

EPIC, Electric Vehicles and Vehicle-Grid Integration (VGI)

EPIC Policy & Innovation Forum
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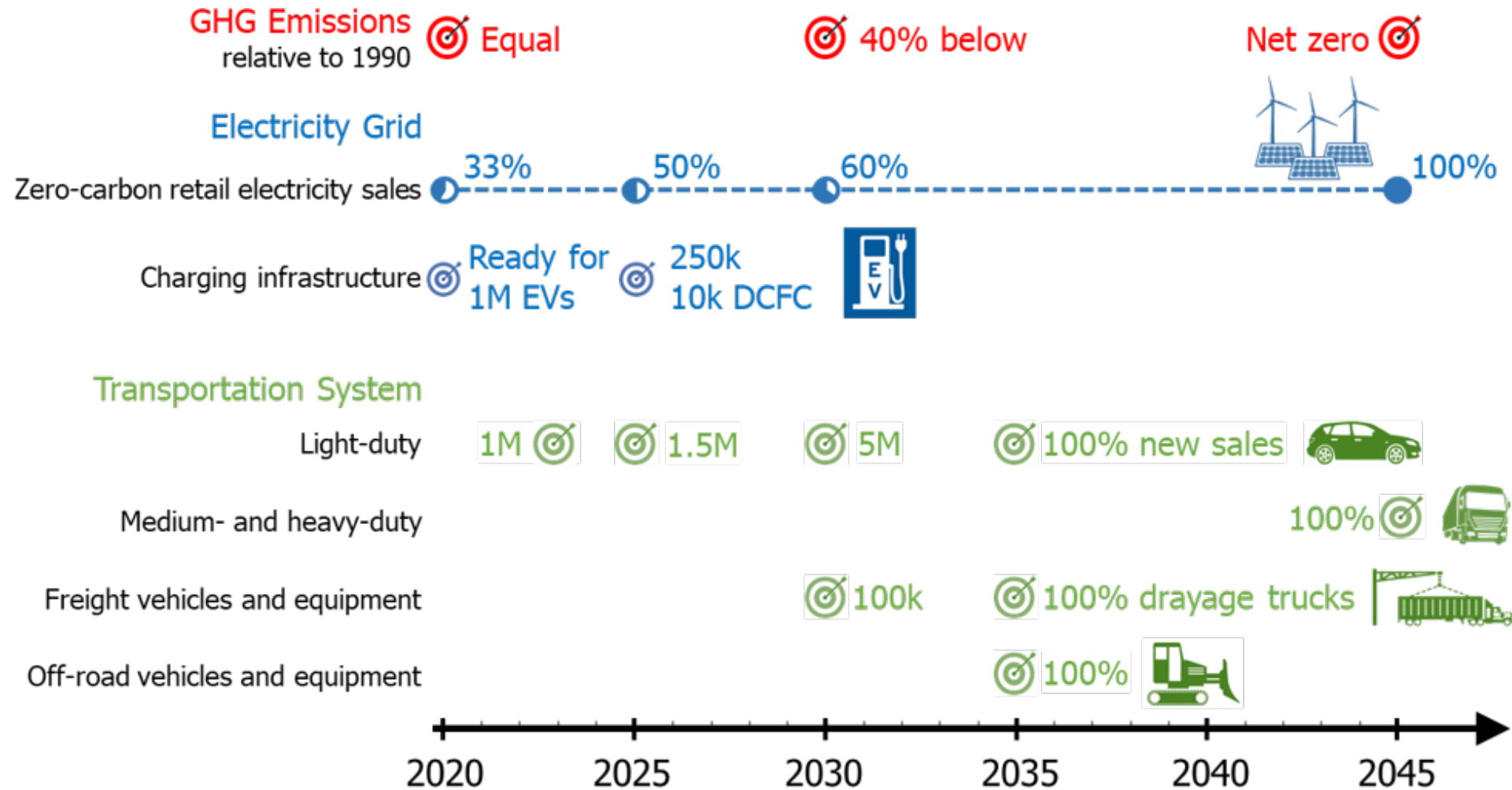


California Public
Utilities Commission

Overview

- Background
- Discussion Questions

100% clean energy and 100% clean transportation goals require rapid scale-up of EVs, Infrastructure and VGI



Decision 20-12-029 (VGI and SB 676)

- SB 676 (Bradford, 2019) requires the Commission to establish strategies and quantifiable metrics to maximize the use of feasible and cost-effective EV integration into the electrical grid by January 1, 2030.
- CPUC issued Decision 20-12-029 December 2020 to implement SB 676
- Authorizes VGI pilots, emerging technology program, identifies VGI related priorities

Examples of CPUC Priorities Related to VGI

- Resiliency
 - Back-up power during Public Safety Power Shut-Offs
- Avoid distribution system upgrades
- Reliable system-level energy supply
- Leverage EV Automatic Load Management to avoid/reduce electrical system upgrades
- Provide value stream(s) to encourage EV adoption

Stakeholder Question #1

- How would you allocate transportation/VGI funding among the three EPIC categories?
 - Applied R&D is most relevant for very early-stage technology development
 - Technology demonstration and deployment is most relevant for technology that is ready to be tested in the real world
 - Market facilitation is most relevant to remove barriers to commercial deployment and support enabling policies and may overlap with technology demonstration/deployment



Applied Research and
Development

Technology Demonstration
and Deployment

Market Facilitation

Stakeholder Question #2

- What sectors require *applied R&D* and *technology development* activities over the next 3-5 years to make products available? For example ...
 - Some vehicle segments like off-road vehicles, drayage trucks and others are very limited today
 - Some VGI technologies such as EVs that export using AC charging ports have not yet entered the market and enabling standards are still under development

Stakeholder Question #3

- What EPIC *market facilitation* activities are most important to expand EV and VGI technologies? For example
 - Develop customer engagement & education strategies
 - Develop business cases, including understanding customer participation and scale-up potential
 - Technology standardization
 - Building standards
 - Remove policy barriers

Big Picture Question

- Does the EPIC planning process:
 - Provide enough direction to help the private market prioritize investments while also:
 - Providing enough flexibility to respond to emerging needs as they emerge?

Appendix: Additional Current CPUC and CEC Activities

Upcoming CEC EPIC Solicitation:

Vehicle to Building for Resilient Backup Power

- CEC anticipates releasing solicitation November 2021 (~\$19.5M)
 - Applied research and technology demonstration and deployment projects
 - Accelerate development of technologies allowing individual or fleets of EVs to power homes or buildings during electricity outages or intentional islanding events
 - Aligns with D. 20-12-029 goal of promoting “V2B”

Current CPUC Activities

Summer Reliability

- Summer Reliability ([R20-11-003](#)) August 16, 2021 [Staff Concepts Paper](#)
 - Includes proposed “VGI aggregation”, including managing one-way charging and also export from vehicles
 - Still pending review and potential adoption by the CPUC

Rule 21 Interconnection Status

- Generator Interconnection Pathway established for Vehicle-2-Grid
 - DC coupled EVSEs containing a compliant inverter can utilize the standard interconnection process as of September 2020 ([Decision 20-09-035](#))
 - AC coupled EVSEs can interconnect within pilots
- Draft CPUC Resolution E-5165
 - Specifies protection required and process for requesting additional pilots for AC coupled EVs under Rule 21 process
 - DC projects initially connected as load-only can go through the Rule 21 interconnection process for permission to enable bidirectional operation
 - Directs coordination of load and generation interconnection processes
 - Comments were due on October 20, 2021

VGI Pilots

- PG&E and SCE proposed seven VGI pilots with a total budget of ~\$28 million
 - VGI pilots must develop pathways to scale implementation through existing or potential new large electrical corporation programs that would further the goals of SB 676
 - IOUs must consider pilots listed in the [VGI Working Group Final Report](#) as “near term priorities with strongest agreement” and also meet other criteria specified in [Decision 20-12-029](#)
 - PG&E focused on EVs that export
 - SCE focused on demand response for one-way EV charging

PG&E Proposed VGI Pilots

- PG&E July 15, 2021 [Advice Letter 6259-E](#) proposed four residential and commercial “V2X” pilots
 - V2X = export power from EVs to buildings and/or the grid
- Proposed pilots would address a variety of barriers to V2X
 - Encourage technology deployment; integration between technologies/market actors; develop customer engagement strategies; develop utility IT systems; evaluate solutions to policy barriers
- [VGI Working Group Final Report](#) strongly agreed on a number of recommendations to encourage V2X

PG&E Proposed VGI Pilots

- Pilot #1: 1,000 residential EVs
 - Stage one (2022): on-site back-up power
 - Stage two (2023): add customer bill management, system real-time energy, system renewables integration and EV export for grid services (such as resource adequacy & system capacity)
- Pilot #2: ~ 200 fleet EVs including medium and heavy-duty vehicles
 - Stage one (2022): on-site back-up power
 - Stage two (2023): add customer bill management; real-time energy; grid upgrade deferral; and EV export for grid services (such as system RA, system capacity)
- Pilot #3: leverage EVs to create microgrids for distribution system sections de-energized during Public Safety Power Shut-off event affecting upstream distribution system sections
- Pilot #4: leverage EVs with high availability for export wholesale market participation

SCE Proposed VGI Pilots

- SCE July 15, 2021 [Advice Letter 4542E](#) focused on a passenger vehicle demand response pilot that would leverage telematics and other technologies
 - IOUs EV/DR workshop report identified a number of barriers to EV participation in demand response
- SCE also proposed smaller pilots for commercial, government fleets

CPUC has authorized ~\$1.85 billion in TE investments

Year	Program Description	Funding
2016	SCE's Charge Ready Pilot	\$22M
	SDG&E's Power Your Drive	\$45M
	PG&E's EV Charge Network	\$130M
2018	SCE's Charge Ready Bridge	\$22M
	SB 350 Small IOU Programs	\$7.6M
	SB 350 Priority Review Pilots	\$42.8M
	SB 350 Standard Review Projects	\$650.5M
2019	PG&E's EV Empower	\$4M
	SDG&E's Power Your Drive Fleets Program and V2G School Bus Pilot	\$113.5M
	AB 1082/1083 Schools, Parks & Beaches	\$54.5M
2020	SCE's Charge Ready 2	\$436M
	SB 676 VGI Pilots	\$38.7M*
2021	SDG&E's Power Your Drive Extension	\$43.5M
	TEF Near-Term Priorities	\$240M*

* Funds authorized for IOU proposals, but no programs/pilots yet approved

Current CEC Activities

Recently Completed EPIC Solicitations

[Bi-directional Energy Transfers and DER Integration for MDHD Fleets](#): (~\$22M)

Fund technology demonstration and deployment research projects that enable and evaluate resilience, renewable integration, and cost management use cases for medium- and heavy-duty EVs.

- Awardees include 2 school buses (1 bidirectional); 2 truck stops; 1 transit; 1 distribution depot

[Research Hub for Electric Technologies in Truck Applications \(RHETTA\)](#): (~\$12M)

Fund applied research and development and technology demonstration and deployment activities through the creation of a Research Hub for Electric Technologies in Truck Applications. The hub will engage stakeholders to advance high power charging systems and plan, design, and deploy innovative corridor charging strategies that extend the range and increase the operational flexibility of battery electric trucks.

- Awardee will develop 2 public charging demonstration sites supporting drayage in south coast air basin

EPIC 4 Investment Plan Transportation Initiatives and Timeline

The [draft EPIC 4 investment plan](#) includes broad topic areas that will lead to more targeted solicitations in the future. The proposed plan is due to CPUC by December 2021, requiring approval at the November CEC business meeting. If the plan is approved by CEC and CPUC, solicitations could be developed beginning mid-2022.

- *Efficient Transportation Electrification and Charging Technologies:* Applied research, development, and technology demonstrations of new high efficiency charging devices and systems to reduce electric losses and costs of EV charging spanning all vehicle classes and power levels, including transportation sectors that are challenging to electrify.
- *Enabling Plug-in Electric Vehicles as Distributed Energy Resources:* Advance technologies and demonstrate EV charging and discharging that is flexible, safe, reliable, and coordinated with grid needs.
- *Integrating Distributed Energy Resources for Grid-Supportive Vehicle Charging:* Integrate DERs (distributed solar, storage, etc.) with transportation electrification to mitigate EV charging grid impacts and GHG emissions.
- *Lithium-ion Battery Reuse and Recycling:* Improve, scale up, and demonstrate innovative reuse and recycling technologies for end-of-life Li-ion batteries to conserve critical materials, promote material sustainability, and reduce the cost of new storage products by lowering material costs.

CEC Fuels and Transportation Division Solicitations (non-EPIC)

[Vehicle Interoperability Testing Symposium \(VOLTS\):](#)

Select contractor to conduct a Vehicle Inter-Operability Testing Symposium (VOLTS) in California to support interoperability of electric vehicle charging.

[Vehicle-Grid Innovation Lab \(ViGIL\):](#)

Increase the capacity and throughput of electric vehicle supply equipment standards testing at a laboratory(ies), which may support expansion of testing of both light-duty and medium- and heavy-duty electric vehicle charging equipment. (up to \$2 million in grant funds available)