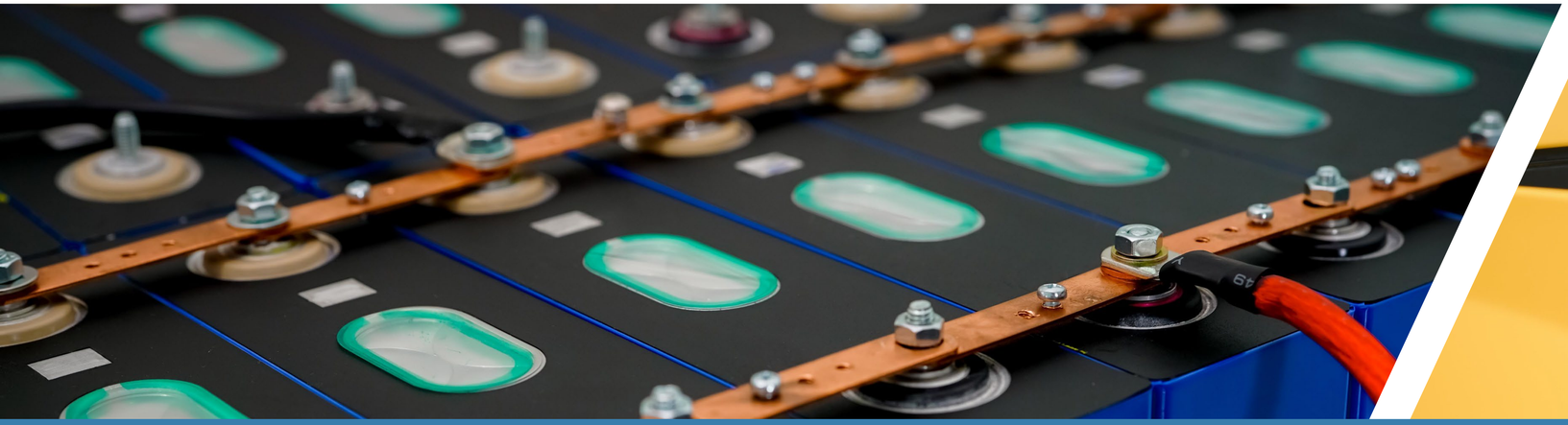
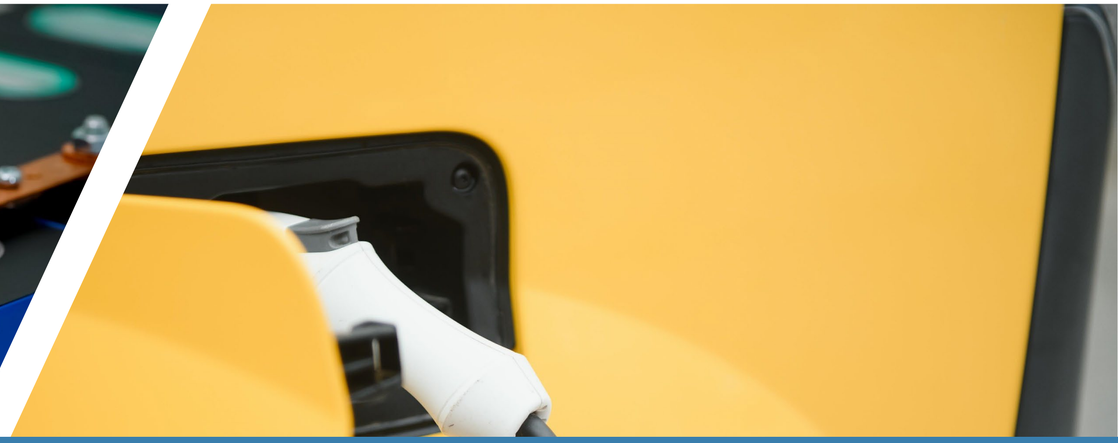
EPIC STRATEGIC OBJECTIVES WORKSHOP PROCESS

Virtual Technical Working Group Meetings – May 2024





This program is funded by California utility customers under the auspices of the California Public Utilities Commission

CALIFORNIA PUBLIC UTILITIES COMMISSION

EPIC Strategic Objectives Technical Working Groups

May 2024

CALIFORNIA PUBLIC UTILITIES COMMISSION

I. Welcome, Introduction, Agenda and Draft Strategic Objectives Presentation
II. Stakeholder Q&A (clarifying questions)
III. Technical Working Group Presentations
IV. Stakeholder Q&A
V. Break (~ 11:40)
VI. Technical Working Group Comments
VII. Wrap-up and next steps

STRATEGIC OBJECTIVES SUPPORT EPIC STRATEGIC GOALS (D.24-03-007)

CALIFORNIA PUBLIC UTILITIES COMMISSION

Transportation Electrification	The Electric Program Investment Charge (EPIC) Program will invest in research, development, and demonstration (RD&D) that supports the planning, integration, scaling, and commercialization of innovation that promotes the state's climate goals to: (1) transition all medium- and heavy-duty vehicles in the state to zero-emission vehicles (ZEV) by 2045; (2) realize 100 percent ZEV in-state new car sales by 2035; and (3) significantly reduce pollution from the transportation sector in disadvantaged, low-income, Environmental and Social Justice (ESJ), and tribal communities, and Environmental Protection Agency non-attainment air districts as soon as possible, by addressing identified gaps for this goal.
Building Decarbonization	EPIC will invest in the rapid acceleration of comprehensive, cost-effective, and equitable building decarbonization technologies and strategies to help achieve the state's goal to be carbon neutral by 2045 economy-wide, including achieving and sustaining a three percent annual building electrification retrofit rate (3.6 percent for affordable housing) by and beyond 2030, by addressing identified gaps for this goal.
Achieving 100% Net-Zero Carbon Emissions and The Coordinated Role Of Gas	EPIC will seek to identify cost-effective opportunities for reaching the "last 10%" of the state's goal to be carbon neutral by 2045 economy-wide, through investment in California-specific strategies for hard-to-decarbonize energy-consuming sectors that could be decarbonized through electrification and coordination with other California RD&D programs to align investments and activities for emerging strategies, by addressing identified gaps for this goal.
DER Integration	EPIC will invest in the cost-effective integration of high penetrations of distributed energy resources to support the state's goal to achieve a renewable and zero-carbon power sector by 2045, in part by building on the state's goal to deploy 7,000 megawatts of flexible load by 2030, by addressing identified gaps for this goal.
Climate Adaptation	EPIC Plans will seek to identify cost-effective, targeted research opportunities for improving grid resiliency and stability, particularly for adaptability of and impacts on ESJ and tribal communities during severe weather events, including preventing and mitigating the effects of wildfires, floods, and other climate-driven events; hardening the grid and improving resiliency especially in the most remote grid edge locations; reducing the number of customers experiencing long-duration outages; and reducing the duration of these outages, by addressing identified gaps for this goal.

TRANSPORTATION ELECTRIFICATION

CALIFORNIA PUBLIC UTILITIES COMMISSION

The Electric Program Investment Charge (EPIC) Program will invest in research, development, and demonstration (RD&D) that supports the planning, integration, scaling, and commercialization of innovation that promotes the state's climate goals to: (1) transition all medium- and heavy-duty vehicles in the state to zero-emission vehicles (ZEV) by 2045; (2) realize 100 percent ZEV in-state new car sales by 2035; and (3) significantly reduce pollution from the transportation sector in disadvantaged, low-income, Environmental and Social Justice (ESJ), and tribal communities, and Environmental Protection Agency non-attainment air districts as soon as possible, by addressing identified gaps for this goal.

EPIC STRATEGIC OBJECTIVES PROCESS SCHEDULE

CALIFORNIA PUBLIC UTILITIES COMMISSION

Working Group Meeting	When	Where
Impact Analysis Framework and Metrics Kickoff	April 2, 2024	Virtual workshop
Transportation Electrification #1	April 10, 2024	In-Person: CPUC Offices San Francisco
Building Decarbonization #1	April 11, 2024	In-Person: CPUC Offices San Francisco
Getting to 100% Net-Zero Carbon... #1	April 12, 2024	In-Person: CPUC Offices San Francisco
Distributed Energy Resource Integration #1	April 30, 2024	In-Person: San Diego Foundation
Climate Adaptation #1	May 1, 2024	In-Person: San Diego Foundation
Transportation Electrification #2	**May 13, 2024**	**Virtual Technical Working Group**
Building Decarbonization #2	May 14, 2024	Virtual Technical Working Group
Achieving 100% Net-Zero Carbon Emissions... #2	May 15, 2024	Virtual Technical Working Group
Distributed Energy Resource Integration #2	May 29, 2024	Virtual Technical Working Group
Climate Adaptation #2	May 29, 2024	Virtual Technical Working Group
Wrap-Up Workshop	June 2024	Hybrid Workshop

TODAY'S GOAL

Gain stakeholder comment and proposed edits to the Draft Strategic Objectives for the Transportation Electrification Strategic Goal that focus on:

- Achieving a target;
- By a specific date;
- With example strategies;
- Including key considerations; and
- Outlining the path to market for sure innovation

Technical Working Group Workplan

CALIFORNIA PUBLIC UTILITIES COMMISSION

Kick-Off

Review CPUC Strategic Goals

Identify priority Gaps from Fall 2023 Workshops

Impact Analysis Framework

Identify methods for measuring success and impact

In-Person Technical Working Groups

Collaborative effort to develop draft strategic objectives based on prioritized gaps

Virtual Technical Working Groups

Stakeholder feedback and comment on draft Strategic Objectives

Post-Workshop Comments

Stakeholder written comments on draft Strategic Objectives

TIPS AND ADVICE

- **Focus on addressing the gaps:** Is what you are proposing a/the key ingredient to overcoming the gap(s)?
- **Fall in love with the problem, not any particular solution.**
- **Don’t try to do everything:** CPUC has established this process to narrow and focus EPIC investments.
- **Focus on the specific role of EPIC:** What can EPIC be doing specifically within its domain (electricity RD&D) that isn’t being done already elsewhere (federal funds, other state funds, private market)?
- **Stay out of the trap of new programs:** EPIC itself does not have the power to create new laws, new regulations, stand up new incentives, or create market signals.

1.1 Reducing Installation Costs and Time

CALIFORNIA PUBLIC UTILITIES COMMISSION

Strategic Objective: The program will result in an X% reduction in electric vehicle charging costs and an X% reduction in electric vehicle charging installation time by 2035.

WILL TAKE INTO CONSIDERATION:	WILL ACHIEVE A PATH TO MARKET THROUGH:	SUCCESS WILL BE MEASURED THROUGH:
• Older housing stock; and • Energization timelines.	• Demonstrating the value for Disadvantaged Vulnerable Communities (DVC) and in charging at multifamily housing.	• Cost per mile parity across charging methods; • Number of electric panel or grid upgrades eliminated or deferred; • Average revenue received by EV owners; • Reduction in curtailed renewable energy due to managed charging; and • Incremental cost of managed / V2X charging.

1.2 Reducing Cost of Charging Infrastructure for Medium and Heavy-Duty Vehicles

CALIFORNIA PUBLIC UTILITIES COMMISSION

Strategic Objective: The program will support the achievement of a target of X% of all medium- and heavy-duty charging installation being bidirectional capable by 2035, to reduce the costs of medium- and heavy-duty EV fleet operations and maintenance.

WILL TAKE INTO CONSIDERATION:

- Ratepayer costs should not increase more than X (for example, the rate of inflation);
- Cybersecurity;
- Available data sources;
- Resiliency and associated costs;
- Coordinating with renewable energy production times ($ value of shifted clean energy);
- Early adopters' costs may be higher;
- Readily deployable infrastructure;
- Supply chain dependability and availability.

WILL ACHIEVE A PATH TO MARKET THROUGH:

- Developing successful replicable and scalable model approaches and cost-effective pathways;
- Developing VPP/V2B/V2G specific rates tariffs to compensate customers (prosumers);
- Reducing upgrade costs.

SUCCESS WILL BE MEASURED THROUGH:

- Number of MWh load shifted;
- EPIC project cost per ton GHG reduction;
- GHG and air pollution reduction in the targeted DVC communities and elsewhere (to identify any air quality impacts elsewhere);
- $/bill savings for ratepayers in avoided infrastructure investments;
- EV adoption rate, particularly for medium and heavy-duty vehicles;
- Number of medium and heavy-duty vehicle fleets electrified..

1.3 Ubiquitous EV-capable parking in Disadvantaged Vulnerable Communities (DVCs)

CALIFORNIA PUBLIC UTILITIES COMMISSION

Strategic Objective: The program will support innovation in deployment strategies to achieve 75% of existing housing in DVC communities having EV charging-capable parking by 2035.

WILL TAKE INTO CONSIDERATION:	WILL ACHIEVE A PATH TO MARKET THROUGH:	SUCCESS WILL BE MEASURED THROUGH:
• Older housing stock; • Need for information on use-cases in disadvantaged, low-income, and Tribal communities; • Energization timelines; and • Need to manage load.	• Demonstrating the value of DVC community markets and in charging at multifamily housing.	• Number of multifamily housing in DVC communities that serve as resilience hubs; • Percent penetration of charging infrastructure in DVC communities; • Percent increase in EV adoption in DVC communities; • Uptake of energy management systems; and • Uptake of EV chargers with load management capability.

1.4 Ensuring Communities Receive VGI Benefits

CALIFORNIA PUBLIC UTILITIES COMMISSION

Strategic Objective: This program will increase the value from managed or dynamic charging for DVC communities' charging use cases by X%.

WILL TAKE INTO CONSIDERATION:	WILL ACHIEVE A PATH TO MARKET THROUGH:	SUCCESS WILL BE MEASURED THROUGH:
• Increased need for community resilience; • Energization timelines;	• Demonstrating value of EV charging and VGI to DVC communities.	• Payback period of EVs through managed charging value; • Time EVs are used as backup power in response to grid outages; • Number of customers in DVC communities participating in virtual power plant applications; • Return on investment; • Number of micro-mobility technologies penetrating DVC communities; • Time burden of charging in multifamily housing; and • Increased resilience (loss of energy reduced) in DVC communities.

1.5 VGI as a Grid Enabling Asset

CALIFORNIA PUBLIC UTILITIES COMMISSION

Strategic Objective: The program will accomplish enabling widespread VGI build out to operate and decarbonize the grid at the lowest societal cost by 2035.

WILL TAKE INTO CONSIDERATION:	WILL ACHIEVE A PATH TO MARKET THROUGH:	SUCCESS WILL BE MEASURED THROUGH:
• Cybersecurity needs of the end-to-end communication systems; • The need for robust market oversight; • Relevant CPUC proceedings including those related to transportation electrification, load management, rate design, etc; • Continued safety and reliability of the grid; • Other non-transportation related flexible loads (ex. buildings, DER) • Affordability of rates and grid upgrades; • Equity specific use cases for VGI; • Competing clean generation use-cases and co-location with DERs; and • Unmanaged charging and misalignment of charging with renewable generation will set California back in achieving it’s clean energy goals	• Understanding and appropriately valuing shifted load; • Determining the required amount of renewable generation and its optimal locations to leverage VGI effectively in meeting California's clean energy targets; and • Creating cybersecurity requirements to enable all VGI capabilities.	• Number of vehicles served • Societal cost test • Cost/Benefit analysis for the electric system • Criteria emissions and GHG attribution • Cost of service • Number of cybersecurity incidents

1.6 Innovative Solutions to Reduce Grid Upgrades

CALIFORNIA PUBLIC UTILITIES COMMISSION

Strategic Objective: Reduce the number of grid upgrades need to support the state's transportation electrification goals by 50% through the implementation of a diversified portfolio of electric grid innovation projects by 2045.

WILL TAKE INTO CONSIDERATION:	WILL ACHIEVE A PATH TO MARKET THROUGH:	SUCCESS WILL BE MEASURED THROUGH:
• Grid performance. • Consumer behaviors. • Community needs. • Equity and justice outcomes.	• Deployment of pilots and demonstration projects as replicable and scalable models. • Support market facilitation with seamless strategies that remove market barriers to achieve economies of scale.	• Total number of grid upgrades. • Total number of project installations needing grid upgrades. • Overall cost of grid upgrades in terms of rate base investment and other funds. • Measurable CPUC cross-cutting ratepayer benefits. • Disadvantaged vulnerable communities (DVC) measurable benefits.

1.7 Smart Systemwide Grid Planning Tools

CALIFORNIA PUBLIC UTILITIES COMMISSION

Strategic Objective: Deploy grid capital planning tools to enable continuous, localized, and prioritization of grid upgrades as efficient and critical pathways by 2035.

WILL TAKE INTO CONSIDERATION:	WILL ACHIEVE A PATH TO MARKET THROUGH:	SUCCESS WILL BE MEASURED THROUGH:
• Variations of transportation modes (i.e. light-medium-heavy duty) • Consumer behaviors. • Community needs. • Equity and justice outcomes.	• Deployment of pilots and demonstration projects as replicable and scalable models. • Support market facilitation with seamless strategies that remove market barriers to achieve economies of scale.	• CPUC cross-cutting EPIC measures • Return on capital associated with grid load management solutions • Less capital investment deployed towards grid upgrades • New, innovative, or enhanced grid performance features

1.8 Accelerate Grid Interconnection Timelines

CALIFORNIA PUBLIC UTILITIES COMMISSION

Strategic Objective: Accelerate grid interconnection timelines by 50% to enable EV infrastructure installation by 2030.

WILL TAKE INTO CONSIDERATION:	WILL ACHIEVE A PATH TO MARKET THROUGH:	SUCCESS WILL BE MEASURED THROUGH:
• Variations of transportation modes (i.e. light-medium-heavy duty) • CPUC energization proceeding. • Consumer behaviors. • Community needs.		• Frequency of interconnection installations. • Interconnection installation timelines. • Cost savings.

Poll Questions – Strategic Objectives

CALIFORNIA PUBLIC UTILITIES COMMISSION

1.1 Reducing Installation Costs and Time

This program will result in an X% reduction in electric vehicle charging costs and an X% reduction in electric vehicle charging installation time by 2035.

1.2 Reducing Cost of Charging Infrastructure for Medium and Heavy-Duty Vehicles

The program will support the achievement of a target of X% of all medium- and heavy-duty charging installation being bidirectional capable by 2035, to reduce the costs of medium- and heavy-duty EV fleet operations and maintenance.

1.3 Ubiquitous EV-capable parking in Disadvantaged Vulnerable Communities (DVCs)

The program will support innovation in deployment strategies to achieve 75% of existing housing in DVC communities having EV charging-capable parking by 2035.

1.4 Ensuring Communities Receive VGI Benefits

This program will increase the value from managed or dynamic charging for DVC communities' charging use cases by X%.

1.5 VGI as a Grid Enabling Asset

The program will accomplish enabling widespread VGI build out to operate and decarbonize the grid at the lowest societal cost by 2035.

1.6 Innovative Solutions to Reduce Grid Upgrades

Reduce the number of grid upgrades need to support the state's transportation electrification goals by 50% through the implementation of a diversified portfolio of electric grid innovation projects by 2045.

1.7 Smart Systemwide Grid Planning Tools

Deploy grid capital planning tools to enable continuous, localized, and prioritization of grid upgrades as efficient and critical pathways by 2035.

1.8 Accelerate Grid Interconnection Timelines

Accelerate grid interconnection timelines by 50% to enable EV infrastructure installation by 2030.

Comments and Input

- Proposed edits and clarifications
- Critical missing elements
- Key considerations
- Methods for achieving a path to market
- Ways to measure success

Presentations

1. Sarah Swickard	PG&E
2. Peter Chen	CEC
3. Nick Fiore	SDG&E
4. Jordan Smith	SCE
5. Zuzhao Ye	University of California, Riverside

Draft EPIC Strategic Objectives Transportation Electrification

May 13, 2024

Together, Building a Better California

EPIC 5 Strategic Objectives – Transportation Electrification

1.5 VGI as a Grid Enabling Asset: *The program will accomplish enabling widespread VGI build out to operate and decarbonize the grid at the lowest societal cost by 2035.*

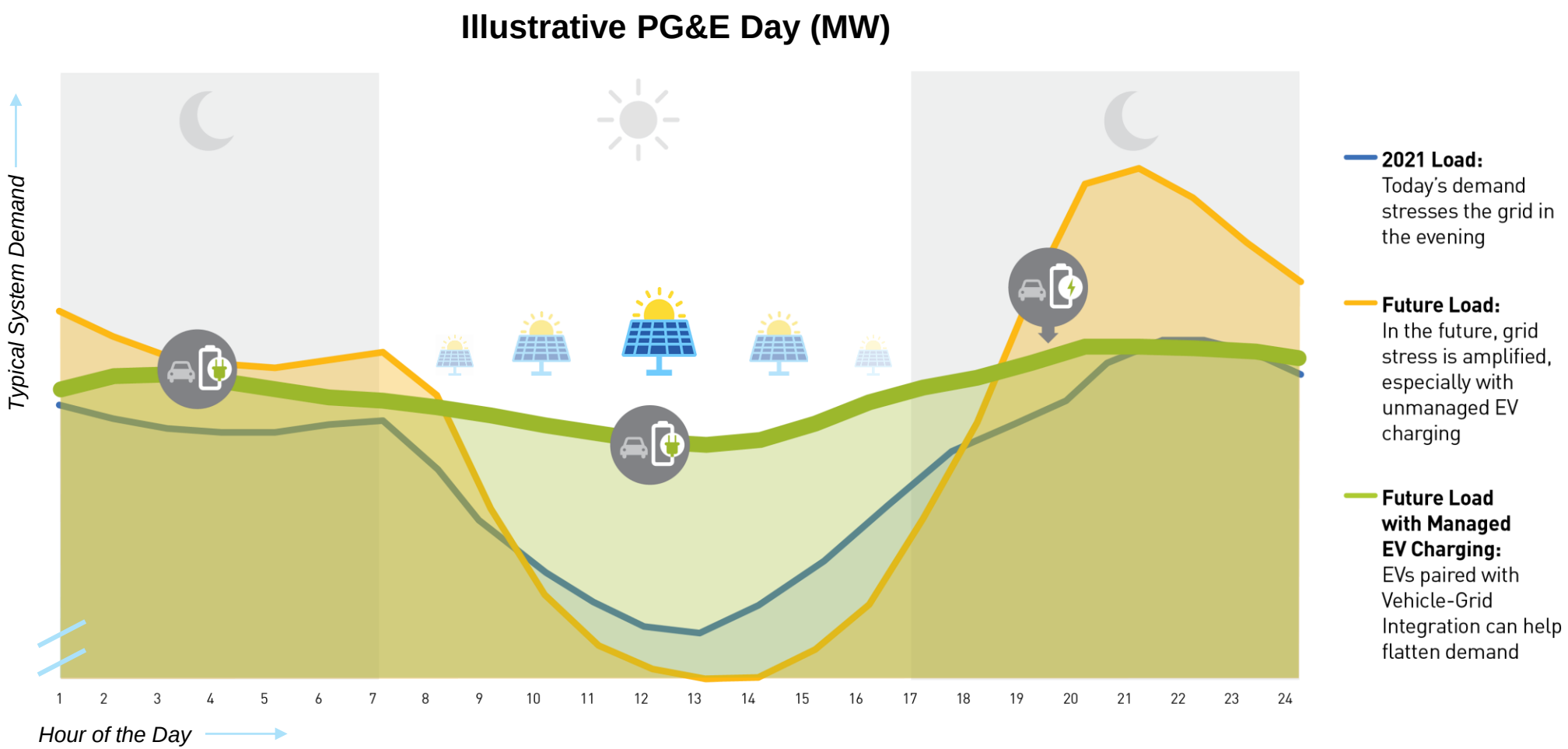
- What does "widespread VGI build out" look like?
- Defining "lowest societal cost"
- Metrics

1.6 Innovative Solutions to Reduce Grid Upgrades: *Reduce the number of grid upgrades need to support the state's transportation electrification goals by 50% through the implementation of a diversified portfolio of electric grid innovation projects by 2045.*

- EV Load Flexibility as grid performance innovation
- Metrics

The Potential of EVs

PG&E's EV Vision: PG&E will harness the potential of EVs to decarbonize the economy at the lowest societal cost



Not An Approved Load Forecast

Our VGI Vision

Our VGI Vision is to offer simple and value-add customer solutions to optimize when and where vehicles charge and discharge that minimize costs for PG&E and its customers and decarbonize the grid at the lowest cost.

By maximizing across these areas, PG&E can achieve its objectives at the **lowest societal cost** and allow PG&E to reach **carbon neutrality by 2040**

Optimize Costs

VGI can enable a large increase in load from electrification with reduced impacts to system peak and dx asset capacity creating a more efficient grid

Customer Value

Bi-directional vehicles can make outages invisible to the customer, make electrification more feasible, and offer additional revenue streams

How we define Vehicle Grid Integration (VGI)

*Altering the **time, charge level, location** at which grid connected EVs charge or discharge*

V1G / Uni-Directional Charging

Rates

Load that can be shifted via time differentiated rates to reduce or increase demand on the grid at certain times

Ex: EV2A, Business EV Rate (BEV), Day Ahead Hourly Real Time Pricing BEV rate (DAHRTP BEV)

Managed Charging/Load Management

Load that can be actively shifted in response to grid conditions (System or Distribution)

Ex: evPulse, Emergency Load Reduction Program, Virtual Power Plant (VPP)

Bi-Directional Charging

Vehicle to Everything (V2X)

Power that can be exported from bidirectional electric vehicle systems (grid-tied installations and self-consumption)

Ex: Vehicle to Home/Building & Vehicle to Grid (V2G)

What does widespread VGI buildout look like?

Based on the quantity and location of VGI (V1G & V2G) system needs/value

Develop an optimized portfolio of VGI rates and programs

Which requires maturity across all these different factors:

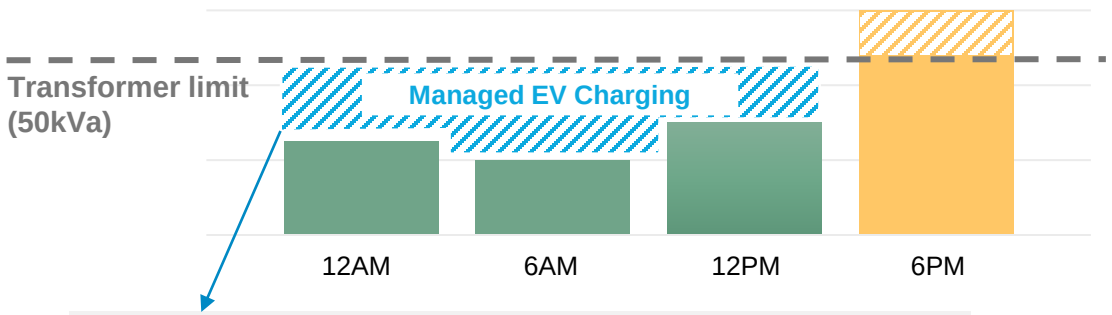
Grid Value	Creates bulk and/or dx grid value
Customer Acceptance	Customers participate at scale at price point
Technology	Utility systems, architecture, EVs, chargers
Business Model	Creates value for all with minimal cost shift
Regulation/Policy	Accounts for unique EV ops and enables scale

Flexible Load Potential

Electric Vehicles represent potentially game-changing potential as flexible load

Pilot hypothesis: Leveraging flexible EV load to defer distribution upgrade costs

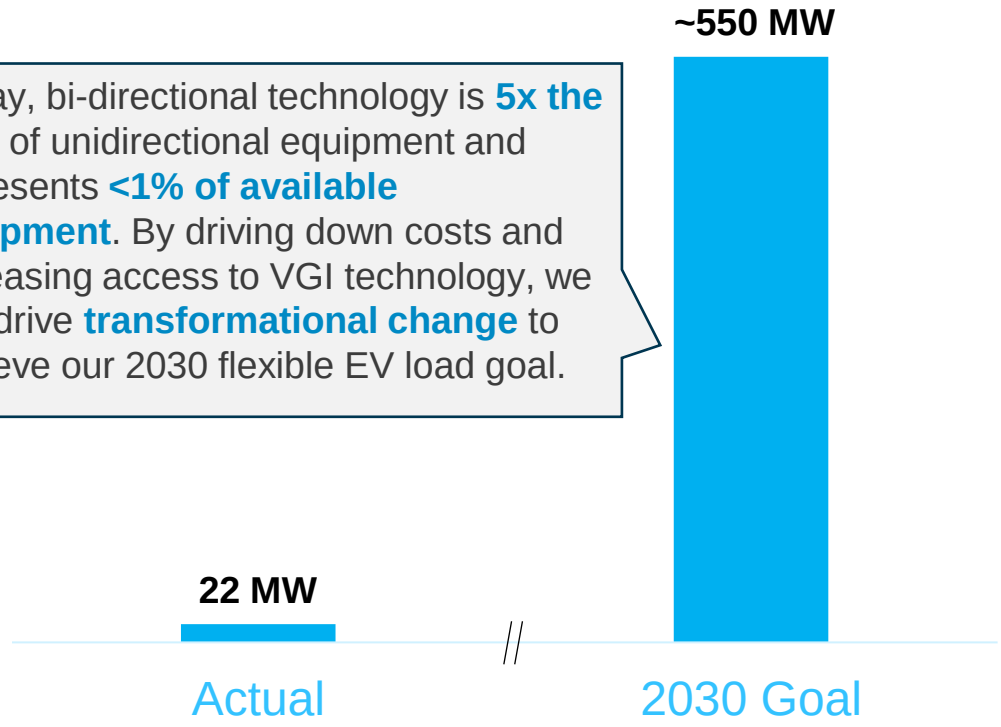
Overloaded residential transformer traditionally unable to accept additional EV load



By actively managing EV charging into hours with transformer capacity, we can enable an **additional ~10-15 daily commutes** on this transformer, deferring grid upgrades. With a goal to reach ~3M EVs by 2030, at scale, this can provide **impactful cost savings**.

Flexible load from Electric Vehicles in PG&E's Service Territory

Today, bi-directional technology is **5x the cost** of unidirectional equipment and represents **<1% of available equipment**. By driving down costs and increasing access to VGI technology, we can drive **transformational change** to achieve our 2030 flexible EV load goal.



Initial Feedback on EPIC 5 Transportation Electrification Draft Strategic Objectives

Peter Chen, Supervisor of the Transportation Unit
Energy Research and Development Division

May 13, 2024

Initial Feedback Summary

1. Combine related objectives to reduce the number of objectives and improve clarity
2. Clarify whether targets are expected to be aspirational or achievable through EPIC projects
3. Include missing technology areas not covered in the draft objectives
4. Consider key related policies and proceedings
5. Build upon existing CEC EPIC Program mechanisms to achieve a path to market

Proposed Revised Objective 1

Reduce the all-in costs of charging infrastructure and associated grid upgrades to ensure affordability and cost per mile parity with fossil fuel vehicles.

Related draft objectives:

- 1.1 Reducing Installation Costs and Time
- 1.2 Reducing Cost of Charging Infrastructure for Medium- and Heavy-Duty Vehicles
- 1.6 Innovative Solutions to Reduce Grid Upgrades

Proposed Revised Objective 2

Increase equitable access to transportation electrification to alleviate pollution, transportation, and energy burdens in disadvantaged, low-income, and ESJ communities; tribal nations; and non-attainment air districts.

Related draft objectives:

- 1.3 Ubiquitous EV-capable parking in DVCs
- 1.4 Ensuring Communities Receive VGI Benefits

Proposed Revised Objective 3

Enable all EVs to engage in a form of vehicle-grid integration to support grid operation and decarbonization at the highest net benefit to ratepayers.

Related draft objectives:

- 1.4 Ensuring Communities Receive VGI Benefits
- 1.5 VGI as a Grid Enabling Asset

Proposed Revised Objective 4

Accelerate grid interconnection timelines for charging infrastructure to keep pace with building the over 2 million chargers needed by 2035.

Related draft objectives:

- 1.1 Reducing Installation Costs and Time
- 1.6 Innovative Solutions to Reduce Grid Upgrades
- 1.7 Smart Systemwide Grid Planning Tools
- 1.8 Accelerate Grid Interconnection Timelines

Critical Missing Elements

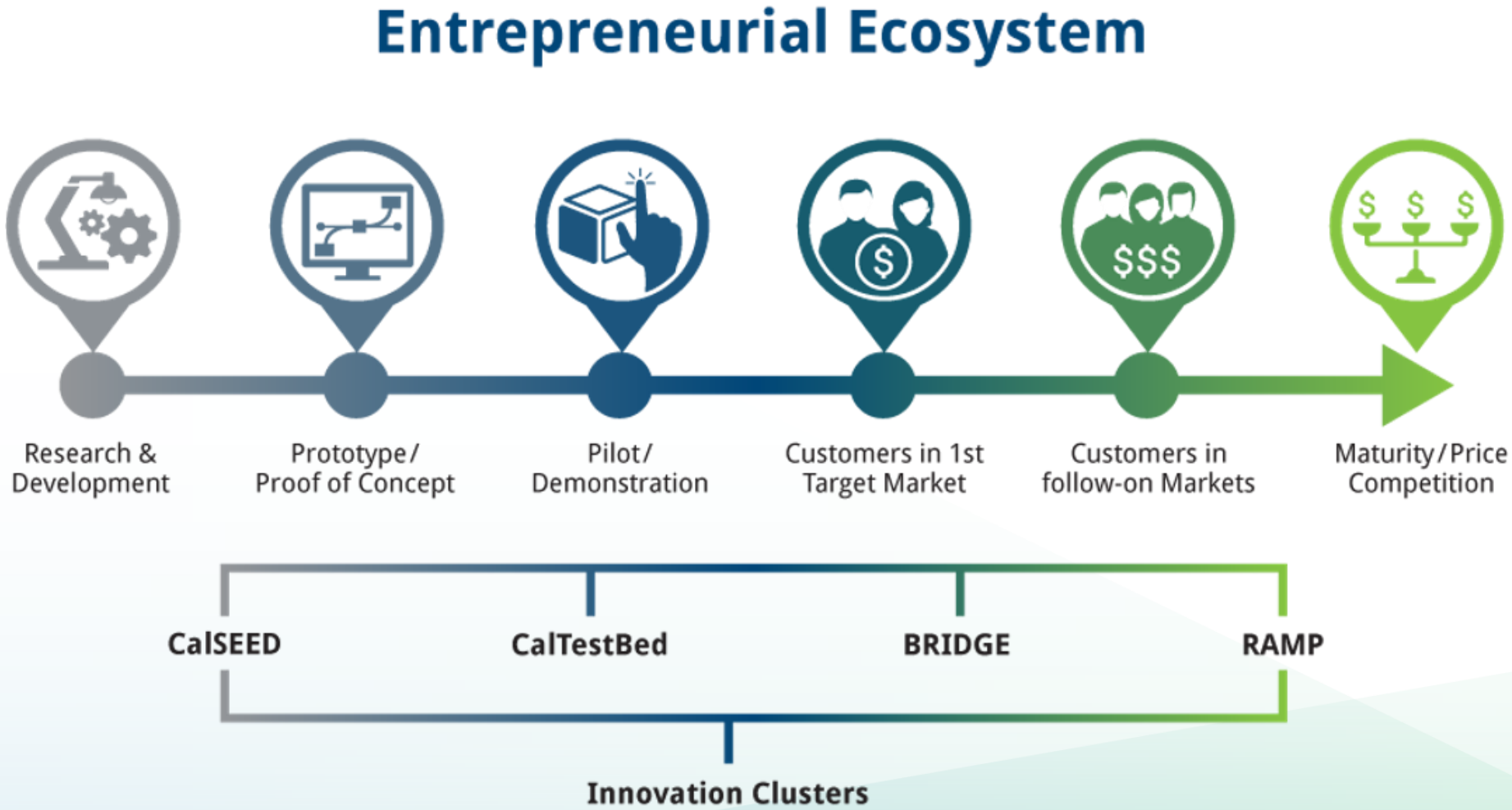
EV Battery Innovations

- Battery capacity, charge rate, and cycle life impact EVs' capabilities as grid assets
- EV batteries at end-of-life can be repurposed as stationary storage to support the grid
- Economically and environmentally sustainable recycling processes can bolster the energy storage supply chain

Key Considerations

- **AB 2127:** EV Charging Infrastructure Assessment projects that over 2 million shared and public chargers are needed in 2035
- **AB 2061 and AB 126:** Charger Recordkeeping and Reporting, Reliability, and Data Sharing Regulations require 97% uptime and 90% successful charge attempt rate
- **SB 846:** Load Shift Goal of 7,000 MW by 2030
- **R.23-12-008:** Transportation Electrification Policy and Infrastructure
- **R.24-10-018:** Energization Timelines
- **R.22-07-005:** Demand Flexibility
- **R.21-06-017:** High DER Future

Achieving Path to Market



Thank You

Peter Chen

Peter.Chen@energy.ca.gov

Feedback on Draft EPIC 5 Strategic Objectives: Transportation Electrification

5/13/2024

Feedback

- **EPIC 5 Strategic Objectives (SO) Target Years:**
  - Setting the 2035 year as a target date for EPIC 5 needs flexibility. Should be dependent on actual approval date + xx years.
  - Including an option to have the target years for EPIC 5 based on approval date (i.e. 2025) + 10 yrs will ensure the program stays on a time schedule.
  - **Recommendation:** The SO target deadlines should start from the Commission's approval of the EPIC Investment Plans + 10 years

Feedback

1.1 Reducing Installation Costs and Time

Strategic Objective: This program will result in an X% reduction in electric vehicle charging costs and an X% reduction in electric vehicle charging installation time by 2035.

- Are these measures statewide? Tracking localized metrics for both charging and install costs would lead to more accurate insights
- Data collection on costs might prove difficult. For example:
  - What are the data sources for validating costs?
  - Are we differentiating costs for residential vs. commercial customers?
  - Pricing models will be different for publicly accessible charging vs. private

Feedback

1.2 Reducing Cost of Charging Infrastructure for Medium and Heavy-Duty Vehicles

Strategic Objective: The program support the achievement of a target of X% of all medium- and heavy-duty charging installation being bidirectional capable by 2035, to reduce the costs of medium- and heavy-duty EV fleet operations and maintenance.

- Supply chain considerations will be key to meeting these goals (i.e. available certified EVSE from manufacturers to support the % goal in installation targets)
- The comparatively high (vs. non-bidirectional) capital costs of currently approved bidirectional capable EVSE (hardware) should be considered

Feedback

1.8 Accelerate Grid Interconnection Timelines

Strategic Objective: Accelerate grid interconnection timelines by 50% to enable EV infrastructure installation by 2030.

- Is this within the scope of the EPIC program?
- How will this objective achieve success?
- How are/will grid interconnection timelines be measured and benchmarked?
- No path to market was listed for this strategic objective: What are innovations, interventions or resources that will allow for the timeline reduction (increase in interconnection speed)?

SDGE™

THANK YOU

EPIC Strategic Objectives Feedback

May 13, 2024

Transportation Electrification

Transportation Electrification

1.1 Reducing Installation Costs and Time

- Suggested Objective:
  - **The program will develop and demonstrate technologies and methods leading to a charging infrastructure capital cost reduction of 10%, together with a corresponding deployment time reduction**.
- This Strategic Objective should focus on the identified gaps of reducing *capital* costs of charging equipment and increasing equitable access to TE benefits
  - Planning needs to focus on the lowest cost methods, equipment, and sources of supply and must incorporate the results of innovation, which can be informed by EPIC RD&D
  - EPIC cannot adjust total operational costs ("cost per mile") which include EVs, maintenance, insurance, and other factors beyond the scope of EPIC
    - Focus should be on cost of supporting incremental EV fleet additions with charging infrastructure allocations (cost per unit charger support)
  - Success factors should stay focused on total capital costs for the deployment of charging infrastructure – not the concept of revenue from a source that doesn't exist or is undefined.
  - The proposed objective references existing Energization Timeline activities, but should consider total project end delivery time from start to finish separately
  - Focus should be on benefits to be realized with DVC and defined communities, with measurable metrics such as emissions reductions and support for EVs in those communities

Transportation Electrification

1.2 Reducing Cost of Charging Infrastructure for Medium and Heavy-Duty Vehicles

- This proposed Strategic Objective is similar to Objective 1.1 and they should be combined.
- The proposed objective focuses on operational costs, not capital costs.
- Bidirectional objectives should align with VGI definition and principles and objectives.
- Bidirectional charging infrastructure has higher capital cost than unidirectional charging infrastructure, which opposes the Goal's requirement to seek lower capital costs
  - It has not been proven that bidirectional operations will lower costs to operators or ratepayers, so the initial premise is not established.
- V2G objectives should align with VGI and focus on grid benefit to the public

Transportation Electrification

1.3 Ubiquitous EV-capable parking in Disadvantaged Vulnerable Communities (DVCs)

- Suggested objective:
  - **The program will support innovation in deployment strategies to achieve 75% of vehicles housed in DVC communities having access to EV charging-capable parking spaces by 2035**
- Lack of capable and effective EV charging at the place of dwelling has been shown in many studies to be a barrier to EV adoption and support
- Level 2 charging has been shown to be the most efficient method and responsible for the least GHG per unit EV charging
- Level 2 charging gives EV owners confidence of sufficient charging service and is capable of VGI use case demonstration
- The Strategic Objective should focus on total housing in DVC communities – not restrict to existing housing.
  - Focusing on existing housing unnecessarily burdens specific action and methods on retrofits and restricts innovation opportunities to specific use cases.
- The results of action on this objective should serve those communities and the public at large.
- The proposed metric is vague (per housing unit or per occupied dwelling?)

Transportation Electrification

1.4 Ensuring Communities Receive VGI Benefits

- A proposed strategic objective should first demonstrate the value of a particular use case, as referenced from the VGI Working Group
- Measurement methods such as payback from VGI based on tariffs and tariff modification would not be in EPIC scope
- Backup power use cases and benefits based on payback could depend on external factors which could not be controlled for
- Focus should be on defined use cases that demonstrate DVC and public benefit as defined by VGI in PU code

Transportation Electrification

1.7 Smart Systemwide Grid Planning Tools

- This proposed strategic objective is similar to 1.6 and should be combined.

Transportation Electrification

1.8 Accelerate Grid Interconnection Timelines

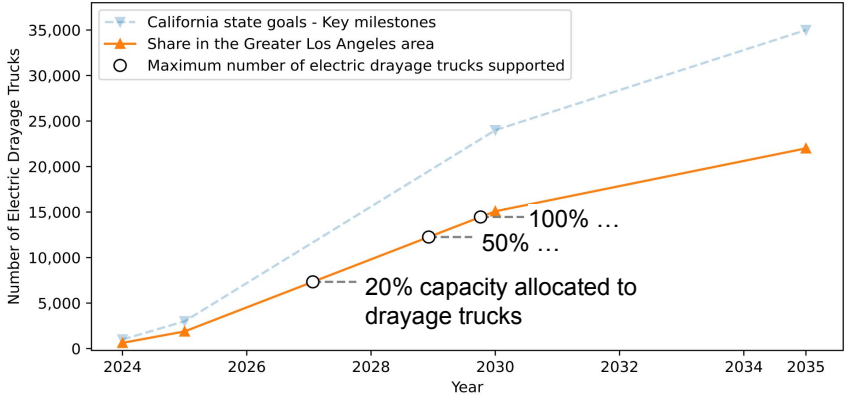
- This proposed strategic objective is not clearly defined.
- It is not clear whether the target is on generator interconnection or focused on energization timelines similar to 1.1.
- The identified gap related to interconnection focused on interconnection standards, system design and communications between devices and systems, which are functionally related.
- The objective should focus on functional development and demonstration to show public benefits.

The Need for an Earlier Timeline in Planning Tools

1. Executive Order N-79-20

- 100 percent of in-state sales of new passenger cars and trucks will be zero-emission by 2035.
- 100 percent of medium- and heavy-duty vehicles in the State be zero-emission by 2045 for all operations where feasible by 2035 for drayage trucks.
- 100 percent zero-emission off-road vehicles and equipment by 2035 where feasible.

2. A Case Study for Drayage Trucks



- Assuming no upgrades.
- Not including loads from other transportation modes.
- Planning should be 5-10 years ahead.

3. Suggested Edits

1.7 Smart Systemwide Grid Planning Tools

Strategic Objective: Deploy grid capital planning tools to enable continuous, localized, and prioritization of grid upgrades as efficient and critical pathways by 2035. → 2030 or earlier

The Strategic Objective will take into consideration:

- Variations of transportation modes (i.e. light-medium-heavy duty)
- Consumer behaviors.
- Community needs.
- Equity and justice outcomes.
- Evolving trends in EV adoption

Reference

Ye, Zuzhao, Nanpeng Yu, and Ran Wei. "Joint Planning of Charging Stations and Power Systems for Heavy-Duty Drayage Trucks." *arXiv preprint arXiv:2403.14866* (2024).

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