EPIC Strategic Objectives Workshop Report

EPIC POLICY + INNOVATION COORDINATION GROUP

July 2024

The EPIC program is funded by California utility customers under the auspices of the California Public Utilities Commission.

This report was completed by The Accelerate Group, a consultant to the California Public Utilities Commission and the Project Coordinator for the EPIC Policy + Innovation Coordination Group. The information herein was collected and summarized by the Project Coordinator, with input from members of the EPIC Policy + Innovation Coordination Group and does not reflect an official position of the California Public Utilities Commission.

EXECUTIVE SUMMARY

In its 2023 EPIC decision (D.)23-04-042, the California Public Utility Commission (CPUC) directed that program-wide goals are needed to evaluate the progress of innovation investments and the extent to which investment plan portfolios maximize ratepayer benefits and impacts in achieving California's clean energy and climate goals. As part of that decision, the CPUC directed the establishment of a public workshop process to inform how Strategic Goals and Objectives should be articulated and established by the Commission in its next guidance Decision for the EPIC 5 cycle (2026-2030). The workshop process was aimed to collect feedback on measurable program level strategic goals and Administrator level strategic objectives that align with achieving the State's climate goals. In a series of 6 Strategic Goals workshops hosted by CPUC and facilitated by the PICG in August - September 2023, the workshop participants helped identify the key pathways and strategic goals for the EPIC cycle 5 funding that laid a foundation for the CPUC Staff Proposal and CPUC decision (D.)24-03-007 adopting the Strategic Goals listed below and provided further guidance in identifying Strategic Objectives for the EPIC Administrators.

Upon the CPUC decision D.24-03-007, the CPUC Staff launched a Strategic Objectives Workshop process to develop the Strategic Objectives for the EPIC cycle 5. The workshop process included a series of 12 virtual and in person interactive work group events in March-May 2024, where participants were broken into small groups to work on specific gaps identified during the fall Strategic Goals Workshop process within each of the CPUC adopted Strategic Goals. More than 530 individuals participated in the workshop process events, including CPUC Staff, the four Administrators of the EPIC Program (California Energy Commission, Pacific Gas and Electric (PG&E), Southern California Edison (SCE), and San Diego Gas & Electric (SDG&E)), RD&D leaders, research institutions, community leaders, technology solution providers, government entities, utilities, non-governmental organizations, and various industry representatives.

The Strategic Objectives workshop process started with a virtual Strategic Objectives Kick-Off Workshop on March 19, 2024, followed by a virtual workshop on Impact Analysis Framework and Metrics on April 2, 2024. CPUC and PICG then facilitated five in-person Technical Working Group meetings in San Francisco and San Diego between April 10 and May 1, 2024 dedicated to developing a first draft of the Strategic Objectives. The Technical Working Groups focused on the Strategic Goals adopted in the CPUC decision D.24-03-007, with each meeting dedicated to one of the five adopted Goals:

1. Transportation Electrification;
2. Building Decarbonization;
3. Achieving 100% Net-Zero Carbon Emissions and the Coordinated Role of Gas;
4. Distributed Energy Resource Integration; and
5. Climate Adaptation.

Upon each in-person meeting a draft report on the strategic objectives developed at the meeting was circulated among the stakeholders inviting their feedback. In addition, CPUC hosted five follow-up virtual working group meetings between May 13 and May 29, 2024 to collect feedback on the released draft Strategic Objectives and identify any missing or overlooked issues and perspectives. Stakeholders were also invited to provide written comments on the draft objectives by June 21, 2024 and 11 entities filed their comments, summarized in this report below. The Final Workshop was held on July 9, 2024 in San Francisco, dedicated to presenting and discussing results of this workshop process and the updated draft Strategic Objectives.

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BACKGROUND

What is EPIC?

The EPIC program is funded by California utility customers under the auspices of the California Public Utilities Commission.

The Electric Program Investment Charge (EPIC) is a California ratepayer funded program that drives efficient, coordinated investment in new and emerging clean energy solutions. Its mandatory guiding principle is to provide ratepayer benefits, with a mission of investment in innovation to ensure equitable access to safe, affordable, reliable, and environmentally sustainable energy for electricity ratepayers. EPIC invests in a wide range of critical innovation, including building decarbonization, cybersecurity, demand reduction, distributed energy resource integration, energy storage, entrepreneurial ecosystems, grid decarbonization, grid decentralization, grid modernization, grid optimization, grid resiliency and safety, high penetration renewable energy grid integration, industrial and agricultural innovation, smart grid technology, transportation electrification, and wildfire mitigation. From 2012 through 2030, EPIC will have invested nearly $3.4 billion in clean energy technology innovation.

What is the Policy + Innovation Coordination Group?

The California Public Utilities Commission (CPUC) oversees and monitors the implementation of EPIC research, development, and deployment (RD&D) program. For current EPIC funds from investment periods 1 (2012-2014), 2 (2015-2017), 3 (2018-2020), and 4 (2021-2025) there are four program administrators: the California Energy Commission (CEC), Pacific Gas and Electric (PG&E), Southern California Edison (SCE), and San Diego Gas & Electric (SDG&E). The CEC administers 80% of the funds and the utilities administer 20%.

In Decision 18-10-052, the CPUC established the Policy + Innovation Coordination Group (PICG) — comprised of a Project Coordinator, the four Administrators, and the CPUC—to better align EPIC investments and program execution with CPUC and California energy policy needs. In Decision 23-04-042, the CPUC directed the PICG to facilitate the Strategic Goals and Objectives process for the EPIC 5 funding cycle (2026-2030).

CPUC GUIDANCE ON THE WORKSHOP PROCESS

The CPUC D.24-03-007 decision adopted the Strategic Goals and established guidance on developing Strategic Objectives, including a clarified definition of what a “Strategic Objective” is for the EPIC purposes.

EPIC Strategic Goals

On March 7, 2024CPUC issued its decision D.24-03-007 establishing the following Strategic Goals:

1. **Transportation Electrification:** EPIC Program will invest in 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 instate 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.
2. **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.
3. **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.
4. **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.
5. **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.

Definition

D.24-03-007 clarified that "Strategic Objectives" are clear, measurable, and robust targets to guide EPIC investment plan strategies to scale and deploy innovation to align with EPIC's Strategic Goals that:

- Address the key identified gaps for critical pathways to demonstrated progress in achieving California's climate goals,
- Focus on the unique role ratepayer funded research, development, and demonstration (RD&D) should play in leading innovation investment, and
- Incorporate important crosscutting principles identified in the decision.

Specifically, D.24-03-007 endorsed principles for crosscutting strategies to be considered in development of the Strategic Objectives. These principles relate to

(1) equity,
(2) emerging strategies, and
(3) safety (including cybersecurity).

Additional Gaps

CPUC Decision D.24-03-007 noted that additional gaps may be added to the record through the Strategic Objectives Workshops. Therefore, the PICG Project Coordinator collected additional comments from the stakeholders during the virtual March 19, 2024 Kick Off Meeting and written comments submitted by March 29, 2024 and updated the key gaps to be discussed during the working groups hosted in April and May 2024. The updated gaps were presented during each working group meetings and are listed in the Attachments to this Report.

KEY GUIDANCE FOR REVISING STRATEGIC OBJECTIVES

During the April 2024 in-person meetings the workshop participants developed an initial draft set of strategic objectives. These draft objectives were shared with the stakeholders upon each working group meeting. Stakeholders were invited to then provide their feedback on these draft objectives in the virtual meetings designed as a follow-up on each of the 5 in-person meetings on each of the Strategic Goals. Stakeholders were also invited to submit their written comments by June 21, 2024.

Based on guidance from the CPUC and feedback received from the technical working group meetings, the Draft Strategic Objectives will be revised according to the following guidance:

- **Consolidate.** Consolidate related and duplicate Draft Strategic Objectives;

- **Significant Impact.** Focus Strategic Objectives to ensure EPIC has a significant, meaningful, and measurable impact;
- **Innovation Gaps.** Ensure Strategic Objectives address and help overcome the key identified gaps;
- **Quantitative Targets.** Establish clear, measurable, and robust targets for each Strategic Objective. While the EPIC program itself may not be expected to reach the target on its own, RD&D investments within the EPIC program should be designed around supporting innovation needed to reach the quantitative targets.
- **Multiple Goals.** Allow Strategic Objectives to cover multiple Strategic Goals;
- **Scale and Deploy.** Allow Strategic Objectives to describe how EPIC will scale and facilitate deployment of innovation to support an outcome or target, and not rely on EPIC to fully reach the target itself;
- **Funding Gaps.** Identify areas where other funding (federal/private) is more prevalent or appropriate, and narrow Strategic Objectives to focus on funding gaps related to EPIC's unique role as ratepayer-funded RD&D;
- **DVC-specific needs.** Identify key areas where critical DVC gaps are the specific focus of a Strategic Objective;
- **Equity.** Ensure equity-focused strategies and impact analysis are incorporated into each Strategic Objective;
- **Ratepayer Benefit.** Identify areas where there is clear benefit to ratepayers resulting from the innovation;
- **Emerging Strategies.** Incorporate emerging strategies into relevant and appropriate Strategic Objectives;
- **Safety.** Identify safety (including cybersecurity) considerations for appropriate Strategic Objectives;
- **Focus metrics.** Reduce the number of metrics and measurements of success, focus metrics on key outcomes from Strategic Objectives, and identify common metrics across multiple Strategic Objectives.

REVISED STRATEGIC OBJECTIVE DESCRIPTIONS

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STRATEGIC OBJECTIVE

(A) Reducing M/HDV Charging Infrastructure Costs

The EPIC program will accelerate innovation, demonstration, and innovative approaches to deployment that support the reduction of the cost of medium- and heavy-duty charging infrastructure installations, associated grid upgrades, and/or the total cost of ownership by a target of 50% by 2035.

The Strategic Objective will take into consideration:

- The need to establish a baseline that appropriately reflects the anticipated price trends in EV charging infrastructure installations through 2035;
- Coordination with existing and planned EV charging infrastructure incentives, relevant CPUC proceedings on Transportation Electrification;
- The need to prioritize strategies serving people in Disadvantaged Vulnerable Communities due to the disproportionate impacts of medium- and heavy-duty trucks on these communities;
- Enabling VGI use cases to reduce costs and/or increase the value proposition for the user or owner;
- Innovations to improve cybersecurity or reduce the costs of ensuring secure communications and operations;
- Reductions in soft costs due to delays and long installation timelines; and
- Supply chain dependability and availability.

The Strategic Objective will achieve a path to market through:

- Developing successful replicable and scalable model approaches and cost-effective pathways; and
- Incorporating lessons learned into utility EV charging programs, CPUC proceedings, and other planning;

Success for the Strategic Objective will be measured through:

- Reduction in charging infrastructure installation times, disaggregated by DVC.
- 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; and
- Number and EV adoption rate of medium and heavy-duty vehicles, disaggregated by community.

STRATEGIC OBJECTIVE

(B) Overcoming barriers to EV benefits in DVCs

The EPIC program will accelerate innovation, demonstration, and innovative approaches to deployment to overcome obstacles to equitable transportation electrification benefits (including alleviation of pollution, bridging transportation access, and addressing energy burden) in disadvantaged and vulnerable communities, low-income communities, and non-attainment air districts.

The Strategic Objective will take into consideration:

- Older housing stock and an increased need for community resilience in DVCs;
- Lack of data on use-cases in disadvantaged, low-income, and Tribal communities, and the need to build trust within communities;
- Differing community needs and desired benefits or outcomes of EV adoption;
- Deferred maintenance and lower capacity on the electric grid in DVCs; and
- Coordination with CPUC proceedings related to VGI and Transportation Electrification;

The Strategic Objective will achieve a path to market through:

- Demonstrating new approaches to serving DVCs, and documenting best practices in charging at multifamily housing;
- Demonstrating value of EV charging and VGI to DVC communities; and
- Incorporating lessons learned into building codes and standards.

Success for the Strategic Objective will be measured through:

- The annual rate of new EV Charging infrastructure installation in DVC communities, in comparison to the system as a whole;
- Reduction in household energy burden for targeted DVC populations;
- Improvement in air quality metrics (NOx, PM 2.5, PM10);
- Number and MW of customers in DVCs participating in VGI use cases;

STRATEGIC OBJECTIVE

(C) Smart systemwide planning tools for new load

The EPIC program will support the development, integration, and updating of grid planning tools that a) substantially increase the forecasting and predictability of intermittent resources, electric vehicles, building electrification, flexible load, and distributed energy resources, b) coordinate with utility capital planning processes, and c) integrate into utility operations for the enablement of grid services and dynamic operation, with the goal of reducing ratepayer costs over time and ensuring Disadvantaged and Vulnerable Communities are not left behind in benefits from the transition to zero-emission technologies.

The Strategic Objective will take into consideration:

- New load growth, including from electrification, that have new load shapes, characteristics, reliability and resilience needs, and capabilities for flexibilities;
- Capabilities and opportunities to leverage existing infrastructure and equipment, rather than replacement;
- Differing needs of customers segments and communities;
- Present and future needs around cybersecurity of communication, controls, and technologies;
- The need to increase affordability of rates by reducing the need for grid upgrades;
- Coordination with CPUC proceedings related to DERs, VGI and Transportation Electrification, Building Electrification, Climate Adaptation, and General Rate Cases;

The Strategic Objective will achieve a path to market through:

- Developing data and modeling tools that can be used by the distribution and transmission grid operators, communities, and other stakeholders; and
- Deployment of pilots and demonstration projects as replicable and scalable models.

Success for the Strategic Objective will be measured through:

- Avoided costs for the project demonstrations, and assessment of avoided costs if deployed at scale, including transformer upgrade deferrals vs expectations;
- Peak load reduction on transformers;
- Reductions in forecasting errors and mismatch with actual load;
- Track locational changes in established resilience and reliability metrics, including System Average Interruption Duration Index (SAIDI), System Average Interruption Frequency Index (SAIFI), and Customer Average Interruption Duration Index (CAIDI);
- Reduced risk of loss of load, reduced load shed events;

STRATEGIC OBJECTIVE

(D) Reducing cost of whole-home electrification

The EPIC program will accelerate innovation, demonstration, and innovative approaches to deployment that help reduce the all-in cost of whole-home electrification for single-family and multi-family buildings by 50%, while decreasing residents' energy costs, by 2035.

The Strategic Objective will take into consideration:

- The lack of market-ready, affordable solutions designed to meet the needs of multi-family, rental, low-income, affordable, and DVC housing;
- The higher need and gaps faced by residents in DVCs, including existing conditions, space constraints, health and safety issues, distrust in the marketplace, capital gaps, split incentives with landlords, and lack of access to federal tax credits;
- The role of financing, including the lack of equitable financing options for DVCs and renters, in covering capital gaps and ensuring long-term energy cost reductions;
- The critical role of contractors and obstacles to adoption, including skills gaps, technological biases, and access to products;
- The need to ensure protections for tenants (higher rents, fees) in rental housing;

The Strategic Objective will achieve a path to market through:

- Coordination with HVAC, water heater, and other appliance contractors;
- Updating electrical codes;
- Leveraging trusted messengers to communicate successful outcomes, addressing issues such as customer values, comfort, costs, and health;
- Identifying tenant-centric solutions that are replicable and scalable, including no-cost and affordable financing pathways;
- Landlord-focused financing options to accelerate adoption and address split incentives;

Success for the Strategic Objective will be measured through:

- Modeled and Real-World all-in costs of whole-home electrification, with attribution by use, and disaggregated by community/region;
- DVC community adoption increases in electrification by 30% by 2035;
- Equity metrics for multi-family and DVC communities adoption;
- Tenant comfort measurements.

STRATEGIC OBJECTIVE

(E) Innovative Approaches for Difficult-to-Decarbonize Sectors

The EPIC program will accelerate innovative approaches, strategies, and business models to achieve lifecycle cost-parity for difficult-to-decarbonize commercial and industrial buildings and processes, with a specific focus on strategies that lead to the reduction of NOx, PM, and other surface-level pollutants impacting Disadvantaged and Vulnerable Communities.

The Strategic Objective will take into consideration:

- Prioritization of emission reductions for industries impacting Disadvantaged and Vulnerable Communities;
- Coordination with the Smart Systemwide Planning Tools for New Load Strategic Objective to address the impacts of electrification for industrial processes and implications on the grid;
- Change management for difficult-to-decarbonize sectors and processes;

The Strategic Objective will achieve a path to market through:

- Validation of net zero technologies and financing solutions to spur commercialization;
- Utilities and the industrial sector co-investment strategies;

Success for the Strategic Objective will be measured through:

- Cost metric improvements, analyzed by process decarbonization category;
- Reduced GHG emission and improved air quality for workers and surrounding communities for funded projects, and for similar projects at scale;

STRATEGIC OBJECTIVE

(F) Community-Scale Decarbonization

The EPIC Program will demonstrate technology, deployment strategies, planning approaches and businesses models for achieving 100% neighborhood- or community-scale electrification at cost-parity or on a cost-beneficial basis on a coordinated timeline with long-term gas planning activities at the CPUC, with a prioritization on addressing needs and obstacles of Disadvantaged and Vulnerable Communities.

The Strategic Objective will take into consideration:

- Prioritization of DVCs, lowest air quality zones, and fire zones for community-scale electrification;
- The need to proactively engage and fund communities for planning and identifying desired solutions;
- Existing conditions, including health and safety issues as an obstacle to home improvements;
- Focusing on models to identify and prioritize communities that can achieve savings from avoided upgrades to gas infrastructure;
- Opportunities to develop an electrification strategy and/or roadmap by 2029 to inform strategic approach.
- Coordination with CPUC proceedings related to Electric and Gas General Rate cases, long-term gas planning (R.20-01-007), DERs, VGI and Transportation Electrification, Building Electrification, and Climate Adaptation;
- Coordinating with existing home upgrades, energy efficiency and other complimentary programs to reduce overall costs;

The Strategic Objective will achieve a path to market through:

- Developing successful replicable and scalable model approaches to community-scale electrification/decarbonization projects, including successful building retrofits/designs, VPP/V2G/V2B integration and load management/energy exports profiles, models for VPP and DER aggregators;
- Developing mapping tools to be used by planning agencies and communities to further electrification and decarbonization efforts; and
- Employing uniform assumptions and data inputs for models and forecasts that can be used by all stakeholders and agencies;

Success for the Strategic Objective will be measured through:

- Number of, total customers within, change in electricity demand, change in gas demand, and total energy/gas/fuel BTU served by 100% electrified/decarbonized communities;

- Savings ($/household) in total energy costs for participants in neighborhood- or community-scale electrification (and % improvement in energy burden);
- Customer satisfaction;
- Savings in avoided upgrades to existing gas/electric infrastructure (per household in the targeted electrified community and per household impact on all other ratepayers); and
- GHG reductions and air quality improvements in the electrified communities;

STRATEGIC OBJECTIVE

(G) Impacts research for new generation and storage

The EPIC Program will support the development of transparent and publicly-understandable lifecycle analyses of emerging generation, storage, and related technologies and strategies, focusing on assessing economic, land, air, water, net energy, health and safety impacts on communities directly or indirectly affected, through comprehensive and replicable processes involving multiple stakeholders and opportunities for community engagement and evaluation of research focus and outputs.

The Strategic Objective will take into consideration:

- The need to invite community input and avoid one-way education from utilities and energy companies;
- A lack of trust of energy system actors, and the need for tools to validate and verify industry research and map information to community concerns;
- Analysis must include cumulative impacts, and incorporate locational findings from other grid needs studies;
- A lack of organizational capacity from community members and groups to engage, and the difficulty in identifying who needs what level of data;
- A thoughtful approach to asking and answering questions is needed to ensure that unintended consequences are avoided.

The Strategic Objective will achieve a path to market through:

- Co-creation of projects (beyond EPIC) with communities that address community concerns and leverage impacts research in design and consideration;

Success for the Strategic Objective will be measured through:

- Increased understanding of risks and knowledge gaps of new generation and storage technologies, measured in impacted or targeted communities, including the use of language from impact research when discussing new technologies;
- Number of projects proactively engaging community groups and members in active dialogue;
- Short summaries and storytelling materials available for all major impact research;
- Lifecycle impacts assessments completed for each technology or project before or during community consultation;

STRATEGIC OBJECTIVE

(H) Increase predictability of weather, intermittent resources, and load

By 2030, the EPIC Program will help achieve measurable reductions in climate-related risk to utility infrastructure through the development of open climate data, analytics, and technologies that a) improve electricity supply and demand forecasts, b) improve the ability to predict risks of extreme, climate-driven weather events to utility infrastructure, c) improve coordination between weather observation, forecasting, and grid operations, and d) inform and coordinate with utility systems planning, operations, and investment decisions.

The Strategic Objective will take into consideration:

- New loads, load types, and capabilities due to electrification;
- The increase in cooling and heating extremes and the impacts these have on technology performance;
- Disparate modeling work and need for better coordination and transparency across researchers, utilities, industry, communities, and regulators, while protecting data privacy;
- Projects that are outside of California and that have California ratepayer benefits (for example in the broader WECC region);
- Customer behavior and needs in responding to weather events;
- Coordination with the Supporting Cost-Effective Decision-making on Grid Hardening for Long-Term Climate Impacts Strategic Objective; and
- Coordination with CPUC proceedings and other state agency efforts related to Climate Adaptation, grid planning, wildfire mitigation, safety, and other relevant activities.

The Strategic Objective will achieve a path to market through:

- Developing data and modeling tools that can be used by the distribution and transmission grid operators and other stakeholders; and
- Developing accurate and consistent data inputs into planning models and tools that will be integrated into CPUC proceedings, utility planning and forecasting, RTO/ISO planning and forecasting, and industry.

Success for the Strategic Objective will be measured through:

- Reductions in forecasting errors and mismatch with actual load;
- Changes in the resilience and reliability metrics (established systems reliability

metrics, including System Average Interruption Duration Index (SAIDI), System Average Interruption Frequency Index (SAIFI), and Customer Average Interruption Duration Index (CAIDI));

- Reduction in variability between service areas, particularly in DVCs;
- Reduced risk of loss of load, reduced load shed events; and
- Data democratization (making data open and available).

STRATEGIC OBJECTIVE

(I) Leveraging DERs for Grid and Community Resiliency

The EPIC Program will support technology development, innovative deployment models, and real-world testing and evaluation for the demonstration of the use of clean distributed energy resources to reduce the impact of outage events, through strategies that make outages invisible to critical loads and that reduce power restoration time for vulnerable populations, with a specific focus on solving challenges related to critical loads identified by Disadvantaged and Vulnerable Communities as critical community resilience needs.

The Strategic Objective will take into consideration:

- The outsized burden that long duration outages have on DVCs, that communities have varying threats and climate risks;
- Critical load must be identified by and will be unique to individual communities, and that critical load not just be critical facilities, but communities have limited bandwidth to engage in this identification;
- Capacity limits of existing grid infrastructure can and has limited DER adoption, and can be prevalent in Disadvantaged and Vulnerable Communities;
- The identification of the value of DER benefits during normal operations will be achieved through the Value of DER Strategic Objective, but can be coordinated with this Strategic Objective;
- Already existing incentives and programs such as tax credits, or the utility community microgrid program;
- Coordination with existing incentives and programs, CPUC proceedings, and processes such as the infrastructure deferral framework.

The Strategic Objective will achieve a path to market through:

- Development of a phased, real-world testing environment(s) for leveraging DERs for grid and community resiliency;
- Replicable and scalable models to make outages invisible for critical loads across various communities; and
- Coordination of an information exchange on how to optimize resiliency investments for communities, developers, and utilities.

Success for the Strategic Objective will be measured through:

- Number of strategies able to successfully demonstrate ability to ride-through, recover quickly from, or otherwise mitigate outage events, the MW load served by such strategies, and duration load was served;

- Individual project success can be tracked through the number of outages mitigated,
- Duration (hours) of outages mitigated; the percent of load and DERs identified as critical load that maintains during outage events; MW of emitting backup generation replaced with zero-emission DERs; and the value of associated outages through the Interruption Cost Estimate (ICE) Calculator 2.0;
- Cost of solution implementation (for project and at scale), before and after-tax credits and incentives;
- The number of circuits that are proactively addressed;
- Operational and cost effectiveness of front of the meter (FTM) and behind the meter (BTM) solutions; and
- Social Burden Metric - Sandia's Resilient Node Cluster Analysis Tool (ReNCAT) (or other novel and/or in-development metrics).

STRATEGIC OBJECTIVE

(J) Expediting and Streamlining Interconnection and Permitting

The EPIC Program will accelerate the development, testing, and integration of innovative technology, communication protocols, and modeling approaches to streamlining interconnection and permitting processes for DER and Electric Vehicle Charging Infrastructure, with a goal to demonstrate the capability to perform same-day interconnection and permitting approval under multiple high DER penetration and electrification scenarios, and a priority for addressing challenges in Disadvantaged and Vulnerable Communities.

The Strategic Objective will take into consideration:

- Capacity limits of existing grid infrastructure can and has limited DER adoption, and can be prevalent in Disadvantaged and Vulnerable Communities;
- There are multiple factors that impact energization timelines, and different locations, grid circuits, regions, and technologies may require different approaches;
- Local jurisdictions are at different starting places for permitting, and different challenges and resources for making adjustments;
- The need for cost-effective solutions to ensure affordability for ratepayers and to reduce costs on DER resource owners;
- The rule of state agencies, regulators, and standards-making bodies in establishing standards, safety, communications, and cybersecurity protocols;
- Coordination with existing resources on the grid; and
- The rapid pace of technology change, as compared to the slower pace of infrastructure change.
- Coordination with CPUC's energization proceeding, and other relevant processes.

The Strategic Objective will achieve a path to market through:

- Streamlined DER and EV Charging Infrastructure interconnection processes through standardization and transparent utility tools;
- Standardized streamlined DER and EV Charging Infrastructure permitting process, strategies, and tools available for local jurisdiction adoption;
- Number of products (DERs, inverters, grid devices) available on the market in line with the best industry standards, standards unification.

Success for the Strategic Objective will be measured through:

- % decrease in interconnection timelines;

- % of DERs and EVs interconnected with expedited timelines;
- Reduced costs & interconnection timelines for the interconnection customers and utilities, including a reduced gap between estimates vs actual;

STRATEGIC OBJECTIVE

(K) Providing data input into a Value of DER Framework

In coordination with relevant CPUC proceedings, the EPIC Program will conduct analysis, coordination, and real-world demonstrations that can support the development and ongoing update of an evidence-based framework for the location-, time-, and performance-based values of grid services that are a) usable by grid operators to reduce costs to ratepayers and expand opportunities for distributed zero-emission technologies, b) accessible by any DER, electric vehicle, or flexible load, and c) include appropriate baselines.

The Strategic Objective will take into consideration:

- Relevant CPUC proceedings and existing or planned incentive programs, including those related to transportation electrification, load management, rate design, DERs, and other relevant topics;
- Different methods for engaging DERs, EVs, and flexible load to provide those services to enable adoption, including behavioral (e.g., rates), constraint management (e.g., markets), control, and other mechanisms;
- Constraints, conflicts, and competing and preferred use cases of DERs, EVs, and flexible load depending on other needs during normal operating conditions and in grid emergencies;
- The need to establish and update standardized baselines;
- Risks, costs, and remedies for underperformance;
- Cybersecurity needs of the end-to-end communication systems;
- Lower DER, EV, and flexible load adoption levels, higher retrofit costs, lower access to broadband, and low trust levels in Disadvantaged and Vulnerable Communities, the need for equitable participation in benefits, and differing community needs;
- The need to create a feedback loop to system- and statewide planning processes;

The Strategic Objective will achieve a path to market through:

- Providing data and results into CPUC proceedings and processes on DERs, EVs, flexible load, rate cases, and other relevant topics;
- Creating cybersecurity requirements to enable secure DER, EV, and flexible load capabilities; and
- Achieving demonstration and deployment through a staged test-bed process.

Success for the Strategic Objective will be measured through:

- Whether a standard procedure to evaluate DER, EVs, flexible load grid services, benefits, and baselines has been established;
- A public checklist review of grid services that are valued and accessible to DERs;
- A quantification of the contribution of different market segments to the 7,000 MW flexibility goal;
- Quantification of avoided capacity (and associated cost) of new grid upgrades;
- Overall tracking: carbon intensity of supply for each load hour, percentage of capacity served by DER capacity;
- # of customer's enrollment in load flexibility programs statewide;
- Cost effective peak load reduction ($/kW); and
- $/value of deferred grid upgrades due to load flexibility.

STRATEGIC OBJECTIVE

(L) Reducing feeder/circuit peaks

To support ratepayer affordability, the EPIC Program will accelerate innovation, demonstration, and deployment of innovative and replicable methods to increase the utilization rate of a circuit and reduce circuit and feeder peak loads, in order to avoid or defer costly grid upgrades, through the coordination of DERs, EVs, flexible load, and grid intelligence, with a focus on circuits serving Disadvantaged and Vulnerable Communities where increased adoption of zero-emission technologies can increase equitable benefits.

The Strategic Objective will take into consideration:

- Existing conditions, such as existing transformer capacity, PV hosting capacity, and other existing resources;
- The lack of, and need for, granular data at the circuit level;
- The need to root an operational capability to actively manage feeder/circuit peaks with long-term planning and capital planning processes;
- Need to maintain grid performance and reliability and understand electric usage behaviors and community needs at the local level; and
- Coordination with Calfuse pilots, CPUC proceedings, and utility processes;

The Strategic Objective will achieve a path to market through:

- Demonstration of capability in a staged test bed process.
- Deploying through utility processes as an alternative to capacity expansion planning; and
- Coordination with long-term planning processes (IEPR, IRP, Resource Adequacy);

Success for the Strategic Objective will be measured through:

- Avoided upgrade costs, on a per project basis, and extrapolated if deployed at scale;
- Transformer upgrade deferrals vs expectations;
- Changes in load factor for demonstrations projects;
- Increases in flexible load capacity as a percent of peak power (grid-wide and locally);
- Reduction in DER capacity-limited feeders/circuits;
- Adoption of a planning model to compare leveraging DERs to a grid upgrade; and
- Perception of DVCs of whether they feel well-positioned to participate in and benefit from grid upgrades and additional DER integration activities.

STRATEGIC OBJECTIVE

(M) Cost-effective grid hardening for long-term climate impacts

By 2029-2033, the EPIC program will develop and demonstrate tools and frameworks that improve long-term planning and achieve more cost-effective capital investments for grid hardening for long-term climate impacts, with a focus on increasing affordability, reducing outage risk, and reducing social burdens of outages.

The Strategic Objective will take into consideration:

- The development of an optimized capital deployment framework would be developed and adopted within other CPUC processes, but would leverage EPIC investments aligned with this Strategic Objective to source data and real-world case studies;
- The need for tools to make cost-effective prioritization of investments using objective, measured, and verifiable data on grid equipment conditions, capability, and alternatives;
- Prioritization of strategies designed to address risks, burden, and impacts in DVCs, to ensure reliability and affordability are preserved or improved in communities more vulnerable to climate impacts and outages;
- Prioritizing investments that help mitigate multiple hazard impacts, including recognizing the difference in needs around long-term anticipated climate change and acute climate events;
- The increase in cooling and heating extremes add to electric grid strain;
- Timing of the next general rate case (GRC) as a goal for larger pilots and deployments of technologies that utilities will demonstrate in EPIC 5;
- CEC's EPIC 5 (2026-2030) investments should be prioritized with accelerated timelines and will inform the utility EPIC 5 projects; and
- Data must be publicly available and easy to understand.

The Strategic Objective will achieve a path to market through:

- Demonstration projects, bigger pilots, and deployments; and
- Incorporation of data and lessons learned into an optimized capital deployment framework.

Success for the Strategic Objective will be measured through:

- Reduction in the number of pieces of infrastructure identified as vulnerable;

- Change in capital costs for projects/circuits, and extrapolated at scale;
- Change in O&M costs for projects, and extrapolated at scale;
- Changes in repetitive loss metrics (for projects and extrapolated at scale);
- Using baselines developed under modeled conditions;
- Change in restoration time metrics, including Customers Experiencing Long Interruption Duration (CELID);
- Changes in frequency and duration of outages (for projects and extrapolated at scale), such as SAIDI, SAIFI, and Customers Experiencing Multiple Interruptions (CEMI); disaggregated by community type; and
- Demonstrated reduction in social burden (ReNCAT).

REVISED STRATEGIC OBJECTIVES - Key Changes and Mapping to Goals & Gaps

Strategic Objective Short Title	Strategic Goals Supported	Gaps Addressed
(A) Reducing M/HDV Charging Infrastructure Costs	**Transportation Electrification**	High costs of electric vehicle charging infrastructure for light-, medium-, and heavy-duty electric vehicles High costs of infrastructure for electrifying public transit to benefit DVC and nonattainment communities by mitigating pollution
(B) Overcoming barriers to EV adoption in DVCs	**Transportation Electrification**	Lack of availability of affordable public or shared charging infrastructure Lack of opportunities for disadvantaged, low-income, ESJ, and tribal communities to directly benefit from electric vehicle adoption
(C) Smart systemwide planning tools for new load	**Transportation Electrification**	Lack of advanced planning for grid needs Long timelines for grid upgrades to accommodate EV charging infrastructure, particularly for fleets
	Building Decarbonization	High cost of grid upgrades associated with new, unmanaged electric load Need for advanced modeling and forecasting to better account for demand flexibility potential
	Achieving 100% Net-Zero	Electrification of high-heat processes creates additional stress on the electric grid locally, and regionally in high-adoption scenarios
(D) Reducing cost of whole-home electrification	**Building Decarbonization**	High upfront costs of electrification retrofits Lack of whole home retrofit approaches for low-income retrofits Lack of standardized retrofit packages and difficult for consumers in coordinating among different decarbonization incentives and financing opportunities to understand how to fit them together High costs of panel and wiring upgrades for other residences Long lead and installation times for electrification retrofits, in comparison to emergency equipment replacement timeline needs Lack of coordination between decarbonization, energy efficiency, and DER investments lead to higher costs High costs for health and safety upgrades,

		mitigation for pre-electrification/pre-weatherization barriers in older existing buildings Inability of renters to make large-scale, permanent upgrades in tenant-occupied buildings, and risk of increased rent burdens and loss of affordable housing Split incentives are a barrier to the deployment of energy efficiency and DER measures in buildings
(E) Accelerate commercial viability of last 10%	**Building Decarbonization**	Commercial and industrial building often have higher energy demand and unique end uses that make electrification and decarbonization more difficult
	Achieving 100% Net-Zero	Lack of clear pathways to economically decarbonize 100% of hard-to-decarbonize activities through electrification with no increase in air, water, and land pollutants by 2045
(F) Community-Scale Decarbonization	**Building Decarbonization**	Complex coordination needed to transition entire neighborhoods from gas to decarbonized buildings Lack of advanced planning, including city planning, for grid needs
	Achieving 100% Net-Zero	Lack of coordination among EPIC and other gas and electric RD&D program investments on the common goal of decarbonization and right-sizing energy infrastructure and ratepayer affordability Lack of understanding on the potential to transition entire neighborhoods from gas to geothermal heating and cooling, particularly in warm climates
(G) Impacts research for new generation and storage	**Achieving 100% Net-Zero**	Lack of information on high production and life-cycle costs of "green" electrolytic hydrogen Lack of opportunities for disadvantaged, low-income, andESJ communities and tribes to be readily included in the discussions and decision-making process on emerging generation and storage technology adoption, including discussion of potential impacts on public health Lack of independent studies on appropriate, cost-effective roles and lifecycle costs and impacts of emerging technologies, including floating OSW, enhanced geothermal, biomass conversion,and clean renewable hydrogen in achieving carbon neutrality
(H) Increase predictability of weather, intermittent	**Achieving 100% Net-Zero**	Uncertain impacts from significant changes in energy demand patterns due to electrification Long timelines for renewable energy, storage, and transmission development may not match timelines for electricity demand changes

resources, and load	**Climate Adaptation**	Lack of comprehensive weather operational data to predict system conditions Increased risk to grid equipment life expectancy under climate adaptation scenarios, including from stronger winds and increased heat and humidity that prevent the equipment from cooling down at night
(I) Leveraging DERs for grid and community resiliency	**DER Integration**	An outsized burden that long-duration outages have on disadvantaged, low-income, ESJ, and tribal communities Need for reliable and resilient power for communities and critical facilities during periods of power outages due to wildfire, extreme weather, and other emergency situations
	Climate Adaptation	Lack of ESJ and tribal communities' access to resiliency infrastructure and resources An outsized burden that long-duration outages have on disadvantaged, low-income, and ESJ tribal communities
(J) Expediting and streamlining interconnection and permitting	**DER Integration**	Complex and demanding interconnection and permitting processes increase the cost and slow timelines for DER deployment Lack of uniform standards and protocols for interconnection,system design, and communication among grid-connected devices, including smart meters, smart inverters,and internet-of-things (IoT)technology
	Transportation Electrification	Lack of uniform standards and protocols for interconnection,system design, and communication among grid-connected devices, including smart meters, smart inverters,and internet-of-things (IoT)technology High costs related to charger interconnection and grid upgrades for areas with high concentrations of electric vehicle charging infrastructure and/or low grid capacity
(K) Providing data input into a Value of DER Framework	**DER Integration**	Insufficient valuation, incomplete business models, and lack of appropriate market mechanisms for transmission and distribution grid services provided by flexible resources Potential operational conflicts between leveraging the same DERs for grid services, resiliency, reducing energy bills, and transportation Lack of opportunities for disadvantaged, low-income, ESJ, and tribal communities to engage early and directly benefit from deployment of flexible resources
	Building Decarbonization	Lack of understanding of customer behavior in technology adoption and demand flexibility Need for advanced modeling and forecasting to better account for demand flexibility potential Lack of flexible load capacity from building

		electric use High costs of grid upgrades associated with new, unmanaged electric load Lack of coordination between decarbonization, energy efficiency, and DER investments lead to higher costs
	Transportation Electrification	Lack of capability to leverage optimized charging, bidirectional charging, and V2X for grid services Misalignment between electric vehicle loads and intermittent renewable energy production
(L) Reducing feeder/circuit peaks	**DER Integration**	Need to better understand the ability of aggregated DERs and VPP deployment to reduce or forestall the cost associated with grid upgrades, and to support grid reliability Lack of reliable, real-time automated coordination of generation and load at the grid edge Lack of comprehensive weather operational data to predict system conditions
	Transportation Electrification	High costs related to charger interconnection and grid upgrades for areas with high concentrations of electric vehicle charging infrastructure and/or low grid capacity Long timelines for grid up grades to accommodate EV charging infrastructure, particularly for fleets
	Building Decarbonization	High costs of grid updates associated with new, unmanaged electric load Lack of standardization and complex and demanding building codes, permitting, and interconnection processes Inability to easily share data across systems needed to plan for, develop, interconnect, and optimize building retrofits
	Achieving 100% Net-Zero	Electrification of high-heat processes creates additional stress on the electric grid locally, and regionally in high adoption scenarios
(M) Supporting cost-effective decision-making on grid hardening for long-term climate impacts	**Climate Adaptation**	High cost of grid hardening Lack of actual and expected performance, health, lifespan, and failures of grid equipment under new climate scenarios increases cost and outage risk Lack of tools to support coordinated planning for the impact of high-impact widespread, and long-duration climate related events An outsized burden that long-duration outages have on disadvantaged, low-income, and ESJ communities Lack of fail-safe equipment to reduce ignition events

KEY CONSIDERATIONS FOR ADMINISTRATORS

In many cases, stakeholders provided input that was cross-cutting across the Strategic Objectives, related to implementation of the Strategic Objectives in EPIC 5, or addressed the cross-cutting considerations adopted by the CPUC. That input was consolidated into the following key considerations findings for Administrators:

Coordination and Timely Research: Administrators should work together and ensure coordination and collaboration on initiatives including staged approaches where applicable. Strategic Objectives may rely on CEC funded research which will inform utility RD&D projects. This research must be prioritized and completed within a timeline that allows utilities to initiate projects within the same EPIC timeframe.

Focused Investments for Significant Impact: Focus investments on areas that can yield significant results from EPIC funds. Funding too many areas and concepts may dilute impact, resulting in only minor or incremental progress rather than substantial advancements.

Streamlined Contracting Timelines: Improve contracting timelines to ensure that work is contracted and completed in a timely and streamlined manner. This is crucial for producing results needed to make decisions in the 2030-2035 timeframe, especially when a staged approach is required across administrators.

DVC and Community Engagement: Ensure robust DVC and community engagement to gain local support for projects, measure impacts and benefits to those communities, and prevent negative consequences. Consider impacts on environmentally and socially vulnerable communities even in lab tests. Project updates should include community benefits plans similar to those required by the Federal government. Simply locating projects within a community is insufficient; actual benefits must be provided to that community.

Bridging DVC Needs and Research: Find a bridge between Environmental and Social Justice (ESJ) concerns and desired research. As expressed throughout the Strategic Goals and Strategic Objectives process, there is DVC resistance to investments in certain technologies: hydrogen research (unless it is green), biomass, biofuels, car batteries, and Carbon Capture, Utilization, and Storage (CCUS). If these areas are to be funded, there must be comprehensive buy-in from communities, including shared understanding of why the research is important and how it fills gaps not covered by federal or private investment.

Rationale for RD&D Investments: Avoid RD&D investment in research topics solely because they are expensive (Examples identified by stakeholders include biomass, carbon capture, and geothermal technologies). If there are existing incentives or tax credits, collaborate with private industry to understand why a technology is not being deployed at scale. Industry research must be thorough and not anecdotal. Utility ratepayer funds should only be expended if the barriers to scale are specific to California and not addressed by existing incentives. Collaboration with industry should be comprehensive and included in EPIC project initiative requests.

Justification of EPIC Investment Plans: EPIC investment plans should clearly demonstrate that the proposed research is not occurring through federal or private investment and outline the specific and unique benefits to California ratepayers.

Community Communication and Technology Adoption: Keep communities informed about the removal of technologies installed for RD&D projects, or offer a path to adoption if the technology proves successful and beneficial. Avoid abandoning technologies without providing communities with clear information and options for future adoption.

PROPER USE OF ADOPTION READINESS LEVEL

Several stakeholders endorsed the use of Adoption Readiness Level as a core metric for evaluating success of Strategic Objectives. Specifically, California Energy Commission proposed even using "increasing adoption readiness" as the primary focus of its proposed revised Strategic Objectives.

Background

Adoption Readiness Level, as developed by the US Department of Energy Office of Technology Transitions (OTT), is a tool to complement Technology Readiness Level evaluations to evaluate adoption risks of a technology using 17 dimensions under four core risk areas: Value Proposition, Market Acceptance, Resource Maturity, and License to Operate.[1]

The use of Adoption Readiness Level is recommended by DOE to gain a strategic view of an existing technology portfolio, or to design and set goals for a new program. The tool itself is not intended to be a rigorous and quantitative analysis across each dimension of adoption risk, and its strength is in quickly identifying where there may be critical barriers in a technology's pathway to market that need to be addressed.

Role of Adoption Readiness Level in the EPIC 5 Strategic Goals and Objectives Process

Much of the stakeholder discussion during the Strategic Goals and Objectives Process focused on this same task - to identify risk areas that could hamper achievement of the State's climate, equity, and energy goals. The development of the Critical Pathways and Gaps along those Pathways encouraged stakeholders to provide a wide range of obstacles, which often correlated with the areas assessed by the Adoption Readiness Level framework.

However, the Strategic Objectives process took the next step in the strategic planning exercise, which was to narrow the Gaps (the risks) down to a smaller set of issues that the EPIC program was able to address, due to its unique role as a California ratepayer-funded, electricity-focused RD&D program with specific requirements. Further, the Strategic Goals and Objectives process as a whole was done through the lens of achieving the State's climate, equity, and energy goals, and did not focus on the success or failure of a specific type of technology, as in Adoption Readiness Level analysis.

While there is stakeholder consensus that the use of Adoption Readiness Level can be a useful tracking and strategy tool, it would not be prudent for Adoption Readiness Level to be the sole focus of these Strategic Objectives. There is a significant likelihood that factors outside of the control or influence of the EPIC program would result in the increase or decrease of a technology's adoption readiness. For example, one of the dimensions

[1] https://www.energy.gov/sites/default/files/2023-06/CARAT-R10_6-2-23.pdf

measured under the tool is “Policy Environment,” with the definition of high risk being an environment where policymakers are not aligned with implementing policy interventions to encourage adoption, and the definition of medium risk being an environment where policy interventions are aligned with current governmental policy positions. That risk level could ultimately swing based on the results of local, state, or federal elections, and the resulting change in the Adoption Readiness Level score from that singular event could move a technology completely up the scale or down the scale, and even change the assessment completely from “Low Readiness” to “Medium Readiness”, “Medium Readiness” to “High Readiness,” or vice versa. Other factors also outside of EPIC’s control could have a similar effect, including supply chain constraints, the presence or lack of workforce training, regulatory changes, availability of insurance or philanthropy, or the presence of applicable markets.

Role as a Metric

While inappropriate as the primary focus of the Strategic Objectives, measurement of certain dimensions of Adoption Readiness Level’s Core Risk areas, with specific attribution of EPIC’s role in mitigating those risks, would be a useful tool to measure impact, and is recommended to be incorporated as a component of the Impact Analysis framework. Examples for some EPIC initiatives may include looking at the reduction in risks of a technology’s or solution’s delivered cost, functional performance, or ease of use within the Value Proposition category, a reduction in the infrastructure risk within the Resource Maturity category, or reductions in environmental & safety risk in the License to Operate category, so long as those risk reductions are specifically attributable to EPIC.

STAKEHOLDER PROCESS AND COMMENTS SUMMARY

EPIC Strategic Objectives Working Group Process

Kick-Off Workshop

On **March 19, 2024** CPUC hosted a virtual **Strategic Objectives Kick-Off Workshop** attended by over 160 participants, aimed to equip stakeholders with essential knowledge for subsequent technical working group participation. During the workshop EPIC PICG Project Coordinator Andrew Barbeau, and CPUC Staff, Fred Beck, presented an overview of the recent CPUC decision and the approved Strategic Goals and outlined the framework of criteria that define Strategic Objectives. They also answered participants' questions about the purpose and process of the Strategic Objectives Workshops. CPUC Commissioner Karen Douglas provided opening remarks, stressing the importance of ensuring that ratepayers realize benefits from the EPIC investments. Commissioner stressed that the Strategic Objectives Workshop process is aimed to help identify strategies that can scale and identify cost effective and equitable innovation that could benefit ratepayers.

The participants discussed the five adopted Strategic Goals and commented on some additional gaps to be discussed during the development of Strategic Objectives in the following in-person working group meetings. These comments were incorporated in the Strategic Objectives process.

Impact Analysis Framework and Metrics Workshop

On **April 2, 2024** CPUC hosted a virtual **EPIC Impact Analysis Framework and Metrics Workshop**, attended by 109 participants. The Uniform Impact Analysis Framework is a set of metrics, assumptions, and methodologies designed to measure the progress of EPIC program investments toward meeting EPIC Strategic Goals and Strategic Objectives. In its D.23-04-042 CPUC directed all EPIC Administrators to use the same impact analysis framework and establish metrics to inform improved EPIC program evaluation and oversight, as well as greater transparency to inform ratepayer benefits. The EPIC Impact Analysis Framework should provide EPIC Administrators with a uniform methodology to demonstrate with data the realized and potential impacts to ratepayers from EPIC RD&D investment. D.23-04-042 adopted foundational principles for the development of the Framework. The Workshop goal was to kick off the conversation the Impact Analysis Framework development that would be continued in more details in the following in-person Technical Working Groups and further finalized in the future CPUC proceeding on EPIC 5 Guidance.

At the start of the workshop EPIC PICG Project Coordinator, Andrew Barbeau, and CPUC Staff, Fred Beck, presented an overview of the Strategic Objectives Workshops. CPUC Commissioner Karen Douglas provided opening remarks, welcoming the participants and introducing the workshop topic.

The workshop discussions opened with the presentations from the EPIC Administrators discussing their views on the metrics and foundational principles and presenting past EPIC project examples. Presentations from other stakeholders included DNV, PNNL and CPUC providing comments on the metrics and foundational principles for EPIC 5 and providing examples from their project evaluation, measurement and verification. The presenters included the following:

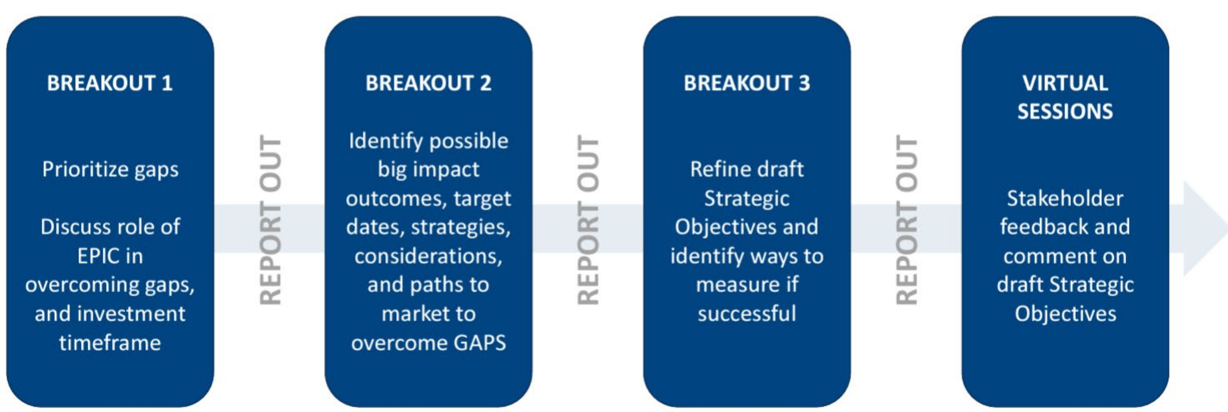
- Ian Burnside from PG&E, Cynthia Carter from SDG&E & Jordan Smith from SCE - Joint Presentation Link
- Colleen Kredell from California Energy Commission - Presentation Link
- Jarred Metoyer from DNV - Presentation Link
- Kamila Kazimierczuk and Jennifer Yoshimura from PNNL - Presentation Link
- Ankit Jain from California Public Utilities Commission - Presentation Link

The presentations were followed by stakeholder discussion, including how to measure learnings from the failed projects, early and midstream project results and getting timely information from projects as they progress to realize and utilize early and midstream project learnings quickly, annual reporting, market adoption, and replicating and scaling successes.

In-Person Technical Working Group Meetings

The CPUC hosted in-person Technical Working Group Meetings on April 10, 11, 12, and 30, and May 1, 2024. Each workshop focused on a specific Strategic Goal and related key gaps identified in the Strategic Goals process. The EPIC PICG Project Coordinator facilitated these workshops, which included multiple breakout sessions with reports out in between, as illustrated below, aimed at developing measurable draft Strategic Objectives and identifying metrics to measure success. Attendees included representatives from state government, utilities, non-profit organizations, research and education institutions, industry, environmental and social justice organizations, and others.

Technical Working Group Process



Workshop details and attendance were as follows:

- **April 10, 2024**, Transportation Electrification (Attendance: 32)
- **April 11, 2024**, Building Decarbonization (Attendance: 33)
- **April 12, 2024**, Achieving 100% Net- Zero Carbon Emissions and the Coordinated Role of Gas (Attendance: 35)
- **April 30, 2024**, Distributed Energy Resource Integration (Attendance: 62)
- **May 1, 2024,** Climate Adaptation (Attendance: 43)

The output of these workshops were initial draft Strategic Objectives for each goal pathway shared with the stakeholders upon each workshop:

- Transportation Electrification: Draft Strategic Objectives
- Building Decarbonization: Draft Strategic Objectives
- Achieving 100% Net-Zero Carbon Emissions and the Coordinated Role of Gas: Draft Strategic Objectives
- Distributed Energy Resource Integration: Draft Strategic Objectives
- Climate Adaptation: Draft Strategic Objectives

Virtual Follow-up Working Group Meetings

Upon the conclusion of the in-person Technical Working Group Meetings, the CPUC hosted the followup series of virtual meetings on May 13, 14, 15, and 29, 2024. These virtual workshops featured presentations on the outputs from the in-person meetings, along with facilitated discussions that included polls and moderated questions focusing on edits, comments, prioritization, and identifying critical missing elements of the draft strategic objectives. A specific public comment period was included to ensure that all voices were heard in the development of the EPIC 5 (2026-2030) Strategic Objectives.

Workshop details and attendance were as follows:

- **May 13, 2024**, Transportation Electrification (Attendance: 87)
- **May 14, 2024**, Building Decarbonization (Attendance: 76)
- **May 15, 2024,** Net- Zero Carbon Emissions and the Coordinated Role of Gas (Attendance: 53)
- **May 29, 2024,** Distributed Energy Resource Integration (Attendance: 78)
- **May 29, 2024**, Climate Adaptation (Attendance: 73)

Each virtual meeting included a call for presenters, focusing on proposed edits, priority areas, and critical missing elements of the initial draft Strategic Objectives. A common theme across the presentations was the need to consolidate draft Strategic Objectives both within and across goal pathways.

Workshop presenters and presentations were as follows:

Transportation Electrification PRESENTATION

- Sarah Swickard: PG&E
- Peter Chen: California Energy Commission (CEC)
- Nick Fiore: SDG&E
- Jordan Smith: SCE
- Zuzhao Ye: University of California, Riverside

PG&E's presentation focused on draft Objectives 1.5 and 1.6. WIth regard to Objective 1.6, PG&E discussed what a "widespread VGI built out" would look like, noting expected capabilities of the EV batteries to shave peaks and even out the duck curve. PG&E also discussedf "lowest societal cost" definition that encompasses optimized costs and customer value. PG&E recommended using achieved load flexibility as a metric for Objective 1.5. On Objective 1.6, PG&E discussed the potential of load flexibility as a grid performance innovation and its ability to defer grid upgrade costs.

CEC recommended better distinguishing and combining objectives around common themes to allow for greater flexibility for the EPIC Administrators. CEC expressed support for setting within the objective aspirational market wide non-arbitrary targets that are based on policies but urged CPUC to clarify that the EPIC projects are expected to move the needle towards these targets rather than achieve the targets themselves. CEC proposed to consolidate the 8 draft Objectives and replace them with the four Objectives proposed by CEC: Objective 1: "Reduce the all-in costs of charging infrastructure and associated grid upgrades" that combines cost reductions related Objectives 1.1, 1.2 and 1.6 and ties more closely with the ZEV adoption as a key metric; Objective 2: "Increase equitable access to transportation electrification" that combines equitable access Objectives 1.3 and 1.4 and ties it more to pollution burdens metrics (quantified in public health costs) and transportation equity (as % of household income); Objective 3: "Enable all EVs to engage in a form of vehicle-grid integration" that combines VGI objectives 1.4 and 1.5 and ties it to ratepayer, rather than societal, benefits; and Objective 4: "Accelerate grid interconnection timelines for charging infrastructure" that combines Objectives 1.1, 1.6, 1.7 and 1.8 and removes the 50% interconnection timeline reduction target (arguing that it is not clear what that target is based on and if it is achievable) and, instead, focuses on the CEC target of 2 million chargers by 2035 from the CEC latest AB 2127 report. CEC also offered additional considerations and missing elements for these Objectives, suggesting that EPIC can play a role in EV battery innovation (battery capacity, charge rate, capabilities as grid resource and stationary storage) and recommended adding references to key policies and proceedings, including AB 2127, AB 2061 and AB 126, SB 846, R.23-12-008, R.24-10-018, R.22-07-005 and R.21-06-017.

SDG&E recommended setting the target date for EPIC 5 based on the actual CPUC approval date + 10 years, instead of 2035, to provide flexibility and to ensure meeting these set timelines. SDG&E recommended consolidating draft objectives to make EPIC more focused. SDG&E recommended combining Objectives 1.1 and 1.2 and focus on EV changing costs and capital expenditures rather than conflating two targets of installation costs and time within these objectives, and suggested carving out bi-directionality to address it separately, because it is still not clear if it will reduce ratepayer costs. SDG&E suggested using localized metrics for both charging and installation costs to have more accurate insights. SDG&E suggested clarifying the scope of Objective 1.8 - clarify whether it focuses on energization, and if so, then combining it with other strategic objectives.

SCE recommended combining Objectives 1.1 and 1.2 and restating it to focus on demonstration and development of technologies and methods leading to reduction in EV charging installation time and 10% capital cost reductions, noting that this objective shall focus on capital cost reductions instead of operational cost (like costs per mile). SCE expressed support for the focus on the DVC benefits and having measurable metrics of DVCs benefits from the EPIC projects, such as emission reductions or EV support in these communities. SCE suggested restating Objective 1.3 to focus on access to EV charging and services in the DVCs, rather than focusing on specific parking stock, and suggested a target of 75% EVs in DVC having access to EV charging capable parking by 2035. For Objective 1.4, SCE recommended focusing on the use cases that demonstrate DVC and public benefits as defined in the VGI and PU code. SCE recommended combining Objectives 1.6 and 1.7 and clarifying the Objective 1.8 focus, whether the target is energization or generator interconnection and recommended focusing on functional development and demonstration to show public benefits.

University of California presenter Mr. Ye recommended earlier timelines for the planning tools, and have the Objective 1.7 target set as 2030 or earlier, instead of 2035. Mr. Ye noted that 2035 is already set as a target for the 100% EV adoption in the Executive Order N-79-20 so the planning tools need to come earlier to accommodate that timeline.

Poll results: During the stakeholders discussion, in answering the question of how relevant each objective is to EPIC 5, the participants ranked as highest priority Objectives 1.1, 1.4, 1.6 and 1.8.

Participant discussions offered the following comments on the draft Objectives:

- Overall: a participant indicated potential danger of too much consolidation of the objectives and obfuscating the value and ability to validate the results of the objectives individually; other participant expressed a concern over the danger of having too many segmented ideas and not being able to focus, if there are too many objectives; some participants recommended for EPIC 5 to fund demonstration and verification projects for bi-directional vehicles cost reductions potential;
- Objective 1.1: a participant supported having more detailed targets for this objective; a participant recommended as a strategy for this objective to treat EVCS installations at multifamily properties as residential, rather than commercial, and enabling residential-rated equipment dedicated to EVCS installations that is faster and cheaper to obtain and is equipped with the necessary safety features; another participant recommended as a strategy to encourage installation of L1 and low power L2 (as adopted by CA Building Standards Commission); another participant recommended that EPIC 5 should work on expediting the charging availability, lowering charging speed and having it at low cost, making it accessible to all, and developing ways to reduce the time it takes to scale up the system; a participant noted that with the EPIC 5 funding cycle of 2026-2030 this objective should be solved before that and might not be as appropriate for EPIC 5 timeline;
- Objective 1.2: a participant noted that while there is some research already underway elsewhere, it is important to continue focus on efficiency and reducing costs of medium and heavy-duty vehicles charging infrastructure and continue to seek methods to lower costs of infrastructure;
- Objective 1.3: a participant expressed concern about gentrification as an inevitable side effect for DVCs and recommended that EPIC can help find an way for the EV infrastructure development that allows for the DVCs to develop their economies and and wellbeing at the same time as the EV adoption so that the clean tech becomes accessible to the members of these communities; a participant noted a missing gap of lack of intelligent circuits that enable grid response and lack of low cost and simple chargers, noting these as good opportunities for EPIC research; a participant suggested to refocus this Objective on access to clean transportation, rather than parking; a participant noted a need to support this at ride-share and transit center locations;
- Objective 1.4: a participant noted that EV charging infrastructure is uneconomical and it is key to find a way of making it work for low income customers;
- Objective 1.5: a participant expressed the importance of addressing the gap of managed concentrations of charging loads on the distribution system in this objective and through other objectives (1.4, 1.5, 1.6 and 1.7); a participant notes a lack of access to grid specific information and price signals on when to and when not to charge is an important gap to address; a participant noted that treating VGI as enabling grid asset is important from reliability perspective and a reliability index is needed, beyond

of what NEVI requires, or 97% up time for the funded projects, so that there is predictability and accountability to use VGI as a firm grid asset;
- Objective 1.6: a participant noted that EPIC shall take up as a challenge developing a strategy on bi-directional vehicles and rooftop solar as grid services and focus on avoiding grid upgrades; another participant noted that infrastructure costs should not be a research project but industry innovation and should be addressed by market economics;
- Objective 1.7: a participant recommended that proforma tools (like the DOE/NREL pro forma for large-scale solar implementation) for different types of upgrades are needed and should be part of the distribution and transmission planning process, but noted that is it a challenge to come up with something that is ubiquitous because it is specific to each zone;
- Objective 1.8: a participant noted the importance of focusing on the 2030 timeline and having something tangible and achievable by then, to have a direct impact on customers.

Building Decarbonization PRESENTATION

- Yu Hou: California Energy Commission (CEC)
- Jon Kochik: SDG&E
- Jordan Smith: SCE (did not present)

CEC recommended combining objectives to improve clarity and avoid arbitrary targets. CEC further recommended considering key related policies and proceedings and leveraging existing EPIC Program mechanisms for the paths to market. CEC recommended combining Objectives 2.1, 2.4 and 2.6 into one objective focusing on technology and strategy research to provide whole-home electrification options for the residential sector. CEC recommended for this proposed objective to use community-scale electrification to achieve 100% decarbonized communities and address split incentives in multi-family buildings. CEC recommended restating Objective 2.2 to focus on reducing need for grid upgraders due to building decarbonization, instead of setting a % target, and recommended including EV charging load from buildings in this objective. For Objective 2.3, CEC proposed restatement focusing on limiting relative grid capacity increase by X%, instead on the “number of grid upgrades,” and recommended avoiding “$ amount of grid upgrades deferred” as a metric due to lack of tools or models to determine it. CEC further recommended clarifying in Objective 2.5 that the decarbonization of industrial buildings does not include industrial processes. CEC noted that a critical missing element is lack of customer ability to navigate available building electrification financing and programs, and that EPIC 5 could play a critical role in it.

SDG&E recommended using CPUC approval and number of years as the timing target and proposed several edits to the Objectives 2.1-2.6. For Objective 2.1, SDG&E suggested explicitly calling out contractors and tools that measure/predict energy changes in path to market. SDG&E also recommended looking at the contractor adoption (expanded offerings) as a potential metric. SDG&E recommended clarifying and distinguishing the overlap in the Objectives 2.2 and 2.3 (potentially based on the set of customers) and suggested rephrasing it to focus on electric service upgrades vs grid upgrades. SDG&E suggested that Objective 2.4 may be too broad and may need to be focused on specific enablers. For Objective 2.5, SDG&E noted a missing reference to hydrogen innovation. SDG&E suggested approaching this Objective with the "leading" and "lagging" indicators (#/% of decarbonized buildings by size, type etc. and corresponding GHG reductions). For Objective 2.6, SDG&E suggested adding community solar and microgrids and getting all customers to agree as considerations/challenges. SDG&E also provided suggestions on additional considerations (including EV charging, panel technology and load balancing innovation, storage, IOU requirements, renters motivations) and paths to markets for several objectives.

Poll results: During the stakeholders discussion, in answering the question of how relevant each objective is to EPIC 5, the participants ranked as highest priority Objectives 2.1, 2.2, 2.3 and 2.6.

Participant discussions offered the following comments on the draft objectives:

- Overall: a participant noted that the manufacturer's perspective is missing; some participants noted opportunity of taking advantage of and learning from the federal Solar For All and other programs funding in California in addressing gentrification and community engagement matters;
- Objective 2.1: a participant noted that the potential of residential flexible load has not been fully explored and can provide many opportunities; a participants added as additional things to consider the lack of investments in business models and the need to coordinate with direct install programs and technological and financing innovation and raising success metric for community adoption to 40% to align with Justice 40 Initiative; a participant recommended connecting Objective 2.1 with 2.4 on split incentives and technologies that will make electrification more accessible in multifamily buildings and developing business models that will allow decarbonization without passing down costs to tenants; a participant recommended having community benefits plan and tenant protections included in funding applications in EPIC 5; a participant recommended coordinating across programs between hardware innovation and adoption models to increase access to established technologies in DVCs; a participant suggested that additional considerations should include access to internet and other factors in DVCs that will affect adoption and deployment in these communities;
- Objective 2.2: a participant noted that this objective is a high priority for California and the need for grid capacity increase mitigation; another participant noted that it is the right time to focus on this Objective because there is a good momentum with many technological breakthroughs and the need for market support and grid side participation and because it also brings direct value to customers;

- Objective 2.3: a participant suggested adding inverter-based resources and grid forming inverters, in addition to flexible capacity in buildings, as an additional gap; a participant suggested disaggregating the number of customers enrolled by income or status in CalEnviro and race to identify trends and types of benefits customers receiving, tracking bill impacts (savings/increases) and using health and environmental factors in evaluating load flexibility; another participant noted importance of expanding monetization for revenue streams for flexible load and coordinating with the energy system integration groups in integrating building load flexibility; some participants suggested combining this Objective with 2.2 and potentially with some of the objectives from the Transportation Electrification;
- Objective 2.4: a participant noted that this objective is too narrowly stated, comparing to other objectives; a participant noted that it is important to look into different models (large vs. small multi-family buildings) and that this Objective should be coordinated with Objective 2.1 but that also argued that it merits having a separate objective and targeted investment for this Objective even if the solution can support other objectives; a participant noted the needs to come up with technological solutions, rather than continue utilizing incentives (looking at the example of rooftop solar incentives); a participant noted that this Objective has a particular weight on its own, considering the large % of residential ratepayers in rental properties in California (contrary to Objective 2.1 that is addressing whole-home electrification) and providing a new model with the tenant having more control over appliances is important; a participant suggested considering the US DOE Customer Bill of Rights (that must flow through the state energy offices in the home programs) in addressing split incentives; a participant suggested adding rent stabilization, 3rd party metering, ownership of assets, billing and benefits allocations to additional considerations and look to solutions developed in different countries; another participant expressed concern that it is not clear whether this objective can help reducing customer rates;
- Objective 2.5: a participant noted that a greater granularity is needed for data in this area and that the avoided cost calculation, with respect to grid peak shaving, needs to be modernized to reflect substation and feeder level peaks to unlock all potential benefits of decarbonization;
- Objective 2.6: a participant suggested clarifying "community scale" and considering that different scale can have different trade-offs, and that gas decommissioning can potentially inform the scale of the neighborhood; a participant suggested looking to the Eastern Europe and EU Directive examples (for example look at the community scale projects in Ukraine); a presenter noted that exploring cost-benefit of this objective is a key.

Achieving 100% Net-Zero Carbon Emissions and the Coordinated Role of Gas **PRESENTATION**

- Rachel McMahon: California Energy Storage Alliance (CESA)
- Moriah Saldaña: SDG&E

- Mirthra Moezzi: California Energy Commission (CEC)

CESA commented on Objectives 3.1, 3.4 and 3.5. For Objective 3.1, CESA recommended that communities receive information about various long duration energy storage (LDES) technologies (lithium ion, including flow batteries, iron-a, zinc-based etc.) and that impact research should show LDES technology development aligned with community needs. For Objective 3.4, CESA recommended a 50% "improvement," rather than "certainty." CESA offered additional considerations, including setting current forecast error as a baseline; and considering LDES ability to reduce renewables curtailment and make the generation portfolios more robust. CESA offered additional success metrics: a % improvement in local resiliency impacts and renewable curtailment; and efficiency of CAISO's dispatch of LDES. CESA also suggested some new strategies, including impact studies and demonstrations of co-locating LDES with resilience, and wholesale and retail price signals coordination RD&D. For Objective 3.5, CESA recommended using a metric of minimizing community electric service down-time due to new transmission facility fire risk mitigation. CESA suggested the strategies to include RD&D on impact and value to the customers of co-locating LDES with new transmission.

SDG&E commented on Objective 3.2 and recommended not establishing targets for the state, because that is beyond EPIC scope. SDG&E also noted that while EPIC can support electrification strategies development, the strategies must be broadly coordinated across key agencies, including CPUC, CEC, CAOSI, CARB and others and must consider customer choice, privacy, low-income impacts and utility obligations to serve. SDG&E noted the importance of engaging communities that are most impacted to ensure affordability and equity of energy transition. SDG&E further noted that success metrics must be coordinated with the work done across agencies and coordination with cities and local governments and utilities in pilots is an important step for developing paths to market.

CEC recommended restating all draft objectives to broaden their scope and adding additional ones to capture key missing elements. CEC urged to avoid setting arbitrary targets. CEC recommended modifications to Objective 3.1 that reflect the need to consider input of all relevant communities in assessing environmental and other impacts and in communicating research results and clarifying that applied research and technology demonstrations and deployment are included (like geothermal and mineral recovery in sea area). For Objective 3.2, CEC proposed revisions that more explicitly name the elements that should be included, like technology manufacturing, adoption and integration phases. CEC proposed including detailed coordination with gas RD&D (like identifying opportunities and mechanisms to redirect investments in gas infrastructure to fund decarbonization and neighborhood scale electrification). For Objective 3.3, CEC proposed broadening its scope to address various opportunities in hard-to-electrify processes, rather than focusing on the high heat. For Objective 3.4, CEC recommended restatement that broadens the goal by including management of demand and resource intermittency. CEC proposed an additional objective that covers technology advancement breakthroughs and identified some promising technologies that are not included in other objectives (like tidal and wave energy, carbon capture and geothermal). CEC also offered a number of success metrics and additional considerations for each objective. CEC endorsed developing quantifiable metrics, helping bring technologies to market, technology advancement, special attention to DVCs, community engagement and public education and listening.

Poll results: During the stakeholders discussion, in answering the question of how relevant each objective is to EPIC 5, the participants ranked as highest priority Objectives 3.1, 3.2.

Participant discussions offered the following comments on the draft objectives:

- Overall: a participant suggested that V2G AC is a missing gap not addressed by the other objectives and should be addressed by EPIC; a participant noted a need for social license from host and impacted communities for innovation in California and urged to include community impacts and benefits analysis (for example through construction management) somewhere in EPIC objectives to help the customer acceptance (for example in transmission siting);
- Objective 3.1: a participant noted that this area will benefit from federal funding in the future years;
- Objective 3.2: a participant noted that this area is important since there are no many solutions for long term intermittency and it will need to be bridged with gas; a participant also suggested looking at hydro as another area for EPIC to investigate for bridging the intermittency;
- Objective 3.3: a participant noted that renewable hydrogen can play a role in this objective;
- Objective 3.4: a participant expressed a concern that Objective 3.4 should not be included in EPIC 5 because it is already getting considerable amount of funding and resource implementation; another participant noted that there is a role for EPIC to play in filling the gap in available fundings, including in equity and environmental concerns and coordination;
- Objective 3.5: a participant suggested that this objective should not be included in EPIC 5 because industry should be the one funding it and it is not the role of ratepayer funded research to demonstrate the value of different technologies; another participant noted that this requires policy changes so the industry might not be able to address this gap and that the role of EPIC would be to demonstrate the value for the future regulatory proceedings; a participant noted that recent FERC decisions on transmission will result in more development in this area in terms of tribal and DVC impacts because transmission proponents have to account for these impacts in their applications.

Distributed Energy Resource Integration **PRESENTATION**

- Jimmy O'Hare: PG&E
- Eric Ritter: California Energy Commission (CEC)

PG&E recommended updating Objective 4.1 to include enabling coordination of grid benefits during normal operations and to clarify "clean energy DER" to exclude GHG-intensive DERs (like fossil fuel generators). PG&E recommended combining Objectives 4.2 and 4.3 into one objective focused on removing barriers to DER adoption in DVCs and measuring local impacts. PG&E also recommended adding additional consideration of including new financial mechanisms to enable DER adoption in low-income communities. For Objective 4.4, PG&E recommended including advanced computational modeling technologies. For Objective 4.6, PG&E recommended restarting the objective to focus on demonstrating increased rate payer affordability through the use of DER's shaping circuit load, combining increased energy capacity factor with infrastructure investment efficiencies. PG&E further suggested to include among strategies a combination of managed load, load shifting, generation and storage at the grid edge, new targeted load, and new infrastructure.

CEC recommended avoiding overly prescriptive objectives with arbitrary targets of broad market-based outcomes. CEC argued that the success of the program should be measure by its ability to advance innovations, rather than achieve market outcomes. CEC recommended that DVCs should be integrated into all objectives, rather than have separate DVC objectives. CEC proposed an alternative approach with a single objective for DER Integration goal that focuses on advancing the adoption readiness of DER technologies and strategies. CEC proposed to use metrics based on the program's ability to innovate, such as: Technology Readiness Level (TRL), Adoption Readiness Level (ARL), Commercial Readiness Level (CRL), Manufacturing Readiness Level (MRL). CEC also proposed several non-technology metrics, like private-sector commercial use, coordination with policies, proceedings and programs. CEC also noted that current Objectives do not include permitting that is a major gap. For Objective 4.1, CEC recommended focusing on innovation, rather than deployment strategies. For Objectives 4.2 and 4.3, CEC recommended focusing on innovation and on benefits to DVCs, rather than adoption. For Objective 4.4, CEC recommended to including the streamlining of permitting process. For Objective 4.5, CEC recommended to keep the objective higher level and more in research angle and to avoid being over prescriptive. For Objective 4.6, CEC recommended measuring success by advancing innovations and the ability of technologies to defer upgrades, including increase utilization rates of circuits.

Poll results: During the stakeholders discussion, in answering the question of how relevant each objective is to EPIC 5, the participants ranked as highest priority Objectives 4.5, 4.6 and 4.1.

Participant discussions offered the following comments on the draft objectives:

- Overall: a participant noted that CEC proposed rewrite and consolidation of all objectives into a one proposed objective is a major rewrite and major deviation from what was developed in San Diego during the in-person Technical Working Groups and there is not sufficient time for participants to process it; another participant noted that there should be a focus on finding technologies that do not increase the rates and technologies that benefit all ratepayers, whether they have DER/EVs or not; a participant urged to properly define "rural" so that the communities can have a proper access to the benefits; a participant noted that a lot of technology is already available but the adoption is lacking; several participants noted importance of having EPIC focus on affordability of technology; a participant noted land use as an important key consideration to keep in mind;

- Objective 4.1: a participant expressed concern over the CEC proposed broadening of this objective and recommended keeping the objective's specificity related to resilience as an important issue for California ratepayers and to ensure better accountability to ratepayers; a participant noted the social burden metric and referenced Sandia tool related to it; several participants expressed the concern that EPIC should not focus on deployment, but rather on pre-commercial phase, improving and advancing technologies and strategies; some participants suggested using "advancement" term instead of "deployment"; CEC noted they recommend advancing the adoption readiness of technologies instead; another participant suggested using language "position DERs to prevent outages" in objective restatement;
- Objective 4.2: a participant suggested maximizing the role of DERs as non-wires alternatives and have DERs installed in DVCs; another participant noted that this is much stronger objective than 4.3 in terms of focus on measurable metrics and benefits; a participant added the land use as the consideration for this objective;
- Objective 4.3: a participant noted that this objective might be appropriate for the state but not for RD&D program like EPIC; another participant noted that there is overlap with 4.1 and recommended adding focus on multi-DER benefits/multi-measure applications in DVCs and offered workforce training and data connectivity as additional considerations;
- Objective 4.4: a participant noted that this is an overly ambitious objective for an RD&D program; another participant noted importance of this objective and keeping pressure with the targets on the driving improvements;
- Objective 4.5: a participant noted that this objective is overly prescriptive and may limit Administrators ability to coordinate with other proceedings, considering that other proceedings might conclude earlier than EPIC timelines; another participant noted that a large data gap needs to be filled outside of the existing proceedings and EPIC can play a key role in it; a participant noted that more clarity of what "support" EPIC can provide will be helpful;
- Objective 4.6: a participant noted a critical need to engage local government on this objective; engaging some other US DOE funded research and other frameworks on the data access can be helpful; another participant noted that this is one of the strongest proposed objectives and has a proper focus and detailed targets.

Climate Adaptation PRESENTATION

- Lindsey Fransen: California Energy Commission

- Kevin Johnson and Jimmy O'Hare: PG&E

CEC recommended adopting a single strategic objective that focuses on innovation and advances the adoption readiness of climate adaptation technologies and strategies. Alternatively CEC proposed to restate the Objectives more broadly. CEC proposed combining Objectives 5.1, 5.2 and 5.3 into one objective focused on adoption readiness of climate adaptation in DVCs. CEC proposed combining Objectives 5.3, and 5.4 into one objective focused on strategies and technologies that enhance grid resilience. CEC proposed reframing Objective 5.5 to focus on open climate data, analytics and technologies. CEC further proposed creating a new objective focused on technologies and strategies that reduce the risk of catastrophic wildfire along utility corridors. CEC recommended using metrics related to ability to innovate, including ARL, TRL, CRL and MRL as well as proposed to use some non-technology based metrics, like private sector offset and coordination with policies, proceedings and programs.

PG&E commented on Objectives 5.2, 5.3 and 5.4 and proposed two new objectives. On Objective 5.2, PG&E recommended that this objective is included as equity across all objectives as a cross-cutting principle and not a standalone objective and offered repraming it in an RD&D angle of enabling collaborative solutions to climate adaptation. PG&E alternatively recommended reframing Objective 5.3 as two separate areas: 1) prevention of climate hazard-related outages and 2) rapid restoration. PG&E recommended using climate hazard events as the metric for this objective. For Objective 5.4, PG&E recommended that "operational cost effectiveness" be incorporated as the cost-cutting principle of affordability, rather than a standalone goal. PG&E alternatively recommended revising the objective to focus on technologies to increase grid resilience to long term climate impacts, while considering short-term and long-term affordability. PG&E proposed two new objectives to address the key missing gaps around wildfires: "5.6 Advance solutions to support cost-efficient forestry and vegetation management, to improve affordability" and "5.7 Advancing solutions to eliminate ignitions with improved grid protection schemes and improved monitoring capabilities, to reduce the increasing risk of climate hazards in California." PG&E noted that utility corridors can also serve as wildfire mitigation tools. PG&E noted that there is a gap between the nature-based solutions and their role for utilities and EPIC can play a role in working with utilities and others to build a toolkit to invest in the natural areas and advance land preservation.

Poll results: During the stakeholders discussion, in answering the question of how relevant each objective is to EPIC 5, the participants ranked as highest priority Objectives 5.4 and 5.5.

Participant discussions offered the following comments on the draft objectives:

- Overall: a participant suggested that the redundancies can be good for EPIC in both keeping some of the topics as the cross-cutting principles and as separate objectives; participants discussed the biomass management and forestry in the wildfire and vegetation management and wildfire mitigation process and if EPIC can play a role in this area;

- Objective 5.4: a participant inquired if EPIC could look into how the hardening of the grid can provide other benefits beyond the grid itself (like the utility corridors serving as wildfire mitigation tools); a participant noted that there is still a significant gaps around research and technology around wildfire mitigation and vegetation management, and there is room for research for lowering costs and increasing efficiencies, for example with using drones or machine learning;
- Objective 5.5: a participant noted the key importance to maintain and improve access to open climate data with respect to this objective and appreciated discussions around this during the development of this objective.

Post-Workshop Comments

Upon the conclusion of the in-person Technical Working Groups and the virtual follow-up workshops, the stakeholders were invited to submit written comments regarding the draft objectives by June 21, 2024. The following entities have submitted their written comments:

1. CEC
2. PG&E
3. SCE
4. SDG&E/SoCalGas
5. Leapfrog Power (Leap)
6. Greenlining Institute
7. Dean Taylor Consulting
8. GoPowerEV
9. Earthjustice
10. Eagle Rock Analytics
11. SWITCH

Full copies of written copies are available online at www.epicpartnership.org/strategicobjectives.html. The commenters primarily recommended the following:

CEC

CEC overall recommended removing targets that are industry or market-wide and too broad for EPIC to achieve on its own (like in Objective 1.1 a target of a X% reduction in EV charging costs and of a X% reduction in EV charging installation by 2035). CEC recommended to focus on advancing the adoption readiness levels of technologies and strategies that address the gaps identified in each Strategic Goal, providing as an example the Adoption Readiness Level (ARL) framework developed by the US DOE Office of Technology Transitions. CEC suggested using the traditional RD&D assessment measures, such as Technology Readiness Levels (TRL), Manufacturing Readiness Levels (MRL), and Commercial Readiness Level (CRL).

CEC expressed concerns that several of the draft Objectives are overly specific in prescribing a particular technology or strategy to address a given problem (for example Objective 4.5) and limit EPIC Administrators' flexibility to develop subsequent initiatives, topics, or projects. CEC recommended phrasing objectives more broadly and consolidating similar topics into more broader objectives to avoid spreading EPIC 5 too thin over too many initiatives. CEC provided extensive and detailed recommendations for consolidating and rephrasing all Strategic Objectives for each of the Strategic Goals, as follows:

- Consolidating Objectives 1,1, 1.2, 1.6, 1.7 and 1.8 into "Objective 1.1: Reduce Charging Infrastructure Costs and Deployment Timelines";
- Consolidating Objectives 1.3 and 1.4 into "Objective 1.2: Increase Equitable Access to Transportation Electrification Benefits";
- Consolidating Objectives 1.4 and 1.5 into "Objective 1.3: Enable All EVs to Engage in Vehicle-Grid Integration";
- Consolidating Objectives 2.1, 2.2 and 2.6 into "Objective 2.1: Advance Building and Community-Scale Electrification Readiness"
- Rephrasing Objective 2.3 into "Objective 2.2: Increase Flexible Load in Buildings";
- Consolidating Objectives 2.4 and 2.5 into "Objective 2.3: Accelerate Net-Zero Technologies in Commercial and Industrial Buildings";
- Rephrasing Objective 3.1 into "Objective 3.1: Improved Knowledge of Environmental and Other Impacts of Electricity Supply And Use";
- Rephrasing Objective 3.3 into "Objective 3.2: Strategic Advancement of Technology Innovations";
- Consolidating Objectives 3.2, 3.4 and 3.5 into "Objective 3.3: Transitioning Energy Systems"
- Consolidating Objectives 4.2, 4.3. 4.5 and 4.6 into "Objective 4.1: Maximize Ratepayer and Societal Value of DERs";
- Consolidating Objectives 4.1 and 4.2 into "Objective "4.2: Improve Reliability and Resiliency Capabilities of DERs"
- Consolidating Objectives 4.3, 4.2 and 4.4 into "Objective "4.3: Enhance Safety, Communications, and Cybersecurity of DERs";
- Consolidating Objectives 5.1, 5.2 and 5.3 into "Objective "5.1: Accelerate Climate Adaptation in DVCs";
- Rephrasing Objective 5.4 into "Objective 5.2: Improving Grid Resilience to Climate Impacts";
- Rephrasing Objective 5.5 into "Objective 5.3: Improve Data and Tools Related to Electricity Sector Climate".

CEC further recommended CPUC pursue dedicated consultation and engagement with tribes so that tribes can inform strategic objectives and all subsequent stages of EPIC 5. CEC further provided detailed comments on each draft Objective that repeat many of the commends CEC provided during the virtual follow up meetings that are described above.

PG&E

PG&E noted that reducing grid upgrades and streamlining interconnection and permitting are particularly important topics for PG&E as they expect a 70% increase in load over the next 20 years. PG&E recommended removing performance targets that measure widespread deployment and adoption or rephrasing them to better align with the scope and scale of the EPIC Portfolio and aligning EPIC definitions with the established industry definitions.

PG&E recommended revising and combining some of the objectives to make them less restrictive or more high level. PG&E recommended consolidating similar themes, particularly into the following two objectives:

1. **Reducing Grid Upgrades:** To support ratepayer affordability, this program will advance solutions related to reducing grid upgrades through enabling flexible load, visibility into DERs, enhanced grid planning and operation tools and cost-effective grid upgrades. (Related draft Objectives: 1.6 Innovative Solutions to Reduce Grid Upgrades; 1.7 Smart Systemwide Grid Planning Tools; 2.2 Avoiding Grid Upgrades due to Decarbonization; 2.3 Flexible Load; 4.6 Reducing Feeder/Circuit Peaks); and

2. **Streamlining Interconnection and Permitting:** This program will identify, develop, and advanced technologies related to advanced computational modeling technologies to streamline permitting and interconnection. Interconnection evaluation process has a complex array of variables, which have to be calculated under multiple different scenarios to determine the net grid effects and needs. (Related draft Objectives: 1.8 Accelerate Grid Interconnection Timelines; 4.4 Expediting and Streamlining Interconnection of DERs).

PG&E further recommended combining the following Objectives: Objectives 1.1 and 1.2; Objectives 1.4 and 1.5; Objectives 1.6 and 1.7; Objectives 2.1, 2.4 and 2.6; Objectives 4.2 and 4.3; and Objectives 5.1 and 5.3. PG&E also supported CEC revisions to Objectives 1.3, 1.4, 1.5, 2.1, 2.4 & 2.6, 3.1, 3.2, 3.3, 3.4, 5.5 as well as CEC recommendations to consolidate all DER Integration Objectives into a one broader objective, and to consolidate all Climate Adaptation Objectives into one broad objective. PG&E proposed their own revisions. For Objectives 1.1, PG&E recommended to focus on "all-in" costs. For Objective 2.5, PG&E recommended restatement that focuses on "technology advancement," rather than having a performance target with widespread adoption. For Objective 4.1, PG&E suggested clarifying that DER includes clean energy only and recommended including grid edge computing and coordination of grid benefits during normal operations. For Objective 5.2, PG&E recommended rephrasing the objective in the RD&D lens. PG&E further proposed additional considerations for DER Integration Objectives and for Objective 5.4.

Regarding metrics, PG&E supported CEC's recommendations to measure success of the EPIC program based on its abilities to innovate and advance technologies using traditional metrics like ARL, TRL, MRT and CRL. PG&E also supported other specific metrics, including, grid upgrade deferrals; all-in costs; time to charge EV, instead of cost per mile; focus on affordability and access; number of MW of flexible load, rather than number of customers or EVs; affordability impacts; cost savings or average bill costs; GHG reductions; time to electrify; acceptance rates across communities. PG&E recommended clarifying or eliminating some metrics that are either too vague (like “value,” “return of investment”, “climate zones”, “cost effective peak load reduction”) or are outside of EPIC’s scope (like “time burden of charging in multifamily housing”).

SCE

SCE recommended consolidating strategic objectives that focus on similar goals:

- Cost to deploy EV charging infrastructure;
- Time to deploy EV charging infrastructure;
- Reduction in the number and extent of grid upgrades caused by strict unmanaged increase in electrical load;
- Increase the effectiveness and utilization of DERs in contrast with traditional grid planning and operations methods; and
- Grid hardening against climate impacts.

SCE encouraged more flexibility for EPIC Administrators in the potential approach for achieving objectives to allow for testing the most appropriate technologies to benefit the people of California.

SCE argued that goals that set specific targets that require broad deployments are not aligned with the focus of the EPIC program and urged that any deadlines should either be connected specifically to strategic objectives that focus on the outcomes of RD&D projects or not be included at all. SCE supported CEC’s recommendation to measure the success of the EPIC program based on its ability to innovate and advance technologies and methods, like standards adoption, programmatic advancement, customer adoption etc.

SCE provided suggestions on rephrasing Strategic Objectives 1.1-1.4, 1.6-1.8, 2.4, 3.1, 3.3-3.5, 4.1-4.6, 5.2-5.5 in more broader terms, and suggested consolidating Objectives 1.1 and 1.2, Objectives 1.6, 1.7 and 1.8, Objectives 4.2 and 4.3, and also consolidate Objectives 4.1-4.4 and 4.6 as sub-set under Objective 4.5. SCE also supported CEC’s Proposed Objectives 1, 2, 3, and the CEC’s proposed rephrasing of Objective 5.2. SEC proposed additional gaps on geographic granularity of impacts, outage duration, geographic methodologies for rural areas, estimating geographic footprint outages, and lack of user-friendly interface for utilities to run modeling tools.

SDG&E/SoCalGas

SDG&E overall recommended that the target year timelines referenced in the EPIC Strategic Objectives should avoid identifying a specific year, and rather indicate a reasonable number of years following Commission's approval. SDG&E recommended that the Objectives with targets that seem to measure more widespread adoption than would be impacted directly by EPIC projects should be revised to align more directly with the scope of the EPIC portfolio. SDG&E noted that some terms need to be defined, like "energy burden" or "grid edge." SDG&E recommended consolidating Objectives and/or focusing on priority Strategic Objectives. SDG&E recommended consolidating Objectives 1.1 and 1.2, Objectives 2.2 and 2.3, and supported CEC's consolidation of Objectives 2.1, 2.4, and 2.6 into a single strategic objective with a slight proposed revision. SDG&E also proposed restatement or additions for Objectives 3.4, 2.5, 4.1, 4.2, 4.4, 5.1, 5.2, and 5.3,

WIth respect to specific objectives, SDG&E suggested that for Transportation Electrification the proposed % goals and targets be separated from the strategic objectives themselves and noted that the context and scale of the proposed metrics (i.e. statewide, local, project specific, etc.) and the baseline measures need top be clarified.

SDG&E argued that EPIC is not appropriate for policy-making or to create market signals. With respect to Objective 3.2, SDG&E argued that EPIC should not be establishing a decarbonization policy or action plan for the State and that at this time, it is inappropriate to set targets for system electrification and gas infrastructure decommissions for 2035, as the targets would be a guesswork.

SDG&E recommended Objective 3.1 to further expand upon "Cumulative Impacts" and consider net impact of new generation and storage and compare that to existing technologies, rather than to electrification.

SDG&E provided additional considerations for Objectives 2.1, 2.2/2.3, 2.5, 3.1, 3.2, 4.1, 4.2, 4.3, 4.4, 4.6, 5.3. SDG&E offered suggestions on how to bring strategies to market for Objectives 2.2/2.3, 3.2, 3.3, 4.1, 4.3, 4.4. SDG&E also provided comments on metrics for Objective 2.2/2.3, 3.2, 3.3, 4.2, 4.3, 4.4, 5.2, 5.4, and measurable targets for Objective 3.5, 4.3, 4.6.

Leapfrog Power (Leap)

Leap suggested an additional role that the EPIC program can play in supporting the Objective 4.5 (Supporting Development of Value of DER). Leap recommended that EPIC should sponsor research to validate and improve the granularity and availability of data on DER energy use through device-level measurement (DLM) and providing analysis that confirms the accuracy of DLM for assessing DER energy use. Leap noted that this could support CAISO in developing more granular methods for forecasting DER load and evaluating DR performance. Leep further suggested additional paths to market for this Objective.

Greenlining Institute

Greenlining overall recommended to coordinate EPIC closely with other programs, embed equity throughout all of the stages, and fund more solutions that increase access to existing technologies in innovative ways for priority populations. Greenlining recommended having equity embedded explicitly into all of the objectives across topics and have holistic equitable goals, processes, implementation, and evaluation methods instead of having a separate standalone equity objective.

Greenlining recommended that EPIC quantitative and qualitative equity metrics coordinate with the Department of Energy's Justice 40 priorities and require community benefit plans or similar tools to assess applications. Greenlining further noted that EPIC should work closely with programs like the Solar on Multifamily Affordable Housing Program or Low Income Weatherization Program that provide access to clean energy to priority populations to help ensure that the innovations and projects have direct and meaningful benefits.

Greenlining recommended that in developing goals, EPIC should build upon existing frameworks and metrics, including the SB 350 Clean Energy Equity Indicators, Disadvantaged Communities Advisory Group (DACAG) Framework, Integrated Energy Resources Planning, EPIC Equity Workforce Recommendations, and the CPUC's Environmental and Social Justice Equity Plan.

Greenlining recommended clearly defining energy equity and social impact and require grantees to create specific, measurable, achievable, realistic, timebound, inclusive, and equitable goals to tangibly track progress towards their goals in a way that is aligned with the stage of development of the company, noting the CalSEED as an example.

Greenlining recommended adding equity principles in the path to market and metrics sections of each Objective for Transportation Electrification and ensuring tenant protections and displacement considerations are included in the Building Decarbonization demonstration projects. In the "Achieving 100% Net-Zero" goal, Greenlining recommended more open dialogue with community groups, rather than one-way "education." In the DER Integration, Greenlining recommended prioritizing DVCs in all strategic objectives rather than having dedicated Objectives 4.2 and 4.3. For Climate Adaptation, Greenlining recommended incorporating Climate Resilience and Adaptation into the other objectives and include extreme heat mitigation technologies and innovations explicitly in the Strategic Objectives. Greenlining further provided specific comments to the metrics, considerations and phrasing of most of the draft objectives, and provided various programs as reference. Greenlining also offered Greenlining's Principles for Building EV Charging Infrastructure for Everyone and the Greenlining's Making Equity Real in Climate Resilience as resources on how to incorporate equity into program design.

Dean Taylor Consulting

Dean Taylor Consulting called for more focus on cybersecurity in EPIC 5 and expressed support of draft Objectives 4.5 and 4.6 and opposition to recommendations to simplify these objectives. Dean Taylor Consulting noted that all these objectives are well-written, at a high level, reflect substantial stakeholder input and intentionally put some restrictions on the EPIC Administrators. Dean Taylor Consulting also suggested an additional path to market for the Objective 4.5. Dean Taylor Consulting further noted that Objective 4.6 should mention the need to be as granular as possible with new types of distribution service values. Dean Taylor Consulting also suggested shifting some of the items in the draft Objectives report appendix for Objectives 4.5 and 4.6 to the metrics and paths to market.

GoPowerEV

GoPowerEv provided comments on the Transportation Electrification Objectives, suggesting strategies, gaps, targets, metrics, additional considerations and paths to market or the Objectives 1.1-1.4, 1.6, and 1.8. GoPowerEv suggested a target of reducing grid interconnection cost by 75% and reducing time to interconnect to one month. GoPowerEv further suggested using solar installations on the parking lots and store rooftops in DVC areas as metrics. GoPowerEv overall recommended supporting installation of Level 1 and low powerLevel 2 chargers at multifamily properties to convert all parking spaces to EV charging stalls. For Objective 1.1, GoPowerEv recommended treating EVCS installations at multifamily properties as residential, not commercial, installations, to allow for residential rated equipment dedicated for EVCS installation that is faster to obtain, cheaper, and provides the necessary safety features. GoPowerEv recommended to encourage the installation of dedicated meters for EVCS ONLY to allow use of EV only rate tariffs. GoPowerEv also noted importance of the E-micro-mobility vehicles for DVCs that are less costly to purchase and encourage people from every community to take electrified mass transit. For Objective 1.2, GoPowerEv noted the biggest gap is that the savings gained from the development and installation of new EV charging/DER technologies are not visible to owners and require rebates. For Objective 1.3, GoPowerEv noted the need of PSAs to show the advantages of charging at multifamily housing for various types of EVs (including micro-mobility) that can be charged at parking spaces converted to charging stalls. GoPowerEv further noted that ubiquitous availability in multifamily parking lots (converting all or at least one stall per unit, parking spaces to EV charging stalls) will greatly accelerate the ownership of EVs and E-micro mobility vehicles. GoPowerEv also noted that mass transit coaches must accommodate E-micro-mobility vehicles. For Objective 1.4, GoPowerEv noted that education through PSAs will be needed to convince tenants about the personal benefits they can receive by partaking in V2G.

Earthjustice

Earthjustice overall recommended setting DVC benefits and collaboration as key considerations and metrics of success for all Strategic Objectives to align with the

Commission's approved EPIC Guiding Principles. Earthjustice further provided specific comments on the draft Objectives under the Transportation Electrification, Building Decarbonization and Achieving 100% Net-Zero Carbon Strategic Goals. Earthjustice specifically suggested using community benefits as metrics for Objective 1.1 (like emissions reductions and the level of community support for electric vehicle charging in DVCs). Earthjustice suggested setting a 100% target for Objective 1.2 and a target of 40% GHG emission reductions by 2030/80% by 2040 for Objective 2.5. Earthjustice recommended adding infrastructure siting, high powered charging and community engagement as additional things to consider for Objective 1.2, gentrification for Objective 1.3 and equitable deployment of grid upgrades that prioritize DVC needs for Objective 1.7. Earthjustice recommended clarifying in Objective 2.5 that decarbonization of industrial buildings also includes industrial processes, such as heat. Metrics recommended for the Building Decarbonization included: for Objective 2.5 using zero-emissions industrial equipment adoption; for Objective 3.1 using increased community understanding of risks and knowledge gaps of new generation and storage technologies; for Objective 3.3 using air quality and pollution reduction as metrics. Earthjustice also commented on the paths to market for the Objective 2.6. Earthjustice further urged to remove direct reference to biomass in Objective 3.1.

Eagle Rock Analytics

Eagle Rock Analytics noted that EPIC 5 Strategic Objectives and the metrics must build in sufficient flexibility to respond to rapid policy and technology shifts. Eagle Rock Analytics commented on the Objective 5.5, expressing concern that it is inconsistent with best and appropriate scientific practices, does not stress the clear need for publicly maintained climate data services to support energy sector advancements. Eagle Rock Analytics is concerned that this objective focuses too heavily on a path-to-market model which will reduce public trust in climate projections and create unnecessary barriers to access information. Eagle Rock Analytics argues that the strategic goals understate the need for open, transparent, accessible, and reproducible approaches to incorporating climate data into energy system planning, regulations, and modeling. Eagle Rock Analytics recommended adopting language like “advancing the quality and fit-for-purpose of climate and weather information using best available science,” rather than specifying AI and machine learning requirements, and suggested reflecting development, refinement, and maintenance of a central observation data set in the strategic goals of EPIC 5. Eagle Rock Analytics proposed mandating a transition towards "open" data products and analytics, and require, in alignment with open data best principles, that any developed tools, datasets, and solutions adhere to the open data science best practices of reproducibility and accessibility (like FAIR standards). Eagle Rock Analytics urged explicitly supporting generation of guidance materials for CPUC regulators with clear guidelines on climate data incorporation in the CPUC proceedings. Eagle Rock Analytics also recommended including language like “through the provision of climate data and services” in references to industry integration practices and utility planning, forecasting and operations practices. Eagle Rock Analytics further recommended prioritizing co-production and co-development of climate data and analytics with IOUs, state agencies, and other climate scientists for industry support. Overall, Eagle Rock Analytics urged not to frame all EPIC investments in terms of "market" to measure success, arguing that open data access allows for successful collaboration between state agencies, IOUs, and the scientific community, and noted that climate data needs continuous research, support, management, and real scientific insight and its benefits are most significant when it remains open to public.

SWITCH

SWITCH commented on the Transportation Electrification and offered suggestions for Objectives 1.1, 1.3, and 1.4, proposing restatement of these Objectives. SWITCH recommends restating Objective 1.1 focusing on cost-effectiveness and cost-benefits, rather than time and cost of EV charging installation. SWITCH recommended restating Objective 1.3 with the focus on EV-readiness standards and suggested adding a target of 50% EV-ready parking, and 25% EVSE-installed by 2035. SWITCH recommended restating Objective 1.4 with the focus on economic and energy resilience value of EV charging and adding the “need to manage load” as the additional consideration.

ATTACHMENTS

Attachment A. Updated Identified Gaps

The gaps discussed during development of the Strategic Objectives Working Groups meetings were developed during the fall EPIC Strategic Goals Working Group Process and updated based on the additional gaps identified during the Kick Off Meeting and in the stakeholder written comments.

TRANSPORTATION ELECTRIFICATION

Initial Gaps (from D.24-03-007)

CAPITAL COSTS FOR CHARGING EQUIPMENT

- High costs of electric vehicle charging infrastructure for light-, medium-, and heavy-duty electric vehicles
- High costs of infrastructure for electrifying public transit to benefit DVC and nonattainment communities by mitigating pollution
- Lack of uniform standards and protocols for interconnection, system design, and communication among grid-connected devices, including smart meters, smart inverters, and internet-of-things (IoT) technology

INTERSECTION BETWEEN CAPITAL COSTS AND RATES

- Lack of availability of affordable public charging infrastructure
- Lack of opportunities for disadvantaged, low-income, ESJ, and tribal communities to directly benefit from electric vehicle adoption

MANAGING CONCENTRATIONS OF CHARGING LOADS

- Lack of advanced planning for grid needs
- High costs related to charger interconnection and grid upgrades for areas with high concentrations of electric vehicle charging infrastructure
- Incomplete understanding consumer decision-making behavior related to challenges of electric vehicles adoption

MANAGING BULK SYSTEM OR ZONAL LOADS OF CHARGING

- Misalignment between electric vehicle loads and intermittent renewable energy production
- Lack of robust and uniform data sharing and cybersecurity protocols for transportation electrification

Modified Gaps (dark green represent added gaps and light green show updated gaps)

Increasing Equitable Access to Transportation Electrification Benefits	Reducing Capital Costs for Charging Equipment	Managing Bulk System or Zonal Loads of Charging	Managing Concentrations of Charging Loads on the Distribution System
Lack of availability of affordable public or shared charging infrastructure	High costs of electric vehicle charging infrastructure for light-, medium-, and heavy-duty electric vehicles	Misalignment between electric vehicle loads and intermittent renewable energy production	Lack of advanced planning for grid needs
Lack of opportunities for disadvantaged, low-income, ESJ, and tribal communities to directly benefit from electric vehicle adoption	High costs of infrastructure for electrifying public transit to benefit DVC and nonattainment communities by mitigating pollution	Lack of robust and uniform data sharing, testing, certification, and cybersecurity protocols for transportation electrification	High costs related to charger interconnection and grid upgrades for areas with high concentrations of electric vehicle charging infrastructure and/or low grid capacity
	Lack of uniform standards and protocols for interconnection, system design, and communication among grid-connected devices, including smart meters, smart inverters, and internet-of-things (IoT) technology	Lack of capability to leverage optimized charging, bidirectional charging, and V2X for grid services.	Incomplete understanding of consumer decision-making behavior related to challenges of electric vehicles adoption
			Long timelines for grid upgrades to accommodate EV charging infrastructure, particularly for fleets

BUILDING DECARBONIZATION

Initial Gaps (from D.24-03-007)

SPEEDING AND ENABLING RESIDENTIAL RETROFITS

Inability to easily share data across systems needed to plan for, develop, interconnect; and optimize building retrofits

High upfront costs of electrification retrofits

Lack of whole home retrofit approaches for low-income retrofits

Inability of renters to make large-scale, permanent upgrades in tenant-occupied buildings, and risks of increased rent burdens and loss of affordable housing

Lack of standardized retrofit packages and difficulty for consumers in coordinating among different decarbonization incentives and financing opportunities to understand how to fit them together to complement each other to reduce decarbonization cost

Long lead and installation times for electrification retrofits, in comparison to emergency equipment replacement timeline needs

Lack of standardization and complex and demanding building codes, permitting, and interconnection processes

COORDINATING AT A COMMUNITY SCALE

- Increasing share of gas infrastructure costs accruing to those not able to afford electric retrofits
- Lack of advanced planning, including city planning, for grid needs
- Lack of understanding on the potential to transition entire neighborhoods from gas to geothermal heating and cooling, particularly in warm climates

UNDERSTANDING AND PRIORITIZING ENERGY BURDEN

- Lack of energy burden, air quality, and safety metrics for building decarbonization efforts
- High energy burden levels for low-income customers as compared to national and State averages, and increasing electric rates

FLEXIBLE LOAD

- Lack of understanding of customer behavior in technology adoption and demand flexibility
- Need for advanced modeling and forecasting to better account for demand flexibility potential
- High cost of grid upgrades associated with new, unmanaged electric load
- Lack of flexible load capacity from building electric use

COMMERCIAL AND INDUSTRIAL BUILDING RETROFITS

- Lack of low-cost automation and sensing solutions for commercial buildings
- Commercial and industrial buildings oftern have higher energy demand and unique end uses that make electrification and decarbonization more difficult

Modified Gaps (dark green represent added gaps and light green show updated gaps)

Speeding and Enabling Residential Retrofits	Coordinating at a Community Scale	Understanding and Prioritizing Energy Burden, Improving Air Quality and Building Safety	Flexible Load	Commercial and Industrial Building Retrofits
High upfront costs of electrification retrofits	Increasing share of gas infrastructure costs accruing to those not able to afford electric retrofits	Lack of energy burden, air quality, and safety metrics for building decarbonization efforts	Lack of understanding of customer behavior in technology adoption and demand flexibility	Lack of low-cost automation and sensing solutions for commercial buildings
Lack of whole home retrofit approaches for low-income retrofits	Lack of advanced planning, including city planning, for grid needs	High energy burden levels for low-income customers as compared to national and State averages, and increasing electric rates	Need for advanced modeling and forecasting to better account for demand flexibility potential	Commercial and industrial buildings often have higher energy demand and unique end uses that make electrification and decarbonization more difficult
Inability of renters to make large-scale, permanent upgrades in tenant-occupied buildings, and risks of increased rent burdens and loss of affordable housing	Complex coordination needed to transition entire neighborhoods from gas to decarbonized buildings	Lack of coordinating between decarbonization, energy efficiency, and DER investments lead to higher costs	High cost of grid upgrades associated with new, unmanaged electric load	Split incentives are a barrier to the deployment of energy efficiency and DER measures in buildings
Lack of standardized retrofit packages and difficulty for consumers in coordinating among different decarbonization incentives and financing opportunities to understand how to fit them together to complement each other to reduce decarbonization cost		High costs for health and safety upgrades, mitigation for pre-electrification/pre-weatherization barriers in older existing buildings	Lack of flexible load capacity from building electric use	

Long lead and installation times for electrification retrofits, in comparison to emergency equipment replacement timeline needs

Lack of standardization and complex and demanding building codes, permitting, and interconnection processes

Inability to easily share data across systems needed to plan for, develop, interconnect; and optimize building retrofits

High cost of panel and wiring upgrades for older residences

ACHIEVING 100% NET-ZERO CARBON EMISSIONS AND THE COORDINATED ROLE OF GAS

Initial Gaps (from D.24-03-007)

IDENTIFYING CLIMATE AND LOCAL POLLUTANT IMPACTS OF NEW GENERATION AND STORAGE TECHNOLOGY

Lack of information on high production and life-cycle costs of "green" electrolytic hydrogen

Lack of opportunities for disadvantaged, low-income, and ESJ communities and tribes to be readily included in the discussions and decision-making process on emerging generation and storage technology adoption, including discussion of potential impacts on public health

Lack of independent studies on appropriate, cost-effective roles and lifecycle costs and impacts of emerging technologies, including floating OSW, enhanced geothermal, biomass conversion, and clean renewable hydrogen in achieving carbon neutrality

ADDRESSING INTERMITTENCY AND INCREASING FLEXIBILITY TO ACHIEVE A CARBON-FREE POWER SECTOR

Lack of coordination between grid operators in the western region in order to integrate new large-scale renewable resources, including offshore wind

COORDINATION WITH GAS DECOMMISSIONING

Lack of a coordinated, statewide program to substitute non-pipeline alternatives for gas system repair and replacement projects where technically feasible

Lack of coordination and collaboration among EPIC and other gas and electric RD&D program investments on the common goal of decarbonization and right-sizing energy infrastructure and ratepayer affordability

TECHNOLOGY INNOVATION FOR HARD-TO-DECARBONIZE SECTORS

Lack of clear pathways to economically decarbonize 100% of hard-to-decarbonize activities through electrification with no increase in air, water, and land pollutants by 2045

Lack of understanding on the potential to transition entire neighborhoods from gas to geothermal heating and cooling, particularly in warm climates

Modified Gaps (dark green represent added gaps and light green show updated gaps)

Identifying Climate and Local Pollutant Impacts of New Generation and Storage Technology	Addressing Intermittency and Increasing Flexibility to Achieve a Carbon-Free Power Sector	Technology Innovation for Hard-to-Decarbonize Processes	Electricity system coordination with gas decommissioning
Lack of information on high production and life-cycle costs of "green" electrolytic hydrogen	Lack of coordination between grid operators in the western region in order to integrate new large-scale renewable resources, including offshore wind	Lack of clear pathways to economically decarbonize 100% of hard-to-decarbonize activities through electrification with no increase in air, water, and land pollutants by 2045	Lack of a coordinated, statewide program to substitute non-pipeline alternatives for gas system repair and replacement projects where technically feasible
Lack of opportunities for disadvantaged, low-income, and ESJ communities and tribes to be readily included in the discussions and decision-making process on emerging generation and storage technology adoption, including discussion of potential impacts on public health	Uncertain impacts from significant changes in energy demand patterns due to electrification	Electrification of high-heat processes creates additional stress on the electric grid locally, and regionally in high-adoption scenarios	Lack of coordination and collaboration among EPIC and other gas and electric RD&D program investments on the common goal of decarbonization and right-sizing energy infrastructure and ratepayer affordability
Lack of independent studies on appropriate, cost-effective roles and lifecycle costs and impacts of emerging technologies, including floating OSW, enhanced geothermal, biomass conversion, and clean renewable hydrogen in achieving carbon neutrality	Long timelines for renewable energy, storage, and transmission development may not match timelines for electricity demand changes		Lack of understanding on the potential to transition entire neighborhoods from gas to geothermal heating and cooling, particularly in warm climates

DER INTEGRATION

Initial Gaps (from D.24-03-007)

INCREASING ACCESS TO DER BENEFITS FOR DVCS

- Lack of opportunities for disadvantaged, low-income, ESJ, and tribal communities to engage early and directly benefit from deployment of flexible resources
- Need for better understanding of consumer adoption behavior regarding flexible DERs

STRENGTHENING THE ROLE OF DERS FOR GRID RESILIENCY

- An outsized burden that long-duration outages have on disadvantaged, low-income, ESJ, and tribal communities
- Need for reliable and resilient power for communities and critical facilities during periods of power outages due to wildfire, extreme weather, and other emergency situations

LEVERAGING DER TO REDUCE GRID COSTS AND IMPROVE RELIABILITY

- Need for better understanding of the ability of aggregated DER and VPP deployment to reduce or forestall the cost associated with grid upgrades, and to support grid reliability
- Lack of comprehensive weather operational data to predict system conditions
- Insufficient valuation, incomplete businesses models, and lack of appropriate market mechanisms for transmission and distribution grid services provided by flexible resources

STREAMLINING INTERCONNECTION AND COMMUNICATION

- Lack of uniform standards and protocols for interconnection, system design, and communication among grid-connected devices, including smart meters, smart inverters, and internet-of-things (IoT) technology
- Complex and demanding interconnection processes that increase the costs and slow timelines for DER deployment
- Lack of robust and uniform data sharing and cybersecurity protocols for DERs

Modified Gaps (dark green represent added gaps and light green show updated gaps)

Increasing Access to DER Benefits for DVCs	Strengthening the Role of DERs for Grid Resiliency	Leveraging DER to reduce grid costs and improve reliability	Streamlining Interconnection and Communication
Lack of opportunities for disadvantaged, low-income, ESJ, and tribal communities to engage early and directly benefit from deployment of flexible resources	An outsized burden that long-duration outages have on disadvantaged, low-income, ESJ, and tribal communities	Need for better understanding of the ability of aggregated DER and VPP deployment to reduce or forestall the cost associated with grid upgrades, and to support grid reliability	Lack of uniform standards and protocols for interconnection, system design, visibility, and communication among grid-connected devices, including smart meters, smart inverters, and internet-of-things (IoT) technology
Customers in DVCs face trust, information, valuation, and infrastructure barriers to adoption of DERs and participation in grid services	Need for reliable and resilient power for communities and critical facilities during periods of power outages due to wildfire, extreme weather, and other emergency situations	Insufficient valuation, incomplete businesses models, and lack of appropriate market mechanisms for transmission and distribution grid services provided by flexible resources	Complex and demanding interconnection and permitting processes increase the costs and slow timelines for DER deployment
		Lack of comprehensive weather operational data to predict system conditions	High costs, high latency, and low cybersecurity safeguards for communication to and between DERs to support grid services strategies.
		Lack of reliable, real-time, automated coordination of generation and load at the grid edge.	Lack of low latency distribution system intelligence, data feed for actual dynamic capacity constraints, and real-time enablement for automation services providers including distributed grid services.
		Potential operational conflicts between leveraging the same DERs for grid services, resiliency, reducing energy bills, and transportation	

CLIMATE ADAPTATION

Initial Gaps (from D.24-03-007)

PROTECTING VULNERABLE POPULATIONS

Lack of ESJ and tribal communities' access to resiliency infrastructure and resources

An outsized burden that long-duration outages have on disadvantaged, low-income, ESJ, and tribal communities

RESPONDING TO WEATHER AND CLIMATE VARIABILITY

Need to upgrade grid equipment life expectancy under climate adaptation scenarios, including stronger winds and increased heat and humidity that prevents equipment from cooling down at night

Modified Gaps (dark green represent added gaps and light green show updated gaps)

PROTECTING VULNERABLE POPULATIONS	RESPONDING TO INCREASED WEATHER AND CLIMATE VARIABILITY	HARDENING THE GRID AND IMPROVING RESILIENCY IN REMOTE GRID EDGE LOCATIONS
Lack of ESJ and tribal communities' access to resiliency infrastructure and resources	Increased risk to grid equipment life expectancy under climate adaptation scenarios, including from stronger winds and increased heat and humidity that prevents equipment from cooling down at night	Lack of data of actual and expected performance, health, lifespan, and failures of grid equipment under new climate scenarios increases cost and outage risks
An outsized burden that long-duration outages have on disadvantaged, low-income, ESJ, and tribal communities	Lack of comprehensive weather operational data to predict system conditions	High grid restoration times after large-scale outage/PSPS events
Non-weatherized housing stock in DVCs increase health, safety, and affordability risks	Lack of tools to support coordinated planning for the impacts of high-impact, widespread, and long-duration climate related events	High costs of grid hardening
		Lack of fail-safe equipment to reduce ignition events

Attachment B. Example Strategies

As part of the development of Draft Strategic Objectives in the Technical Working Group Meetings, participants provided examples of strategies that may help achieve the Strategic Objective. At this time, it is premature to finalize specific strategies to reach the Strategic Objectives, as that will be determined as part of Administrator Investment Plans. However, capturing the discussed strategies can provide helpful context to participants to understand the focus of the discussion. The following represents a non-exhaustive list of possible strategies identified by stakeholders for each of the original draft Strategic Objectives.

TRANSPORTATION ELECTRIFICATION

Strategic Objectives	Stakeholder-supplied Example Strategies
1.1 Reducing Installation Costs and Time	• Enhanced and targeted level 1 charging; • Maximizing use of existing infrastructure; • Coordinating with other electrification investments; and • Using networked systems and VGI to make level 1 charging work for everyone.
1.2 Reducing Cost of Charging Infrastructure for Medium and Heavy-Duty Vehicles	• Developing programs that could help medium- and heavy-duty EV fleet operators and drivers to monetize on EV fleet battery use as a grid resource, through, for example: • Demonstrating ROR s, operations and use case scenarios of the medium- and heavy-duty EV fleet/vehicle engagement in VPPs/V2Gs and V2Xs; • Pilots and demonstrations (for example, for battery-swapping, EV fleet operations and charging models, cost-effective managed charging and load management approaches); • Identifying feasible electric rates structures for medium- and heavy-duty EV fleet owners and operators; • Use case studies and demonstrations (for example for off-road vehicle application, V2G capabilities in rural areas); and • Feasibility pilots and use case studies and demonstrations (for example, testing feasibility for bidirectional EV vehicles with different mix of vehicle types and different customer types). • Where bidirectionality is not feasible, develop mapping tools for hardware (controllers, meter adapters, DTM, etc.) and software (e.g. ALM) solutions that match the unique fleet operators' and drivers' needs to reduce costs in EV charging infrastructure installation and operations, and reduce the infrastructure physical (space) footprint.

1.3 Ubiquitous EV-capable parking in DVCs	• Innovation in residential equipment, including metering; • Maximizing use of existing infrastructure; and • Micro-mobility and mass transit.
1.4 Ensuring Communities Receive VGI Benefits	• Technological advancements to facilitate VGI; • All future charging stations are VGI capable; and • Increasing opportunities for load management.
1.5 GI as a Grid Enabling Asset	• Managed charging and other EV use cases for the grid; • Price signals and participation of aggregated EV's in the wholesale market; • VGI as a load management tool to minimize system upgrades and costs; and • Understand customer behavior around charging and VGI use cases.
1.6 Innovative Solutions to Reduce Grid Upgrades	• Aggregated distributed energy resources (DERs) • Smart charge management (SMI) solutions • Dynamic grid management capabilities
1.7 Smart Systemwide Grid Planning Tools	
1.8 Accelerate Grid Interconnection Timelines	

BUILDING DECARBONIZATION

Strategic Objectives	Stakeholder-supplied Example Strategies
2.1 Whole-Home Electrification Cost Reductions	• Validating building decarbonization upgrade approaches; • Characterizing the workforce and housing stock; • Multifamily plug and play solutions; • Whole-home modeling and contractor tools that are reliable and build trust; • Financing; • Controls; • Solar; • Aggregating performance data; • Bi-directional electric vehicles; • Bringing the cost of electric panel retrofits below $1000.

2.2 Avoiding Grid Upgrades due to Decarbonization	• Rooftop solar coupled with bi-directional vehicle charging and electric panel upgrades; • Load management; • Behind-the-meter nano- or micro-grids; and • Energy usage disaggregation.
2.3 Flexible Load	• Advanced modeling and planning tools; • Behind-the-meter technology advancements; • Intelligent communication with customers; • Defer or decrease system upgrades • Understanding different customer segment load potential and behavior; and • Advanced interoperability and automated controls
2.4 Address Split Incentives in Commercial Multi-Family Buildings	• Deployment of pilots for tenant-owned mobile HVAC / energy efficiency units • Pooling of mobile units with tokens to reduce costs and accelerate tenant adoption • Deployment of detachable smart building controls • Novel financing options offered to landlords to accelerate net zero building retrofits • Develop a roadmap tailored to commercial multi-family buildings • Expand existing utility programs for commercial multi-family housing
2.5 Accelerate Net Zero Technologies for Commercial and Industrial Buildings	• Develop a framework to accelerate adoption, reduce costs, and spur commercialization • Deployment of a suite of pilots and demonstration projects for C&I net zero technologies • Establish a data-driven program target for % reduction in GHG emissions by 2035 • Accelerate adoption at a pace needed to achieve California net zero goals

2.6 Community Scale Electrification / Decarbonization	• Identifying best approaches to coordinate/overlay gas and electric infrastructure upgrades and planning:
	  ○ Mapping out and coordinated planning of overlay/intersection of electric and gas infrastructure to identify communities that may be best suited for 100% community-scale electrification (overlaying gas and electric infrastructure and DVC communities to identify most feasible spots where, for example, gas infrastructure requires costly upgrades and it may be most cost effective to transition the community to all electric or geothermal technologies).
	  ○ Developing mapping tools;
	  ○ Developing cost-effective and scalable and replicable pathways (for example, through demonstrations and pilots) for neighborhood scale decarbonization/electrification;

	○ Identifying feasible scale/size of a community for cost effective community-scale electrification/decarbonization projects (for example a block, a street, a group of blocks, a neighborhood, a cluster of buildings or customers based on gas/electric meters interconnection with the utility infrastructure); ○ Social behavior research into customer adoption behavior; ○ Developing recommendations for the building code updates related to mandated pre-wiring for all electric neighborhoods; ○ Developing an online platform to identify and cluster customers interested in 100% electrification of their homes to unite them into community scale projects.
2.6 Community Scale Electrification / Decarbonization (cont.)	• Identifying best approaches to mandate and coordinate bidirectional EV pre-wiring to achieve X number or X% of buildings/communities with bidirectional pre-wiring by 2045 (with the earlier dates aligned with the code updates timelines): ○ Developing building code update recommendations for mandating bidirectional wiring in buildings to enable bidirectional EV/V2B/V2G interconnection and operability; ○ Developing cost-effective approaches/pathways to leverage VPP/V2G/DER capabilities to reduce costs and increase profitability and affordability of community scale electrification projects (for example through studies, pilots and demonstrations for community scale energy export and aggregation capabilities, load and export capabilities of the homes with EVs and DERs); ○ Identifying opportunities for cost savings in various upgrades if performed on community scale, including panel upgrades and bidirectional wiring, neighborhood EV charging planning, DER integration.

ACHIEVING 100% NET-ZERO ENERGY CARBON EMISSIONS AND THE COORDINATED ROLE OF GAS

Strategic Objectives	Stakeholder-supplied Example Strategies
3.1 Impacts Research for New Generation and Storage Technologies	• Comprehensive quantification of pollution, public health, workforce, and non-energy impacts of new technologies; • Effectively communicating existing and new data to the public and especially DVC communities; • Using best practice and new dissemination strategies and looking for lessons learned from past efforts; • Researching customer and community needs and priorities and making that information widely available; and • Failing fast and reassigning funding, where needed.

3.2 Electricity and Gas System Coordination	• Develop forecasting and modeling for the electricity and gas system; • Identify and map aging or vulnerable gas infrastructure suitable for electrification and decarbonization; • Analyze the costs associated with gas system decommissioning under various conditions; • Gain insights into the types of equipment and technologies customers use behind-the-meter; • Determine the most effective ways to communicate electrification and decarbonization to diverse customer segments; • Understand customer behaviors and devise strategies to incentivize the transition from gas to electric; • Implement effective customer engagement and outreach programs;
3.3 Alleviate Grid Constraints to Spur Industrial Electrification	• Build upon existing utility and ISO/RTO data, studies, and models with GIS mapping. • Quantity grid baseline and forecasted grid needs with GHG and grid constraints. • Identify gaps and barriers to industrial electrification adoption • Prioritize localized industrial sub sectors, climate zones, and grid constrained regions. • Operate with a holistic and integrated California Interagency coordinated approach. • Holistic and integrated California Interagency coordinated effort.
3.4 Increase Predictability in the Intermittent Resources and Load Management Modeling and Utilization	• Studies to fill the data gaps in visibility and forecasting of DERs and demand/EV charging/flexible load for distribution grid operators and CAISO modeling and forecasting purposes, including on ways to improve dynamic demand forecasting and load balancing potential; • Studies, pilots and demonstrations on the impact and the value of co-locating long-term storage with resilience needs; • Customer behavior studies (for example pricing pilots for V2G and response to prices); • Research and demonstrations into plug-n-play platforms for bidirectional EVs as mobile long-term storage that can be mobilized to fill the needs where necessary.
3.5 Maximize Local Benefits of New Transmission	• Coordinating transmission planning with local fire risks management and telecom/broadband and undergrounding efforts to maximize benefits in rural communities (for example, using transmission routes as fire breakers).

DER INTEGRATION

Strategic Objectives	Stakeholder-supplied Example Strategies

4.1 Role of DERs for Grid and Community Resilience	• Isolate DERs during a cybersecurity attack • Community scale microgrids • Plug and play community solutions • Community shared resources • Voltage support • Closed loop solutions for long duration resiliency • Behind the panel battery • Island remote communities
4.2 Maximizing DER Impacts for DVCs	• Scalable demonstrations • EV charging (level 1 + public) and microtransit • Workforce training at grid edge • Community outreach and education around all DER benefits • Technological readiness • Studying advantages and disadvantages of behind-the-meter vs. in-front-of-the-meter DER
4.3 Improving Access for DVCs	• Scalable demonstrations • EV charging (level 1 + public) and microtransit • Community outreach and education around all DER benefits • Working with trusted messengers and researchers with cultural competence • Technological readiness improvements • Microgrids and resilience centers

<table>
<tr><td>4.4 Expediting and Streamlining Interconnection of DERs</td><td>Develop tools for utilities to automate interconnection process (to lead to an expedited interconnection process that does not increase ratepayer burdens), including, for example:
Tools that will pull existing information, studies and data available from different sources
Tools that will allow for simulations to be run by the utility and the applicants to estimate interconnection costs and timelines (including e.g., the hosting capacity information, cost of required upgrades in different scenarios)
Perform engineering studies (pre-developed typical studies that are usually performed during the interconnection requests processing) that could be relied on during the interconnection process to reduce costs and reduce the number of studies that need to be performed by the utilities
Perform studies of different models of import/export capacity and limits that can expedite interconnection (for example, look at different successful models and best practices utilized in different jurisdictions and countries)
Develop standards of communication protocols and object models (including DER, grid devices, and other relevant devices and equipment)
Standardized telemetry data to have better predictability to better understand and trust DER devices behavior/performance on the grid in specific scenarios (to reduce the need to study these devices extensively during interconnection process)</td></tr>
<tr><td>4.5 Support development of Value of DER framework</td><td>Virtual Power Plant aggregation of behind-the-meter DERs to provide grid reliability services and operational flexibility.
Developing a better understanding of customers’ and DER behavior and load shapes
Developing consensus-based, technology-neutral baselines for each grid service
Demonstrate zero incident cybersecurity for DERs at the circuit level
Identifying each positive business case for DER services where benefits exceed costs
Develop a dataset for leveraging DER for operations, including data on reliability, load shape, duration, and operating parameters
Application of standards-based control of DER at the circuit level</td></tr>
<tr><td>4.6 Reducing feeder/circuit peaks</td><td>Developing a dataset on granular, circuit-level data
Managing load shape at the circuit level
Developing a transparent, traceable grid services valuation at the circuit level
Developing a value proposition / quantification of values by zip code or other local geography
Deploying distribution transformer monitoring</td></tr>
</table>

CLIMATE ADAPTATION

Strategic Objectives	Stakeholder-supplied Example Strategies
5.1 Innovative approaches to quick deployment and quick, mobile responses to outages	• Demonstrations to leverage existing infrastructure in new ways • Standard communications processes to help people and organizations work together • Advanced weather data to help communities be prepared for response • Adding resilience at repair • Community and building scale improvements and resilience centers with storage and microgrids
5.2 Accelerate and increase scale of climate adaptation in DVC housing	• Leveraging various sources of funding • New business models for utilities • Adding resilience at the time of repair • Identifying critical infrastructure, in addition to critical facilities • More frequent baselines on housing stock and on sea level impacts • Demonstrations to leverage existing infrastructure in new ways and bring confidence around existing technologies • Design-build strategies and demonstrations • Accelerating the integration of medium- and heavy-duty EVs • Broaden building standards and certifications to include resilience • Entrepreneurial ecosystem support • Community resilience infrastructure
5.3 Increase the quality of community engagement and co-creation, collaboration, and empowerment opportunities	• Partnering with communities that have learned lessons through past events • Identifying most effective community partners • Innovating on ways to engage communities • Tools to share data and stories gathered through outreach and education

5.4 Grid Hardening for Long-Term Climate Impacts	• System failure causation data • Comprehensive grid awareness • Comprehensive multi-jurisdictional transparent information and data sharing • Climate hazard risk modeling tools • Machine learning to categorize and process data • Machine learning to enable real time grid monitoring • Understanding asset health and predictive failures

5.5 Improved Predictions and Forecasting for Increased Weather and Climate Variability	• Develop reliability metrics that address community needs
	• Increase situational awareness (for example for wind, heat and cold) with hourly observations and generate data to validate forward looking predictions, for example by
	  ○ Deploying a number of sensors to collect data
	  ○ Locating equipment to collect data in the locations where data is missing or insufficient
	• Develop guidance/studies on the predictions and forecasting best practices
	• Develop novel grid enhancing technologies and novel technologies for decision making, planning and forecasting
	• Develop training approaches and guidance on how to use climate and weather data uncertainties inherent in that data
	• Develop cost-benefit analysis of wildfire mitigation strategies
	• Develop approached to utilize AI and machine learning to improve forecasts and climate predictions to integrate into operations
	• Enhance cause attributions for failures
	• Develop tools and approaches, platforms and portals for coordination, access, navigation and consolidation of existing data from different sources, for example:
	  ○ A shared coordinated data from IOUs, POUs, CAISO, CEC, WECC, other publicly available data
	  ○ Creating tools for pulling data from various resources and making it available and accessible
	  ○ Integrating data on outages, grid planning, load forecasting, customer usage and customer behavior and response to climate events and market signals, various climate data and models, DER operations and performance data, infrastructure digital twin simulations
	• Developing foundational research on climate predictions and forecasting to supplement existing research and fill gaps with more up-to-date information