

# Emerging Issues in Transportation Electrification Forecast: SCE's Perspectives

Demand and DER Forecasting Group, SCE  
November 14<sup>th</sup>, 2019

**SOUTHERN CALIFORNIA EDISON**  
Energy for What's Ahead<sup>SM</sup>

**PATHWAY 2045**  
Update to the Clean Power and Electrification Pathway  
November 2019

**EXECUTIVE SUMMARY**  
By 2045, California will undergo a remarkable evolution. Supported by its residents, the state will achieve carbon neutrality to reduce the threat of climate change. This will require substantial decarbonization of all sectors of the economy and will necessitate rigorous planning to keep energy safe, reliable and affordable.

Pathway 2045 examines the energy implications of California's long-term decarbonization goals on both the economy and the electric sector and maps out a feasible and low-cost path to meeting these goals. Pathway 2045 builds on the Clean Power and Electrification Pathway, Southern California Edison's 2017 analysis of what will be required to meet 2030 interim goals.

Pathway 2045 concludes that the changes required across California's economy are profound. Decarbonization is achieved through powering 100% of retail sales\* with carbon-free electricity, electrifying transportation and buildings and using low-carbon fuels for technologies that are not viable for electrification.

The remaining carbon is sequestered to reach carbon neutrality (Figure 1). Emerging technologies and practices will be required to find the most economical method to remove carbon at this scale.

**Electric sector:** To economically meet both the 2030 and 2045 decarbonization goals, the electric sector needs to decarbonize more quickly than currently required. By 2045, significant electrification of the state's economy combined with population and economic growth will result in a 60% increase in electricity sales from the grid and a 40% increase in peak load.

Eighty gigawatts (GW) of new utility-scale clean generation and 30 GW of utility-scale energy storage will be required in the next 25 years. Energy storage will be essential because the most cost-effective, carbon-free generation sources — wind and solar — are intermittent. Thirty additional GW of generation capacity and 10 GW of storage will come from distributed energy resources (DERs) including up to 50% of single-family homes in California which, driven by improved economics, building codes and supportive but equitable policies, are projected to have customer-stored solar by 2045.

**The grid:** The grid must have sufficient capacity and continue to modernize to harness the full potential of DERs. Electrification will further increase customers' reliance on the grid, underscoring the need to build in additional resilience to withstand the more frequent and severe weather conditions due to climate change impacts. Grid hardening efforts today along with system designs that accommodate increasing flexibility and more monitoring should reduce these risks. At the same time, California's leadership in deep decarbonization can be a global model that helps mitigate the further threats of climate change.

\* Retail sales is electricity used by individual customers (as opposed to wholesale electricity that is bought, sold and traded in markets).

**Figure 1:** Decarbonization is required across the California economy

**SOUTHERN CALIFORNIA EDISON**  
Energy for What's Ahead<sup>SM</sup>

**THE CLEAN POWER AND ELECTRIFICATION PATHWAY**  
Realizing California's Environmental Goals  
November 2017

**Figure 1:** Meeting California's GHG Reduction Goals (Source: California Air Resources Board (CARB))

This paper presents Southern California Edison's integrated blueprint for California to reduce greenhouse gas emissions and air pollutants. Realizing the blueprint will reduce the threat of climate change and improve public health related to air quality. It is a systematic approach and each measure is integrated with — and depends upon — the success of the others. To be successful, California must approach implementation as an integrated package, applying resources across the board where most effective.

**EXECUTIVE SUMMARY**  
Climate change and air pollution pose serious threats. Climate change effects, such as sea level rise and longer, more intense heat waves, are now occurring. In California, while significant progress has been made, too many communities continue to experience asthma and other air-quality related health issues.

California continues its leadership in addressing climate change and air pollution. The state's greenhouse gas (GHG) goals call for a 40 percent reduction in GHG emissions from 1990 levels by 2020 and an 80 percent reduction by 2030 (Figure 1). Air quality goals include a 90 percent reduction in emissions of nitrogen oxides from 2010 levels in some of the state's most polluted areas by 2022. Meeting these ambitious clean energy and clean air goals requires fundamental changes over the next 12 years and beyond.

The electric sector is at the forefront of the fight against climate change in California and today accounts for only 19 percent of the state's GHG emissions. The transportation sector (including fuel refining) and fossil fuels used in space and water heating now produce almost three times as many GHG emissions as the electric sector and more than 80 percent of the air pollution in California.

The Clean Power and Electrification Pathway is an integrated approach to reduce GHG emissions and air pollution by taking action in three California economic sectors: electricity, transportation and buildings. It builds on existing state policies and uses a combination of measures to produce the most cost-effective and feasible path forward among the options studied.

The Pathway will help California achieve its climate goals and significantly reduce today's health-harming air pollution in local communities. It also has strong potential to create highly skilled, middle-income jobs.

By 2030, it calls for:

- an electric grid supplied by 80 percent carbon-free energy;
- more than 7 million electric vehicles on California roads; and
- using electricity to power nearly one-third of space and water heaters, in increasingly energy-efficient buildings.

(Continued)

Energy Research and Development Division  
**FINAL PROJECT REPORT**

**Deep Decarbonization in a High Renewables Future**  
Updated Results from the California PATHWAYS Model

**California Energy Commission**  
Edmund G. Brown Jr., Governor

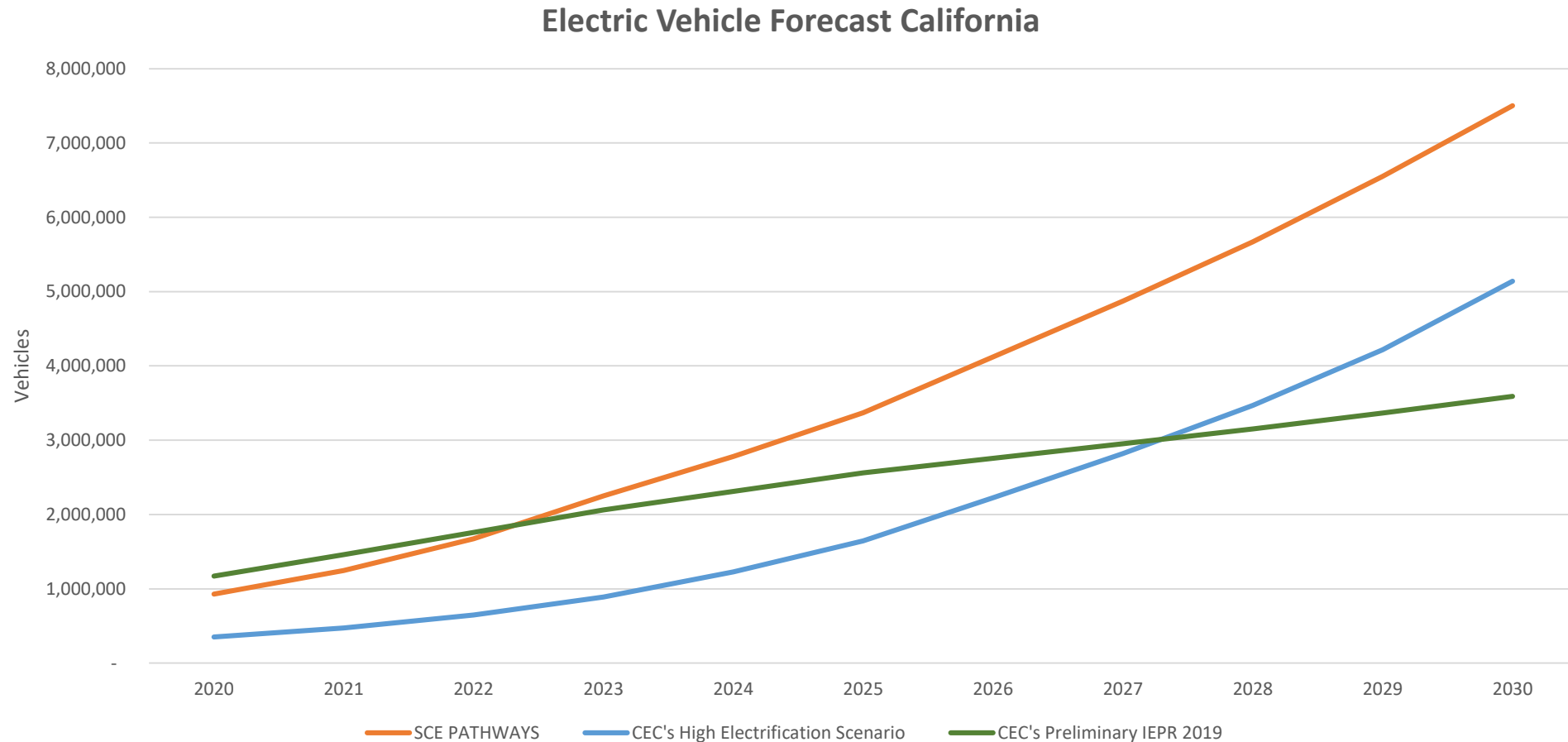
June 2018 | CEC-500-2018-012

# Agenda

- Light-duty EV forecast consideration
  - Forecast Comparison
  - EV charging load profile and impact
  - SCE program development and impact
- MD/HD forecast consideration
  - SCE Charge Ready Transport program implementation
  - MD/HD forecast comparison
  - Expected changes from SCE program and CARB regulation
  - Estimated program and regulation impact
- Recommendations

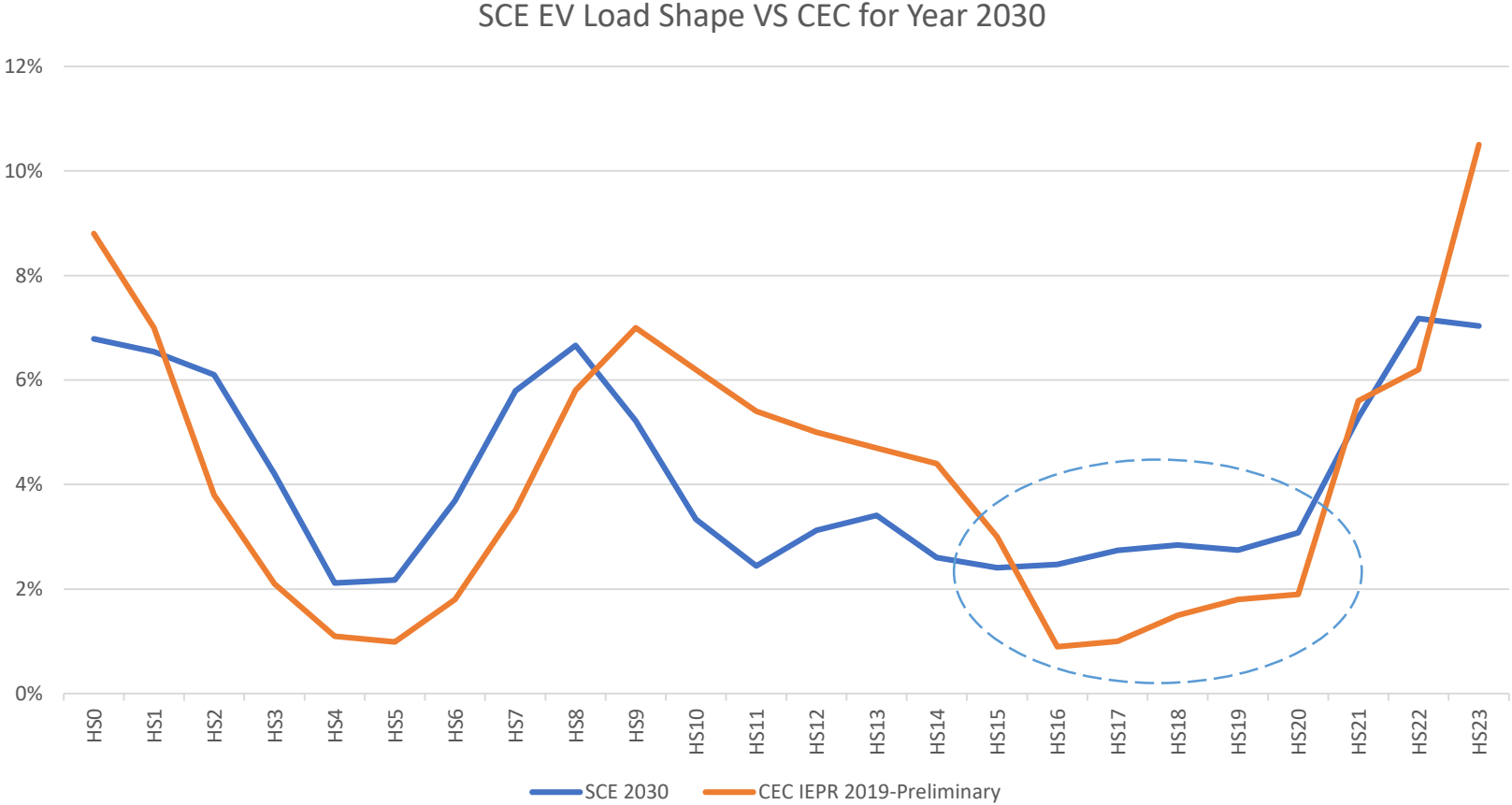
# Light Duty PEV Forecast scenarios for California

SCE found that in the transportation sector, approximately 7.5 million light-duty EVs are needed statewide by 2030 to meet California's GHG emission targets.



# EV Load Shape Comparison

How to account for EV charging load impact on the peak hours will matter for long-term peak demand forecast.



# Charge Ready Pilot Energy Usage

Figure 4.1 Workplace Average Usage per Hour in June 2019: 40 sites/739 ports

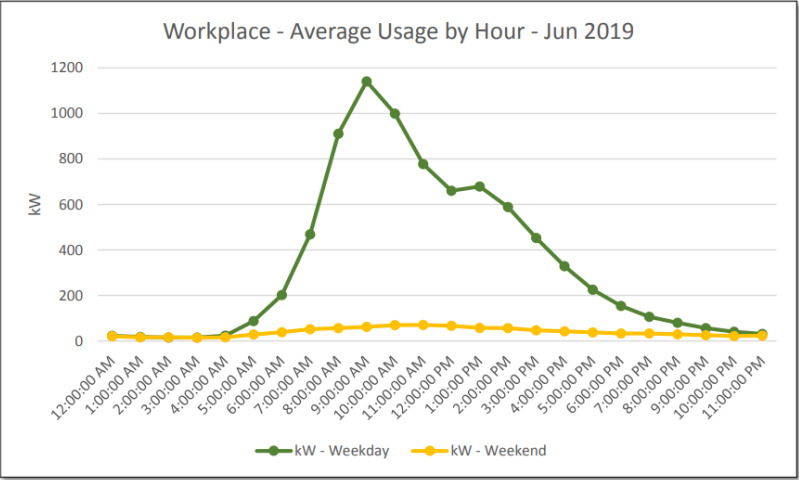


Figure 4.4 Multi-Unit Dwelling Usage per Hour in June 2019: 3 sites/35 ports

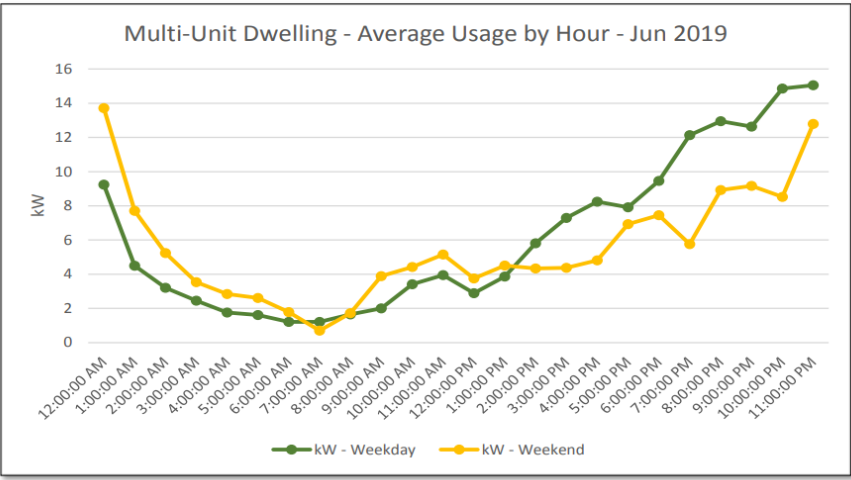
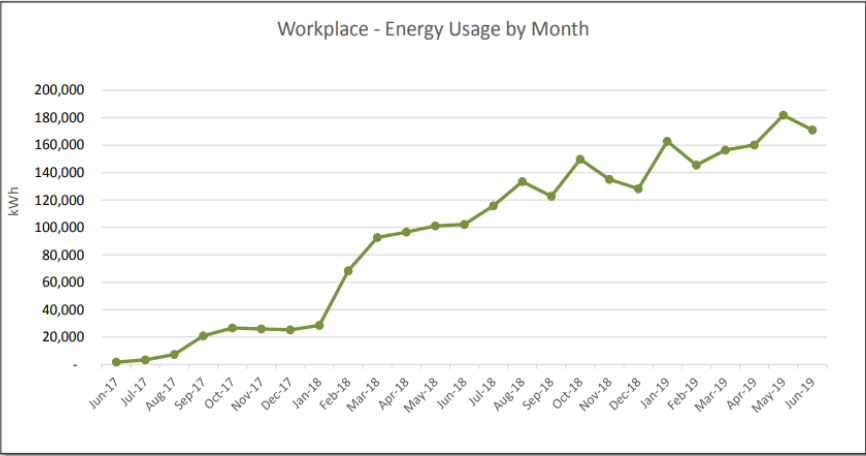


Figure 4.5 Workplace Energy Usage by Month



## Charge Ready 2: Speed, Scope, Scale



Proposal to deploy **32,000 level 2 ports at 3,200 workplaces, apartments, destination centers** and fleets; Install an additional **200 DC Fast Chargers**.



Provide **rebate for above-code installations at new apartments**; Up to \$3,500 rebate per port to exceed CalGREEN building code and install a minimum of 16,000 ports at new construction multi-unit dwellings.



Offer apartments and government customers a **turnkey solution**: SCE can install, own, and maintain up to 4,230 new charging ports.



**Multi-prong marketing strategy:**

- Mass media advertising of EVs and benefits;
- Targeted marketing on EV experience;
- Support businesses to convert fleets to electric;
- Program-specific marketing.



# SCE's Charge Ready Transport program supports non-LDV sectors including medium and heavy-duty electric vehicles

- Medium-Duty Vehicles
- Heavy-Duty Vehicles
- Forklifts
- School Buses
- Transit Buses
- Port Cargo Trucks
- Airport Ground Support Equipment
- Transportation Refrigeration Units (TRU)
- Truck Stop Electrification (TSE)



# Charge Ready Transport Funding & Program Duration

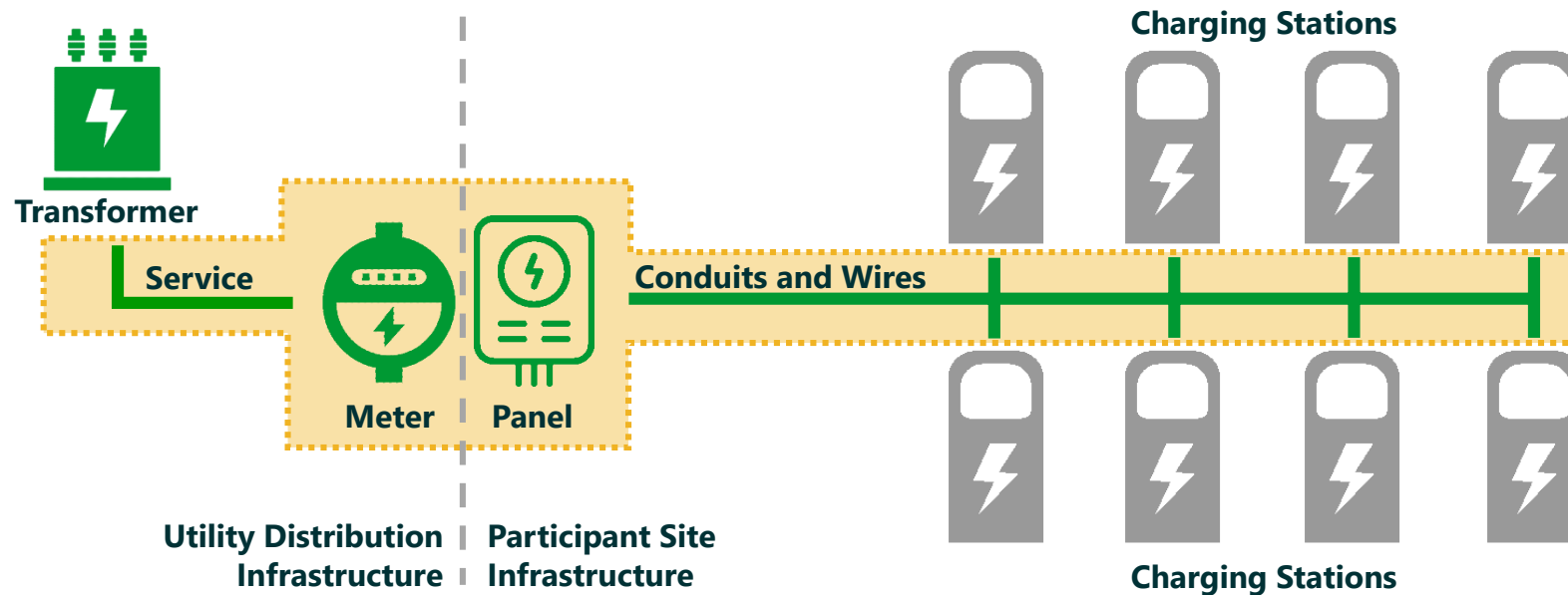
- **Five-year** program
- Approved total program budget of **\$356.4M**
- Program goals: minimum **870 sites** with **8,490 electric vehicles** procured or converted
- **Covers cost of all infrastructure** needed up to charging station

Percentage	Budget Categories
15% minimum	Transit Agencies
25% minimum	Ports and Warehouses
40% minimum	Disadvantaged Communities (DAC) or Transit Agency sites not in DACs
10% maximum	Forklifts
10% maximum	Program Management



# SCE installs “make-ready” electrical infrastructure at no cost

- Standalone charging station model



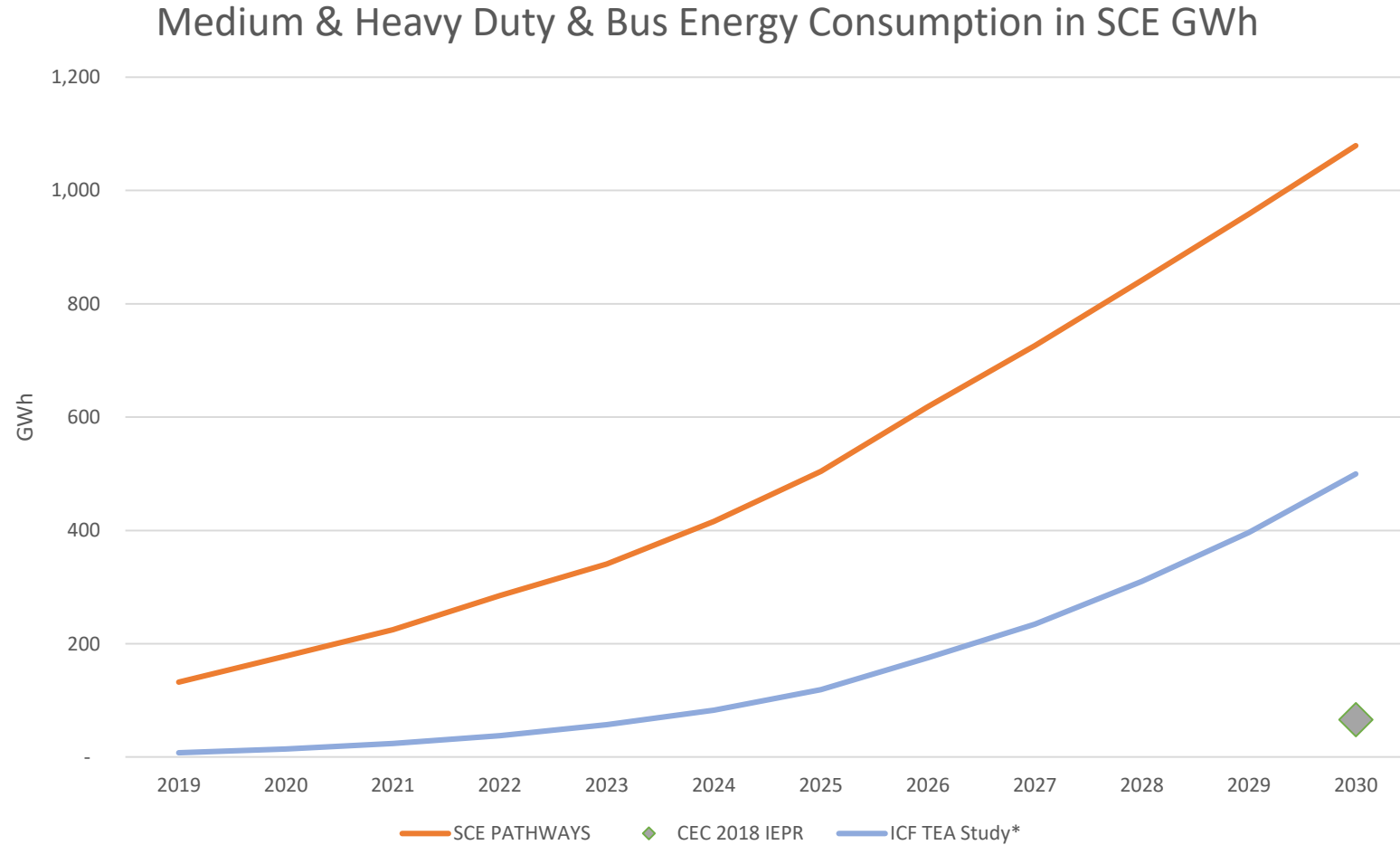
Program covers costs associated with service drop, meter, panel, and circuit dedicated to EV charging. Make-ready ends at interconnection point with customer charging equipment providing AC service.

## SCE's New EV Rates

- **Available now**
- **Zero demand charges until 2024**
- Monthly peak demand can be reduced by building or other “general service” demand at the same site
- **Encouraging off-peak charging:** Higher energy rates on-peak (4-9 PM)
- EV rates available for separately-metered charging installation

Calendar Year	2019-2023	2024	2025	2026	2027	2028	2029+
% of Final Demand Charges	0%	16.67%	33.33%	50%	66.7%	83.33%	100%

# Medium and Heavy-Duty Vehicles and Bus Forecast scenarios for SCE



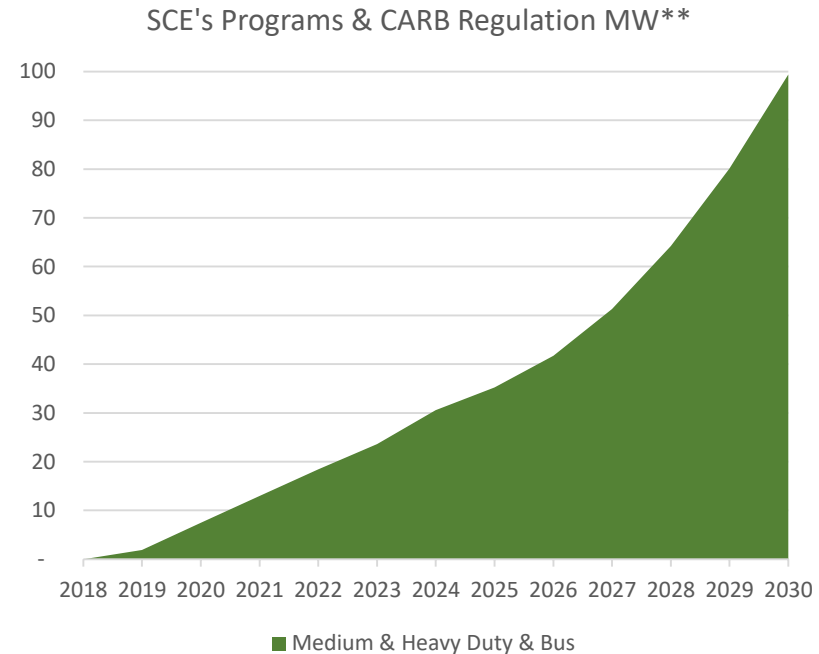
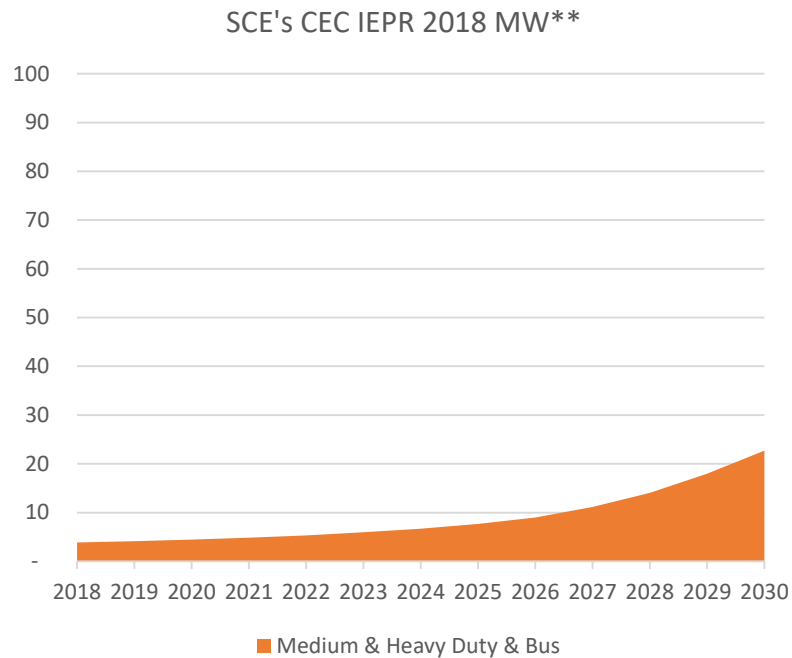
\* Estimated from Statewide forecast, ICF International, California Transportation Electrification Assessment Phase 1: Final Report, p.15-16 (Sept. 2014), available at [http://www.caletc.com/wp-content/uploads/2016/08/CalETC\\_TEA\\_Phase\\_1-FINAL\\_Updated\\_092014.pdf](http://www.caletc.com/wp-content/uploads/2016/08/CalETC_TEA_Phase_1-FINAL_Updated_092014.pdf)

# Infrastructure Development for MD/HD/Buses and Other Non-LDV Sectors

- SCE Charge Transport and Transit Bus programs with more than \$350 million investment for more than 9,000 ports
- Approved MD/HD policies and anticipated CARB regulations bring additional electrification through non-LDV sectors
  - Approved MD/HD Policies:
    - SB 350 Utility Infrastructure Programs (2018-2019)
    - ~18,000-21,000 MDHD EVs over the next 5 years
    - CARB Innovative Clean Transit Rule (2018)
    - ~12,000 Zero-Emission (ZE) buses by 2040
    - CARB ZE Airport Shuttle Rule (2019)
    - ~1,000 ZE shuttles by 2035
    - San Pedro Bay Ports Clean Air Action Plan (2017)
  - In Process or Forthcoming (from CARB):
    - ZE Truck Regulations:
      - Advanced Clean Trucks (2019-2020), ~80,000 ZE Trucks on the road by 2030, ZE Truck Fleets (2022), ZE Drayage Trucks (2022), ZE TRUS (2020)
    - ZE Off-road Equipment Regulations:
      - Airport GSE (2020), ZE Forklifts (2021), ZE Cargo Equipment (2022)

# Medium and Heavy-Duty Vehicles and Bus Programs & Policy Impacts

SCE's Programs & CARB Regulation scenario reflects SCE's charge ready transport program (8,490 vehicles by 2024) and CARB's Innovative Clean Transit and Advanced Clean Trucks (ACT) regulation starting 2024.\*



\* By 2030, zero-emission truck/chassis sales would need to be 50% of class 4 – 8 straight trucks sales and 15% of all other truck sales.

\*\* Maximum Charging capacity to grid and it's based on rough estimation.

# Recommendations

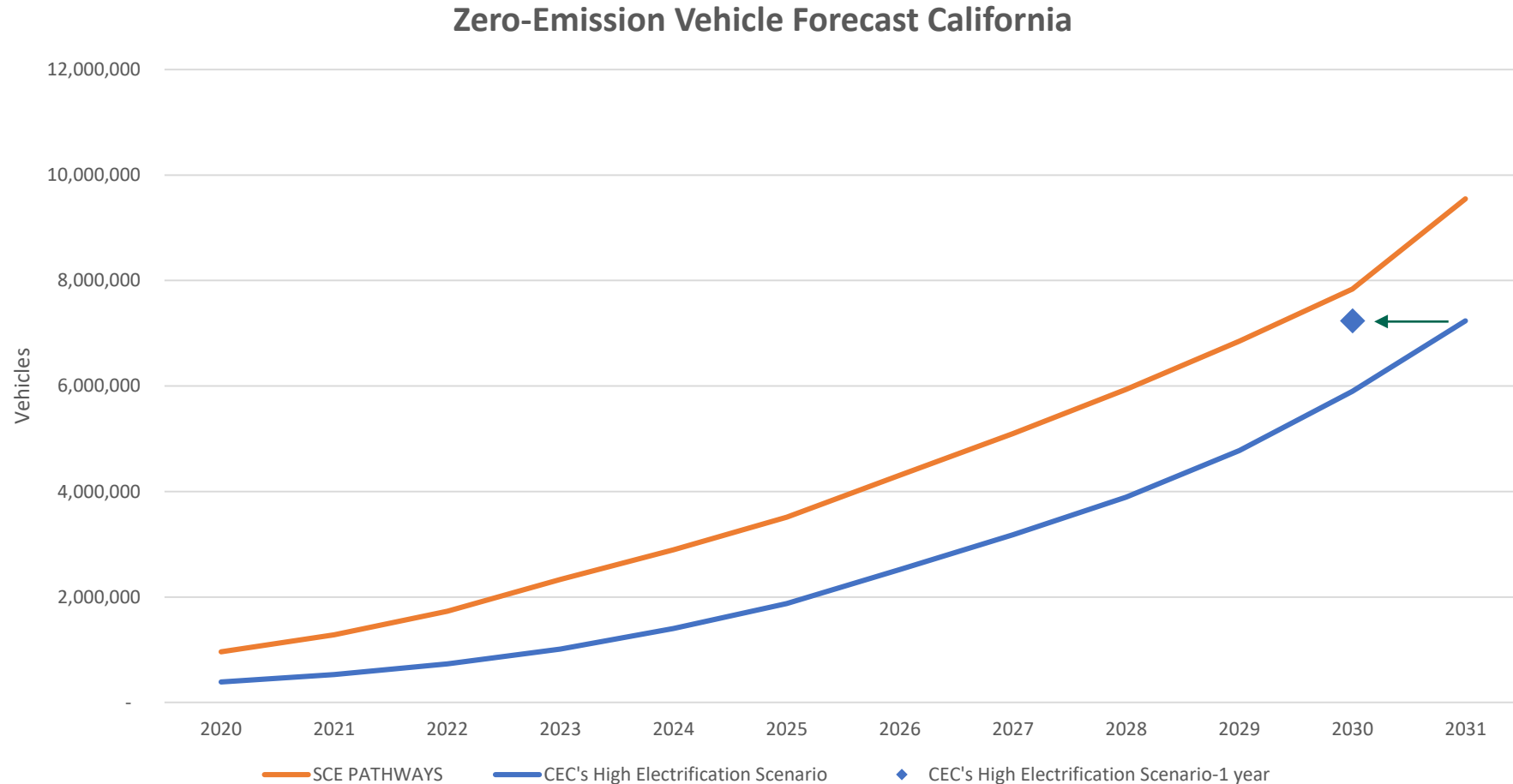
- Create a technical working group to establish the linkage between infrastructure development and TE load forecast
- Build consideration of additional factors for the transportation energy demand forecast
  - local- and regional-level incentive programs across the State
  - Funded and pending approval utility programs impact
  - Approved/expected policy and regulation changes
- Develop scenarios that meet the state's policy goals (e.g. the long-term decarbonization goals) to better support CPUC's major proceedings including IRP modeling

Back up

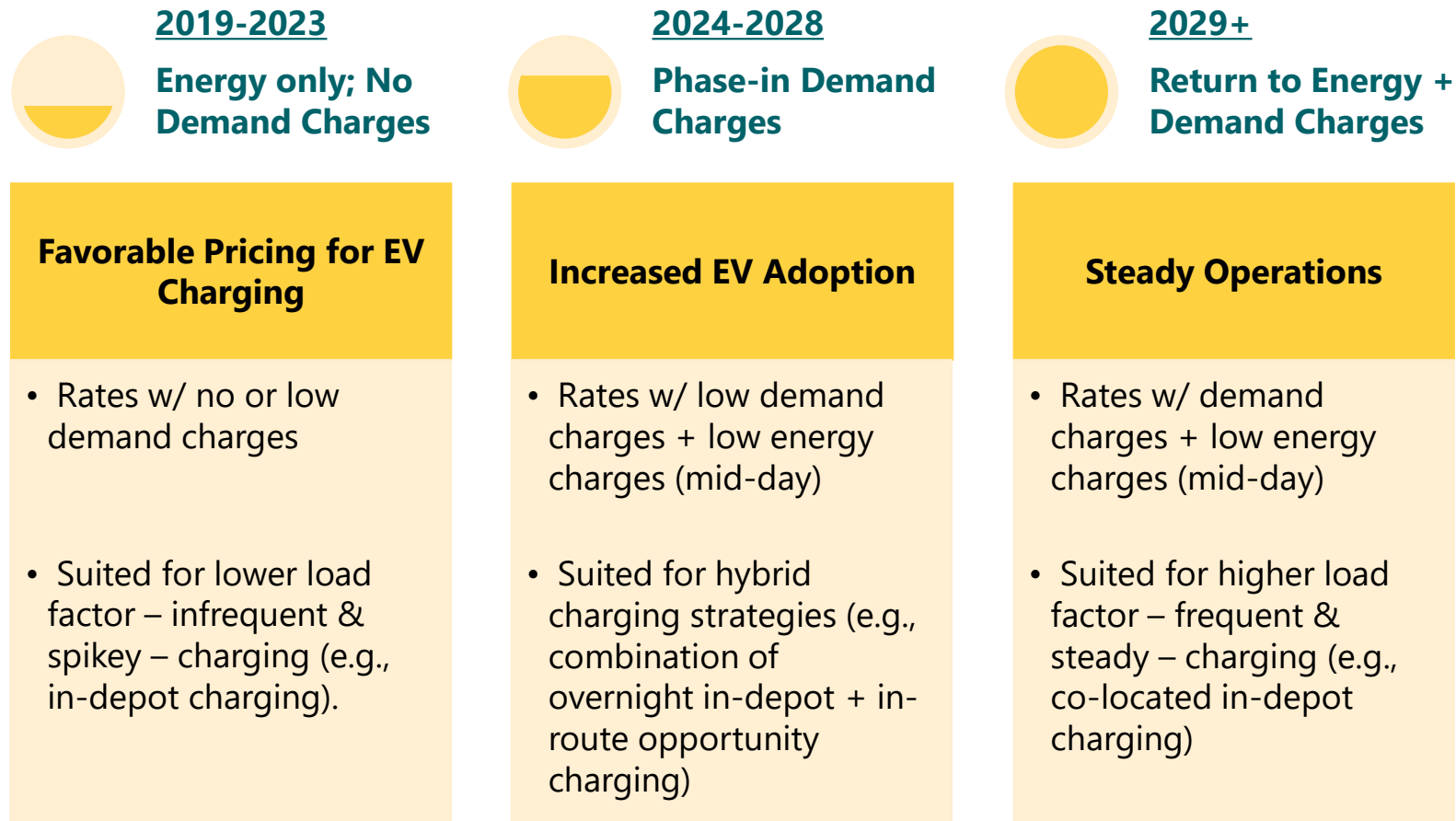


# Light Duty ZEV Forecast scenarios for California

The "High Electrification Scenario" from CEC's Deep Decarbonization Study projects more than 7.2 million ZEVs by 2031 which is close to the ZEV requirement SCE's Pathways model identified by 2030.



# New EV Rates level fueling costs with phased-in demand charges



\* TOU-EV-7, TOU-EV-8, and TOU-EV-9 rates are applicable to commercial customers whose monthly max demand is 20 kW or less, 21 kW to 500 kW, and above 500 kW, respectively. Rates are available starting March 1, 2019.

# Grid Impact from Future Medium/Heavy Duty Electric Vehicles

- **MD / HD is expected to have significant demand impact on SCE's distribution system**
  - SCE's initial Charge Transport Applications range from <.25MW – 9MW anticipated demand
  - These sites may have significant impacts on SCE's distribution grid
- **Preliminary data from SCE Charge Transport Applications indicates potential high concentration of demand growth in local areas**

