

Emerging Issues in Transportation Electrification Forecast: SCE's Perspectives

Demand and DER Forecasting Group, SCE
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SOUTHERN CALIFORNIA EDISON
 Energy for What's AheadSM

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-sited 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

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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 2030 and an 80 percent reduction by 2050 (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 2032. 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.

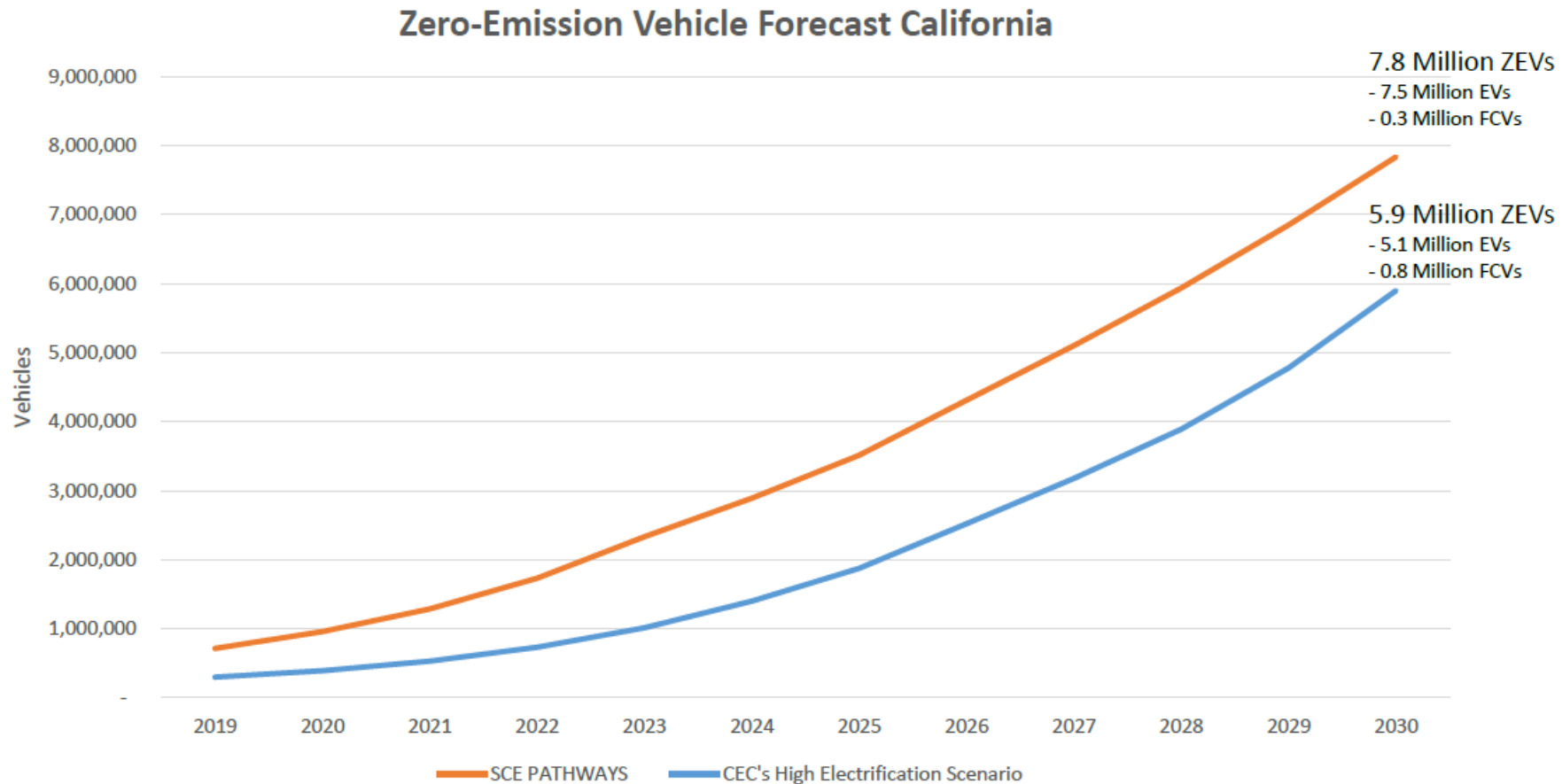
By 2030, it calls for:

- 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)

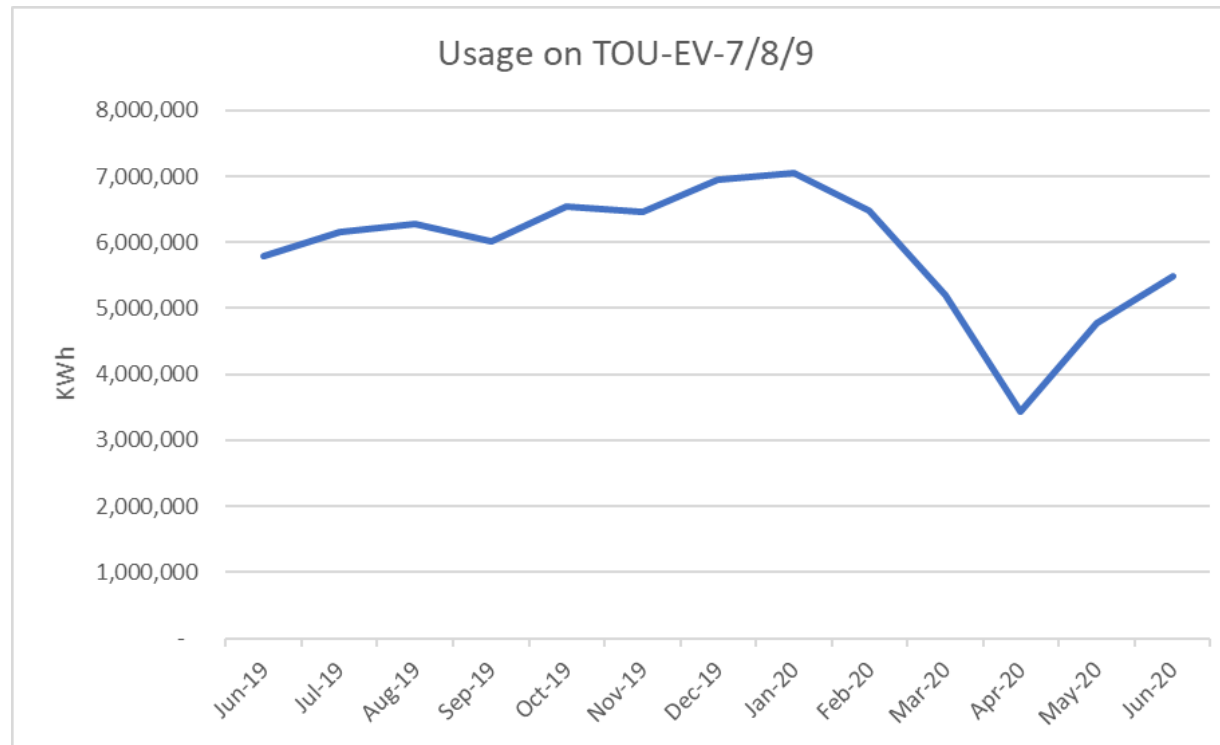
Light Duty ZEV Forecast scenarios for California

SCE found that in the transportation sector, approximately 7.8 million light-duty ZEVs are needed statewide by 2030 to meet California's GHG emission targets.



COVID-19 Impact on EV Charging Load

EV charging load data from non-residential customers shows more a V-shape recovery.



SCE Charge Ready Pilot Energy Usages

Figure 4.1 Workplace Average Usage per Hour in March 2020: 42 sites/767 ports

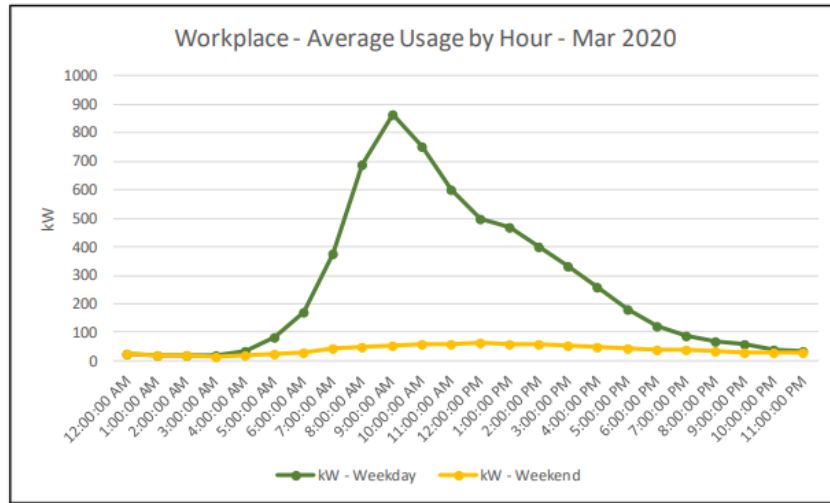


Figure 4.4 Multi-Unit Dwelling Usage per Hour in March 2020: 3 sites/35 ports

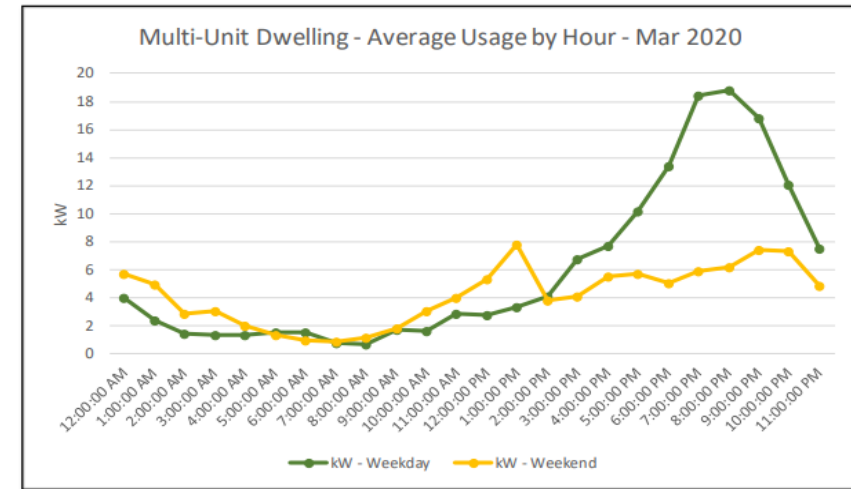


Figure 4.3 Fleet Usage per Hour in March 2020: 8 sites/118 ports

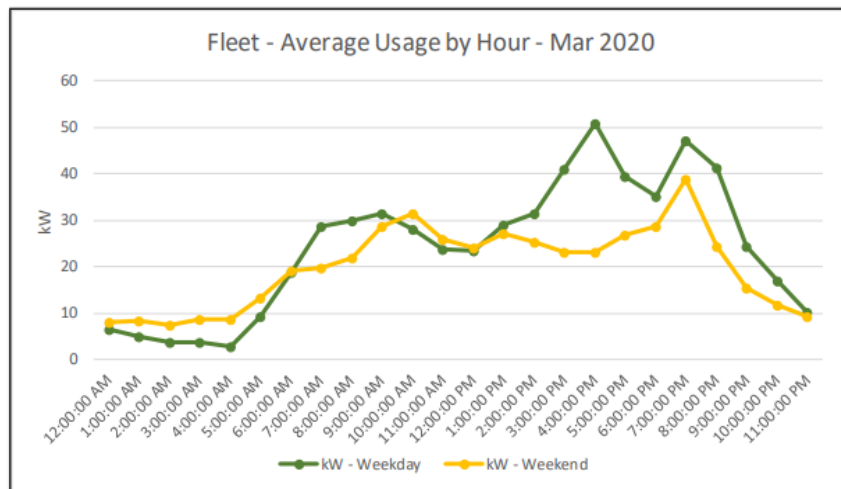
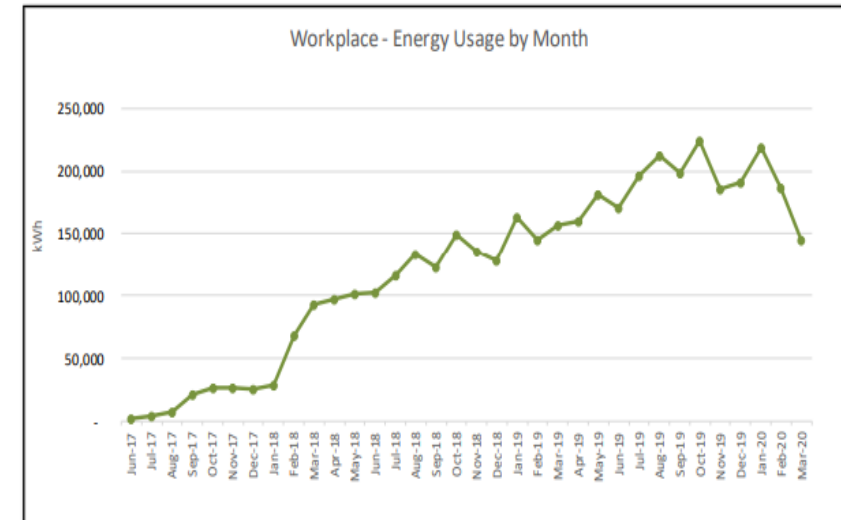
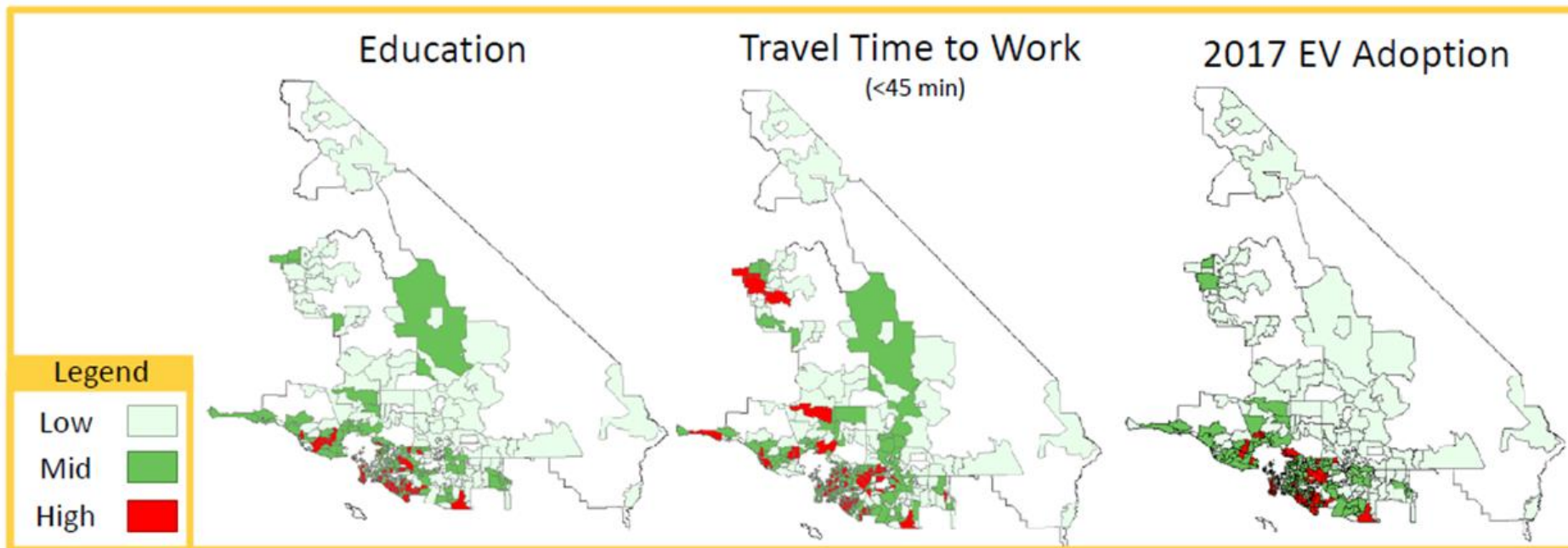


Figure 4.5 Workplace Energy Usage by Month



Granular Forecasting at Circuit Level

- Identifying key indicators of EV adoption will help to have a better understanding about the potential EV charging load by location.
 - Utilizing demographic and socioeconomic data and historical DER adoption (such as PV) and state and utility rebate and travel pattern data can help in improving the forecasting models.



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)



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**

