distribution grid. The residential and commercial pilots provide incentives to customers to install bidirectional charging equipment and compensate customers for exporting energy from their vehicles. Residential customers are authorized to use their EVs for emergency home backup power through vehicle-to-home (V2H) technology when the grid goes down.[4] Commercial customers are authorized to export energy from their vehicles to either a commercial building (vehicle-to-building, V2B) or to the grid (vehicle-to-grid, V2G). Microgrid customers are authorized to export energy from their EVs to the microgrid (vehicle-to-microgrid, V2M) during simulated or actual unplanned power outage events.

The Residential and Commercial pilots have a similar structure. Phase I consists partially of set-up activities, such as contracting with technology providers, developing a customer enrollment portal, and developing and launching the aggregation platform. Additionally, Phase I includes testing the vehicle's backup power ability in islanded mode (V2H for the Residential, and V2B for the Commercial). The purpose of Phase I is to test the backup capability (i.e., resiliency) when the grid goes down. The benefit is almost exclusively for the customer. Phase II focuses on grid-tied V2G deployment, implementing PG&E's Flex Platform to send price signals, and implementing the V2X dynamic rate.[5] The purpose of Phase II is to support the grid and reduce customer electric bills by offsetting on-site load and potentially exporting power past the meter. Customer enrollment, as well as rebate payment for bidirectional charging equipment, will take place in both Phase I and II. Phases I and II are concurrently underway. Customers may participate exclusively in Phase I or Phase II, depending on the eligibility of their EV and EVSE combination. Finally, Phase III will involve data analysis and evaluation as well as final reporting.

[4] When capable technology is added to the eligible products list, residential customers will also have the opportunity to participate in V2G use cases.

[5] PG&E's Flex Platform is a cloud platform with which aggregators will integrate to receive the hourly flex pricing signal and deliver data on customers' charging and discharging activities.

The Microgrid Pilot is structured slightly differently. Phase I comprises two stages: (1) testing and site preparation at the Redwood Coast Airport Microgrid (RCAM), which involves installing and energizing four bidirectional chargers in the microgrid, lab testing of hardware, and deployment of the EPIC 3.11B control scheme, and (2) the demonstration of Phase I, which will collect four months of data to assess how the chargers are charging and discharging and how the microgrid performs during a power outage event. Phase II consists of deploying customer incentives. Phase III will also include pilot evaluation and reporting while continuing the microgrid's operational use. PG&E is working to establish pathways for customers to continuously participate in any outage events beyond the conclusion of the pilot.

Regulatory Context

Pursuant to D.20-12-029, on July 15, 2021, PG&E filed AL 6259-E to request access to funding for four VGI pilots. On May 5, 2022, CPUC issued Resolution E-5192, which authorized a total of $11.7 million to implement three of the four pilots PG&E proposed. Resolution E-5192 rejected the fourth pilot but allowed PG&E to either: (a) justify certain details of the rejected pilot proposal, or (b) request to transfer the funds that would have been used for that pilot to the residential and/or commercial pilots via a Tier 3 AL. Ultimately, PG&E requested to transfer the funds, which was approved via Resolution E-5358 on December 19, 2024.

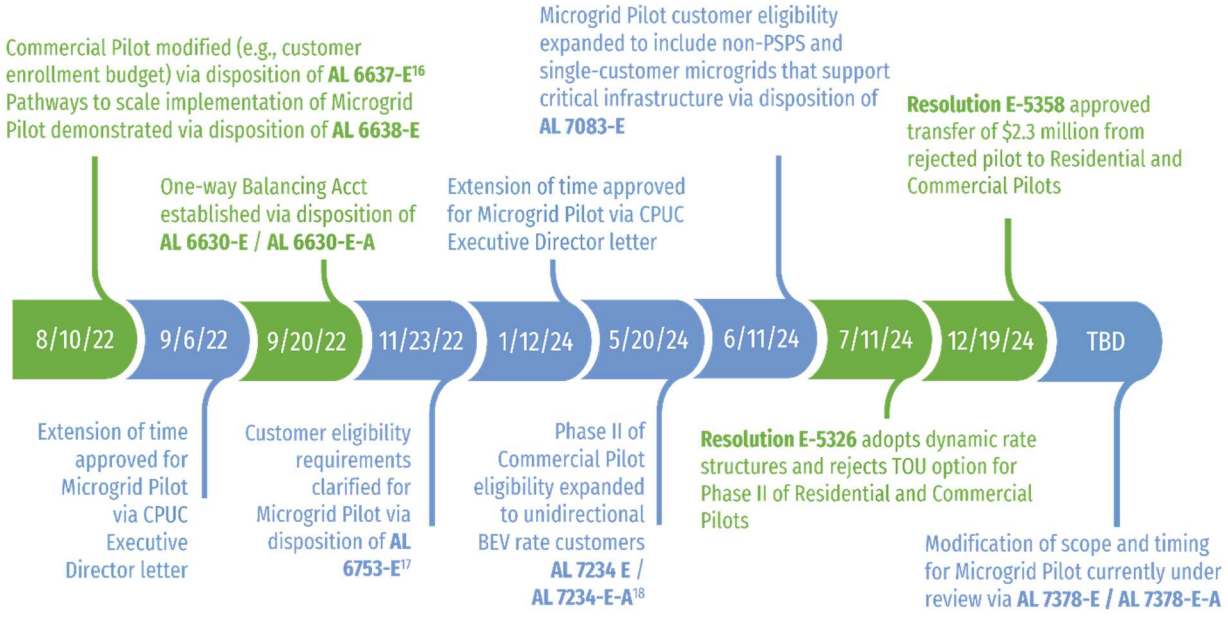
Although the proposed pilots largely complied with D.20-12-029, including the Decision's modified definition and objectives of VGI,[6] equity requirements,[7] and requisite avoidance of overlap with the Electric Program Investment Charge (EPIC) and other California Energy Commission (CEC) programs,[8] some issues remained unresolved. For example, Resolution E-5192 ordered PG&E to justify the commercial pilot's budget,[9-10] demonstrate potential pathways to scale implementation of the microgrid pilot,[11] and implement an hourly dynamic rate for the Residential and Commercial pilots.[12] Figure 2 below illustrates some of the pilot modifications since the Commission adopted Resolution E-5192. The modifications that Resolution E-5192 directed are identified in green. Additional modifications that PG&E requested via ALs or requests to the Executive Director are identified in blue.

Although PG&E initially expected the pilots to be completed by the end of 2024, implementation has been significantly hampered. There are a few reasons for this, including the necessity of several follow-up filings to confirm implementation details, as described above and outlined in Figure 2. Other factors are listed below.

[6] D.20-12-029 at 7-13. D.20-12-029 modified the definition of VGI in PUC § 740.16(b)(1), adding a focus on resiliency and operational flexibility and specifying what types of EVs fall within the scope of this definition.
[7] D.20-12-029 at 45-47. The IOUs must prioritize environmental and social justice (ESJ) communities and consider the Commission's ESJ Action Plan.
[8] D.20-12-029 at 43. The Decision required the IOUs to jointly identify "priority needs" for the pilots and to ensure that these needs do not overlap with the scope of the EPIC program or any other CEC programs.
[9] Resolution E-5192 at Ordering Paragraph 4. The Resolution concludes that PG&E did not explain the commercial pilot's proposed customer enrollment budget of $1,325,000.
[10] Resolution E-5192 at 16-17. The Resolution denied the use of Low Carbon Fuel Standard funds as proposed in AL 6259-E.
[11] Resolution E-5192 at Ordering Paragraph 5.
[12] Resolution E-5192 at Ordering Paragraph 6.

- **Partnership Agreements**: Auto original equipment manufacturers (OEMs) and electric vehicle service providers (EVSPs) have been slower to enter agreements than originally anticipated.
- **High Costs**: Bidirectional EVSE (especially using the direct current approach) is cost-prohibitive, particularly if a Rule 21 Interconnection Supplemental Review is needed.
- **Industry Issues**: Limited availability of EVs and EVSE capable of bidirectional charging that meet technology standards.[13]
- **Technical Issues**: Unexpected issues with deploying the EPIC 3.11b control system, the frequency control scheme that allows the chargers to charge/discharge, in the Microgrid pilot.[14]
  Funding Availability: Non-ratepayer funding delays for the Microgrid pilot as well as downstream delays, including contract execution and equipment procurement.[15]

Figure 2: Timeline of Major Pilot Modifications



[13] Request for Extension of Time submitted by PG&E on November 14, 2023.
[14] Request for Extension of Time submitted by PG&E on May 21, 2024.
[15] A delay in Federal Aviation Administration (FAA) funding was cited as a significant impediment to implementing the Microgrid Pilot, per AL 7378-E and each extension request submitted on 8/23/22, 11/14/23, and 5/21/24.
[16] Resolution E-5192 OP 4 directed PG&E to: (1) justify or reduce the proposed customer enrollment budget and possibly increase the customer incentives budget, (2) justify up-front equipment purchase incentive levels, (3) address incentive stacking, and (4) explain the process for vendor qualification and how PG&E will support deployment of open standards that support interoperability and customer choice.
[17] The initial explanation of eligible microgrids and customers was unintentionally vague. AL 6753-E clarified that for Phase I of the pilot, (1) a "vehicle site" refers to the bidirectional chargers deployed in the microgrids, (2) eligible microgrids include multi-customer microgrids that have experienced a PSPS event, (3) eligible microgrids do not need to be coordinated to a utility-side of the meter "fossil fuel generator" and any grid source in the microgrid is acceptable, including energy storage, and (4) each charger may or may not have a dedicated associated vehicle.
[18] AL 7234-E-A requested to: (1) expand the eligibility of Phase II of the Commercial Pilot to Business Electric Vehicle (BEV) rate customers with unidirectional charging equipment, and (2) increase the cap on incentives for a single automotive manufacturer in the V2X Commercial Pilot.

Dynamic Rate

As Resolution E-5192 directed, and as Resolution E-5326 authorized, PG&E is now offering a real time pricing (RTP) rate to customers enrolled in the residential and commercial pilots, referred to as Hourly Flex Pricing (HFP). The pilot HFP rate is a dynamic, marginal cost-based rate structure that reflects the hourly price for generation and distribution. The RTP rate adopts three key elements from the CalFUSE framework, a CPUC Energy Division white paper and staff proposal published in 2022.[19]

➢ *Subscription*

First, each customer is assigned a monthly energy subscription amount based on their historical energy usage, which is billed under their Otherwise Applicable Tariff (OAT).[20] The subscription recovers fixed and non-marginal costs such as public programs and fixed charges. Any energy used above or below this subscription amount is tracked and valued at the pilot's HFP rate, but only in a "shadow bill" for comparison to their OAT bill. Throughout the year, customers continue to pay their regular OAT bill. If a customer exceeds their energy subscription quantity, they will pay for the amount of energy used at their OAT-based pricing, and they will not be charged more at the HFP rate. However, if they use less than their energy subscription quantity (as a result of load shifting or exporting), their HFP shadow bill will be lower than their OAT bill, and they will receive an HFP credit for the difference at the end of the 12-month period. For example, if a customer's OAT bill for one month is $120, and their HFP shadow bill is $100 due to exporting energy during high-priced hours, they will receive a $20 credit. If the OAT bill is $120 and the shadow bill is $130, the customer will still only pay $120, with no penalty. These values are calculated on a cumulative basis over 12 months. Credits accrued in one month can be negated by poor performance in another month. Overall, this approach encourages demand flexibility in a way that maximizes customer bill savings without any financial risk.

➢ *Real Time Pricing*

Second, any usage that deviates from this energy subscription—either above or below—is priced using the HFP structure based on day-ahead marginal energy and generation capacity costs, as well as Primary Distribution Capacity costs. Transmission charges are excluded and recovered through the OAT.

➢ *Bidirectional and Symmetric*

Third, the rate is bidirectional and symmetrical for importing and exporting, meaning customers will import (i.e., buy) and export (i.e., sell) energy to and from their vehicle for the same RTP value of energy at a given hour.

Unidirectional business electric vehicle (BEV) customers who are not enrolled in the V2X pilots are authorized to access the pilots' HFP rate until HFP rates are implemented in PG&E's 2023 GRC II proceeding.[21]

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[19] The full CalFUSE proposal can be accessed here: https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/demand-response/demand-response-workshops/advanced-der---demand-flexibility-management/ed-white-paper---advanced-strategies-for-demand-flexibility-management.pdf.

[20] To participate in the pilots, the customer must be enrolled in one of the following time-of-use (TOU) rates. Residential: E-ELEC or EV2A; Commercial Small Business: B6; Commercial Medium Business: B10; Commercial Large Business: B19 or B20.

[21] PG&E proposed RTP rates in its 2023 GRC II application (A.24-09-014), which will be litigated in 2025 and 2026.

Pilot Participation Elements

Table 1 below provides a summary of the objectives of each pilot, eligibility requirements, customer participation incentives, and timeline.

Table 1: Pilot Participation Elements

1) V2X Residential Pilot	
Objective	• Promote adoption of bidirectional EVs through customer incentives. • Test customer's EV/EVSE home backup capabilities for resiliency. • Test residential driver responsiveness to dynamic price signals for customer bill savings.
Vehicle Type	• Light-duty EVs.
Export Capability	• V2H, compensated through event incentives.[22]
Customer Eligibility	• Residential customers within PG&E's service area, including Community Choice Aggregator (CCA) customers. For customers to participate in HFP, the CCA must have an agreement with PG&E. • Customers must have a Rule 21 Interconnection Agreement for participation in HFP (Phase II). A Rule 21 Agreement is not required for home backup (Phase I). • Customers are recommended to undergo an electrical assessment to determine whether panel and/or service upgrades are required prior to equipment purchase. • Customers must have a standard split-phase 240v electrical service. • Customers must select an eligible EV and EVSE combination. • Customers must enroll in the Emergency Load Reduction Program (ELRP), a summer reliability pilot that compensates customers for shifting their load during California Independent System Operator (CAISO)-issued emergency events.[23] • Customers must be enrolled in an eligible TOU rate (E-ELEC or EV2A).

Customer Incentive	• Customers will receive $2,500 [$3,000 for Disadvantaged Community (DAC) customers] to offset the incremental cost of bidirectional charging equipment, which will be provided as a rebate after they have purchased an eligible EV and EVSE and they have installed the EVSE at their residence.
	• Customers may also receive additional incentives such as:[24]
	  ○ $800 for filing a Rule 21 interconnection application, reimbursed post-completion.
	  ○ $2,500 for Rule 21 interconnection applications that undergo supplemental review.
	  ○ $1,500 early adopter incentive for the first 250 customers to enroll.

[22] As of September 2025, the participating OEMs have not enabled V2G functionality for their vehicles in the residential pilot.

[23] More information about this program can be found here: https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-costs/demand-response-dr/emergency-load-reduction-program.

[24] Incentives may change as PG&E determines efficacy of dollar amounts.

	○ $100 per Phase I backup power testing event (up to 2 total) for responding to the Post-Outage Survey following a planned test event. ○ $50 for responding to the exit survey at the conclusion of the pilot. ○ Up to $250 for maintaining enrolled status through the end of the pilot term. ○ Up to $450 for customers who keep their EV plugged in while at home.
Number of Customers	• PG&E aims to enroll 1,000 single-family residential customers.
Duration	• Three phases to conclude when pilot funds are exhausted (see more details under Current Timeline and Status).
2) V2X Commercial Pilot	
Objectives	• Promote adoption of bidirectional EVs through customer incentives. • Test customer's EV/EVSE backup capabilities for resiliency. • Test commercial fleet responsiveness to dynamic price signals for customer bill savings.
Vehicle Type	• Commercial fleet vehicles, including light-duty, medium-duty, and heavy-duty EVs.
Export Capability	• V2B, compensated through event incentives. • V2G, compensated annually through dynamic rate.
Customer Eligibility	• Commercial customers within PG&E's service area, including CCA customers. For customers to participate in HFP, the CCA must have an agreement with PG&E. • Customers must have a Rule 21 Interconnection Agreement for participation in HFP (Phase II). A Rule 21 Agreement is not required for building backup (Phase I). • Customers are recommended to undergo an electrical assessment to determine whether panel and/or service upgrades are required prior to installation of EVSE. • Customers must select an eligible EV and EVSE combination. • Customers must enroll in ELRP. • Customers must be enrolled in an eligible TOU rate (BEV-1, BEV-2, B6, B10, B19, or B20).
Customer Incentive	• Customers installing a bidirectional charger less than 50 kW will receive a rebate of up to $2,500 ($3,000 for DAC customers). Customers installing a bidirectional charger greater than or equal to 50kW will receive up to $4,500 ($5,000 for DAC customers). • Customers may also receive additional incentives such as:[25] ○ $800 to cover the cost of interconnection, reimbursed post-completion. ○ $2,500 for interconnection applications that undergo supplemental review. ○ $500 per scheduled Phase 1 backup power testing event (up to 2 total) for customers capable of participating in V2B. ○ $50 for completion of an exit survey at the end of the pilot. ○ Up to $250 for maintaining enrolled status through the end of the pilot term.
Number of Customers	• PG&E aims to enroll 200+ commercial fleet EVs and EVSEs at commercial sites.

[25] Incentives may change as PG&E determines efficacy of dollar amounts.

Duration	• Three phases to conclude when pilot funds are exhausted (see more details under Current Timeline and Status).
3) V2M Microgrid Pilot	
Objectives	• Enable bidirectional EVs to charge and discharge at microgrids to support community resiliency and GHG reduction.[26]
Vehicle Type	• Light-duty, medium-duty, and heavy-duty EVs.
Export Capability	• V2M, compensated through event incentives.
Customer Eligibility	• Residential and commercial customers (including those participating in the other V2X pilots) within PG&E's service area are eligible to participate. • Customers must have a Rule 21 Interconnection Agreement. • Customers must be connected to a multi-customer microgrid or a single-customer microgrid supporting critical infrastructure. • Customers must select an eligible EV and EVSE combination. • Participation requirements differ depending on whether the customer is part of a multi-customer microgrid or single-customer microgrid.

Customer Incentive	• Between $2,000 and $5,000 for pilot participants' continued participation.
	• Multi-customer microgrid participants receive an incentive of $4,000-$5,000 for participation defined as:
	  ○ Authorizing PG&E to access data from the participant's EV telematics, EVSE, and/or PG&E meter throughout the pilot;
	  ○ If enrolled in the Residential or Commercial Pilot, remaining enrolled throughout the entirety of the respective pilot;
	  ○ Completing and submitting pilot surveys within two weeks of receipt from PG&E.
	• Multi-customer microgrid participants have the option for two additional incentives, which are included in the total incentive range of $4,000-$5,000:
	  ○ Additional Frequency Incentive of $500—customers must configure EVSE as prescribed in IEEE 1547 (2018) 6.5.2.7.2 frequency control specifications.[27]
	  ○ Additional Outage Participation Incentive of $500 per event (up to 2)—participants must plug in their EV during a PSPS or unplanned outage event, which must be validated by EVSE or EV data.
	• Single-customer microgrid participants receive an incentive of $2,000-$5,000 for participation defined as:
	  ○ Completing the microgrid questionnaire, and
	  ○ Submitting a single line diagram of the microgrid.
	• Single-customer microgrid participants have the option for an additional incentive, which is included in the total incentive range of $2,000-$5,000:
	  ○ Additional Discharge Incentive of $3,000—customers must implement coordinated functions between the EVSE and microgrid controller/Energy Management System (EMS), which allow the vehicle to discharge into the

[26] Previously, only PSPS microgrids and multi-customer microgrids were eligible to participate. Since the disposition of AL 7083-E, non-PSPS and single-customer microgrids that support critical infrastructure (e.g., schools, hospitals) are now eligible to participate.

[27] This can be verified by looking at the EVSE firmware. PG&E may increase or decrease the $500 incentive amount based on RCAM results.

	microgrid. Several coordinated functions involving discharge qualify for this incentive, including black start capability, export limiting, bill management (demand charges, time of use, etc.), demand response, site backup/resiliency coordination during power outages, or voltage management. • Incentives may be stacked with the Residential and Commercial pilot incentives.
Number of Customers	• PG&E aims to enroll 200 EVs.
Duration	• Three phases over three years (see more details under Current Timeline and Status).

Implementation Timeline and Status

PG&E is in the midst of implementing all three pilots. Phases I and II are both underway. As summarized in Table 2 and Table 3, below, the current expectation for completion of the pilot evaluation and final reporting is 2026.

Table 2: Residential and Commercial Pilots Timeline

	Phase I: Technology contracts, enrollment, resiliency/backup power	Phase II: Grid-tied V2G export testing, HFP, customer bill impact	Phase III: Evaluation and final reporting
Residential	In Progress	In Progress	Estimated launch in March 2026
Commercial	In Progress	In Progress	Estimated launch in March 2026

Table 3: Microgrid Pilot Timeline

	Phase I: Testing and site prep	Phase I: PSPS performance testing	Phase II: Incentive cohort	Phase III: Continued microgrid operation, evaluation and reporting
Microgrid	In Progress	In Progress	In Progress	TBD[28]

As of June 18, 2025, the current number of participants for each pilot is listed below.

- Residential Pilot: Three customers (two in Contra Costa County and one in Yolo County).
- Commercial Pilot: One customer (Zum bus fleet in Oakland), 74 chargers (Alameda County).
- Microgrid Pilot: Three airport staff customers with a total of four chargers within a single multi-customer microgrid, Redwood Coast Airport Microgrid (Humboldt County).

[28] The disposition of AL 7378-E-A may impact the timing of Phase III.

Vendors and Partnerships

To ensure EVs and EVSE are compatible with each other and data reporting is adequate, PG&E works directly with OEMs to enroll eligible technology in the pilots. PG&E has established partnerships with several OEMs, each of which have designated compatible EVSE for their vehicles. In addition to identifying the compatible EVSE, PG&E provides the option for the OEMs it partners with to designate an aggregator or designate PG&E as the aggregator.[29] Table 4 highlights the current eligible products for the V2X Pilots. However, PG&E is actively working with other OEMs to establish additional agreements for eligible vehicles and EVSE.

Table 4: Eligible Products List (as of September 25, 2025)

Residential Pilot	Commercial Pilot
➢ *Ford* Vehicle: Ford F-150 Lightning 2022, 2023, or 2024 EVSE: Ford 80 Amp Charge Station Pro with Sunrun Home Integration System ➢ *General Motors* Vehicles: Chevrolet Silverado EV 2024, Chevrolet Equinox EV 2024, Chevrolet Blazer EV 2024, Cadillac LYRIQ 2024 or 2025, GMC Sierra Denali EV- 2024 EVSE: GM PowerShift e.1.19 with V2H Enablement Kit	➢ *BYD* Vehicles: BYD | RIDE Achiever Type A, Creator Type C, and Dreamer Type D School Buses EVSE: Tellus Power Green models (TP-V2G-20-480, TP-V2G-30-480, TP V2G-40-480, and TP-V2G-60-480) ➢ *Micro Bird* Vehicle: G5e MK3 School Bus (2025-newer) EVSE: Borg Warner RES-DCVC60-480 ➢ *Blue Bird* Vehicles: Vision School Bus (2022-newer) and All American School Bus (2022-newer) EVSE: Borg Warner RES-DCVC60-480

➢ *EV OEM Eligibility*

OEMs must agree to several commitments, notably ensuring technical capabilities, to participate in the V2X pilots. The EV must be capable of exporting to the grid, transferring telematics data through Wi-Fi and/or cellular service, responding to telematics signals to initiate charging or discharging, and must be certified by the OEM to perform V2G with identified EVSE provider(s). The OEM must also agree to inform and collaborate with PG&E on performance of software and telematics updates.

➢ *EVSE Vendor Eligibility*

The EVSE must comply with legal and regulatory standards. Specifically, the EVSE must be International Organization for Standardization (ISO) 15118 ready, certified by a nationally recognized testing lab, certified to Underwriters Laboratories (UL) 1741 SB (or minimally to UL 1741 with exception for ELRP), compliant with Institute of Electrical and Electronics Engineers (IEEE) 1547, and compliant with Open Charge Point Protocol (OCPP) 1.6 (or later). Additionally, the EVSE must be compliant with CA Building Code standards.[30]

[29] The aggregator sends day-ahead pricing and event signals from PG&E's Cloud Platform to the customer as well as charge/discharge signals to the EV or EVSE. The aggregator may be the EV OEM, the EVSP, the customer, or subcontractors of any of these three entities.

[30] The EVSE may be certified with UL 1741 or UL 1741 SA if the customer is already enrolled in ELRP.

The EVSE must meet certain technical requirements, such as the ability to measure and communicate demand (kW) and energy (kWh) at an accuracy of +/-2%, communicate such usage via Wi-Fi and/or cellular service, use Open Charge Point Protocol 1.6 or later to communicate data and signals, and respond to demand response signals via IEEE 2030.5 or the OpenADR 2.0b protocol using either its integrated software or through its cloud platform.

Finally, EVSE providers must meet performance obligations, such as collaborating with PG&E to test data transfers and communications, collecting 15-minute interval data for daily or weekly and ad hoc submittal to PG&E, notifying PG&E of any event in which inaccurate or temporary data were sent to PG&E, storing data in the event of a network outage, and informing and collaborating with PG&E on conducting software updates.

- *Aggregator Eligibility*

The aggregator must provide aggregation for the V2X pilots and ELRP, which requires enrollment through PG&E's program implementor, Olivine. The aggregator must be capable of controlling the vehicle charge and discharge,[31] receiving live event signals from PG&E's Cloud Platform via OpenADR or IEEE 2030.5, receiving day-ahead information on hourly pricing and use case testing events, and providing customers a venue to share their preferences for charging and discharging their vehicle and opting out of the pilot(s).

[31] The aggregator is likely to communicate with the OEM/OEM cloud, which will have direct access to the customer vehicle. In some cases, the OEM will be the aggregator.