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Transportation Energy Demand Forecast: 2020 IEPR Update

Presenters: Mark Palmere, Bob McBride, Heidi Javanbakht

Date: August 26, 2020

Transportation Forecast Updates for 2020 IEPR Update

- American Community Survey data
- Incentives
- CAFE standards
- Baseline vehicle population
- Retirement rates for large trucks and buses
- Consider disruptions due to COVID-19
  - Economic and demographic forecasts
  - Fuel prices

Light-Duty Vehicles

Presenter: Mark Palmere

The 2020 IEPR Update Reflects Changes in Policy and the Economy

- **Base year vehicle population.** The LDV forecast is using DMV's 2019 vehicle population, which was finalized earlier in 2020.
- **Economic and Demographic forecasts.** These consist of population (number of households), income (real earnings per household), and Gross State Product.
- **Incentives.** In late 2019, CARB reduced the state rebate (CVRP) from $2,500 to $2,000 for BEVs, and from $1,500 to $1,000 for PHEVs. Concurrently, however, we are adding an IOU incentive funded by LCFS.
- **2018 American Community Survey data.** Base year inputs from ACS, such as household makeup distribution and vehicles per household, have been updated.
- **Corporate Average Fuel Economy.** The federal rollback of the CAFE standards is reflected in our low case. However, we continue to monitor the California Air Resources Board's efforts to restore the standards within CA.
- **Fuel prices** will also be updated.

COVID-19 Disruptions Will Be Considered

- For the LDV forecast this will be reflected in the following ways:
  - Updated Economic and Demographic forecasts, specifically Households, Income, and Gross State Product. This affects total vehicle population.
  - DMV registration data through June 2020 are being used to adjust forecast based on actual sales in the first half of 2020, given the possibility of disruption to the market. This will show us potential changes in vehicle population makeup.
  - We will also be tracking any long-term effect on Vehicle Miles Traveled.

ZEV Scenarios See Limited Change

Demand Case	Low	Mid	High	Aggressive	Bookend
Preferences					
Consumers' ZEV Preference	Constant at 2017 Level	Increase With ZEV Market Growth	Increase With ZEV Market Growth	Increase With ZEV Market Growth	Increase With ZEV Market Growth
Incentives					
Federal Tax Credit	Decreasing, eliminated after 2022	Decreasing	Decreasing	Decreasing	Decreasing
State Rebate*	BEV: $2,000 PHEV: $1,000 FCEV: $4,500 To 2025	BEV: $2,000 PHEV: $1,000 FCEV: $4,500 To 2025	BEV: $2,000 FCEV: $4,500 To 2030 PHEV: $1,000 To 2025	BEV: $2,000 PHEV: $1,000 FCEV: $4,500 To 2030	BEV: $2,000 PHEV: $1,000 FCEV: $4,500 To 2030
HOV Lane Access	To 2025	To 2025	To 2025	To 2030	To 2030
Attributes in 2030					
Classes Available (out of 15 total classes)**	BEV: 11 PHEV: 14 FCEV: 5	BEV: 12 PHEV: 14 FCEV: 5	BEV: 13 PHEV: 14 FCEV: 6	BEV: 13 PHEV: 14 FCEV: 6	BEV: 15 PHEV: 14 FCEV: 6
Vehicle/Battery Price	PEVs: Prices based on battery price declining to ~$120/kWh FCEVs: $38,000	PEVs: Prices based on battery price declining to ~$100/kWh FCEVs: $25,000	PEVs: Prices based on battery price declining to ~$80/kWh FCEVs: $25,000	PEVs: Prices based on battery price declining to ~$70/kWh FCEVs: $25,000	PEVs: Prices based on battery price declining to ~$70/kWh FCEVs: $25,000
Max Range for a Midsize Vehicle (Mi)	PEVs: ~333 FCEVs: ~365	PEVs: ~341 FCEVs: ~365	PEVs: ~341 FCEVs: ~461	PEVs: ~341 FCEVs: ~461	PEVs: ~341 FCEVs: ~461
Refuel Time (minutes)	PEVs: 15-21	PEVs: 15-21	PEVs: 10-16	PEVs: 10-16	PEVs: 10-16
Time to Station	PEVs: same as gasoline by 2022	PEVs: same as gasoline by 2022	PEVs: same as gasoline by 2022	PEVs: same as gasoline by 2022	PEVs: same as gasoline by 2022

*Energy Commission staff intends to add IOU rebates once amounts are finalized.
**Energy Commission staff is reviewing manufacturers' new ZEV model announcements and may modify available class forecast based on this study.

Medium and Heavy-Duty Trucks and Buses

Presenter: Bob McBride

Buses in 2020 IEPR Update

- Transit buses using 2018 National Transit Database
- Innovative Clean Transit scenarios
- School Bus Replacement Program
- Zero Emission Airport Shuttle Regulation (Air Resources Board)

COVID-19 Disruptions Will Be Considered for MD-HD Vehicles

- For the MD-HD forecast this will be reflected in updated economic growth forecasts, specifically Gross State Product (GSP)
  - GSP drives changes in personal travel, goods movement, other service-related truck movement, and rail movement, resulting in changes to vehicle miles travelled for these sectors
  - Recent Moody's Analytics data reflects COVID-19 impacts

Truck Choice and Freight Model Updates

- Vehicle retirement now follows EMFAC2017 2000-2031
- MD/HD truck incentive levels based on June 2020 HVIP records of stacked incentives
- COVID-19 effects will be captured in economic growth forecast
- Comparison of results to Advanced Clean Trucks Regulation ZEV/NZEV percentage schedule with weight class modifiers
- SCAQMD Ozone Attainment Scenario

2020 MD-HD Vehicle Scenarios

INPUTS	Low	Mid	High
CALIFORNIA REGULATIONS			
CARB Regulations	Innovative Clean Transit Rule, Zero-emission Airport Shuttle Reg., Comparison to Advanced Clean Truck schedule		
SCAQMD Truck & Bus Rules	Implicit for refuse trucks and urban transit buses		
INCENTIVES			
HVIP (through 2021)	Current HVIP record of stacked incentives, in terms of percentage of vehicle incremental cost*	Current HVIP record of stacked incentives, in terms of percentage of vehicle incremental cost*	Current HVIP record of stacked incentives, in terms of percentage of vehicle incremental cost*
HVIP (from 2022 on)	No Incentives	80% of the current HVIP voucher percentage of incremental cost*	The full current HVIP voucher percentage of incremental cost*
Fuel Prices			
Hydrogen Price	NREL Low Case	TBD	Based on "right-sized dedicated fleet" fueling station
Electricity Rates	Commercial Rates, High	Commercial Rates, Mid	Commercial Rates, Low
ATTRIBUTES			
Vehicle / Battery Price (by 2030)	BEV prices based on battery price declining to **~$120/kWh**	BEV prices based on battery price declining to **~$100/kWh**	BEV prices based on battery price declining to **~$80/kWh**
MPG (conventional / alternative fuels) **	High / Low	Mid / Mid	Low / High
Range (2030)	Constrains percentage of truck class based on length of typical trips	Constrains percentage of truck class based on length of typical trips	Constrains percentage of truck class based on length of typical trips

*** -- incremental cost is the difference between the purchased truck and the least expensive truck in the class**

**** -- More than one scenario has the same MPG for some fuels, here we state the pattern for classes and fuels with three distinct cases**

Truck Retirement Rate

- New trucks can only come from two places
  - Replacing retiring trucks
  - Additional trucks to serve economic growth
- For The 2020 IEPR Update, we will apply EMFAC retirement rates to our truck stock from 2000 to 2031, to capture regulatory requirements
- We may curtail some used truck imports recorded in EMFAC2017, for the mid and high cases

Advanced Clean Trucks Rule

- In June 2020, CARB approved the Advanced Clean Trucks (ACT) Rule
- First year of ZEV/NZEV requirements is 2024, and by 2035, these zero-emission truck/chassis sales will be required
  - Class 2b – 3 …….. 55%
  - Class 4 – 8 straight truck ……. 75%
  - Truck tractor …….. 40%
- The Truck Choice model for 2020 IEPR Update
  - does not include NZEV, a compliance option under ACT
  - includes ZEV in four truck classes of eight, due to a lack of truck attributes or HVIP commercialized trucks
- Due to these reasons, and the as-yet unknown compliance choices of fleets
  - ZEV adoption based on truck choice may not achieve ACT target for each class
  - However, other classes may exceed the ACT target
- Results will be compared with ACT regulatory targets

Exploratory Scenarios

Presenter: Heidi Javanbakht

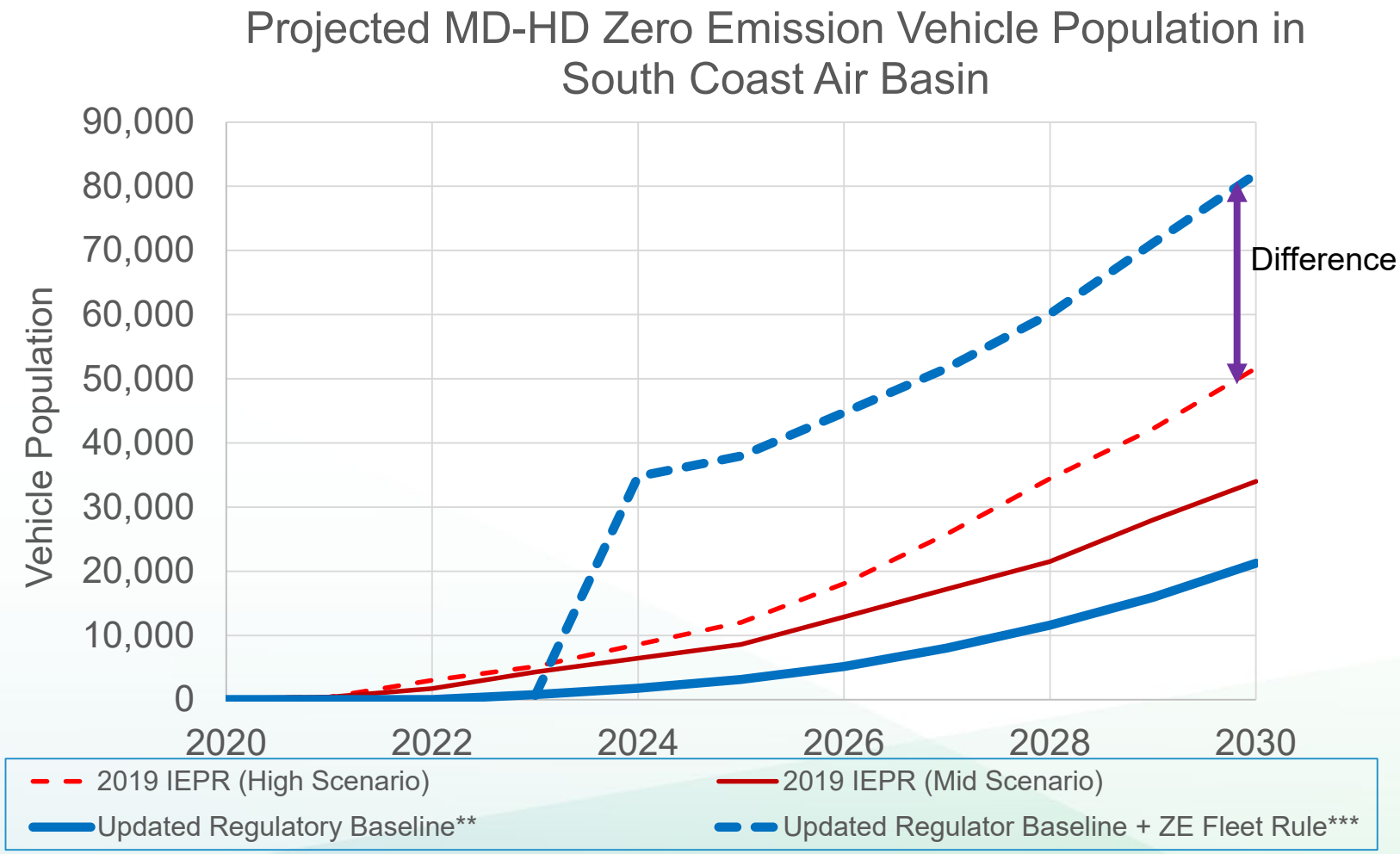
Exploratory Scenarios

- What-if scenarios, developed in addition to the low, mid, and high case forecasts
- Intended to estimate impacts of proposed programs or policies or explore other relevant questions that are outside the scope of the adopted forecast

- 2020 IEPR Update Exploratory Scenarios
  - South Coast Air Quality Management District MD-HD ZEV adoption levels needed to meet Federal ozone standards
  - Telecommuting post-COVID
  - Best and worst case PEV charging load shapes

South Coast AQMD MD-HD Scenario

- To meet Federal ozone standards in 2031, a 55% reduction in NOx emissions is required
  - Transportation accounts for 80% of NOx emissions
- Staff are collaborating with SCAQMD and CARB to develop a scenario for MD-HD adoption where SCAQMD meets ozone standards in 2031



Source: SCAQMD Presentation at the July 22, 2020, Demand Analysis Working Group

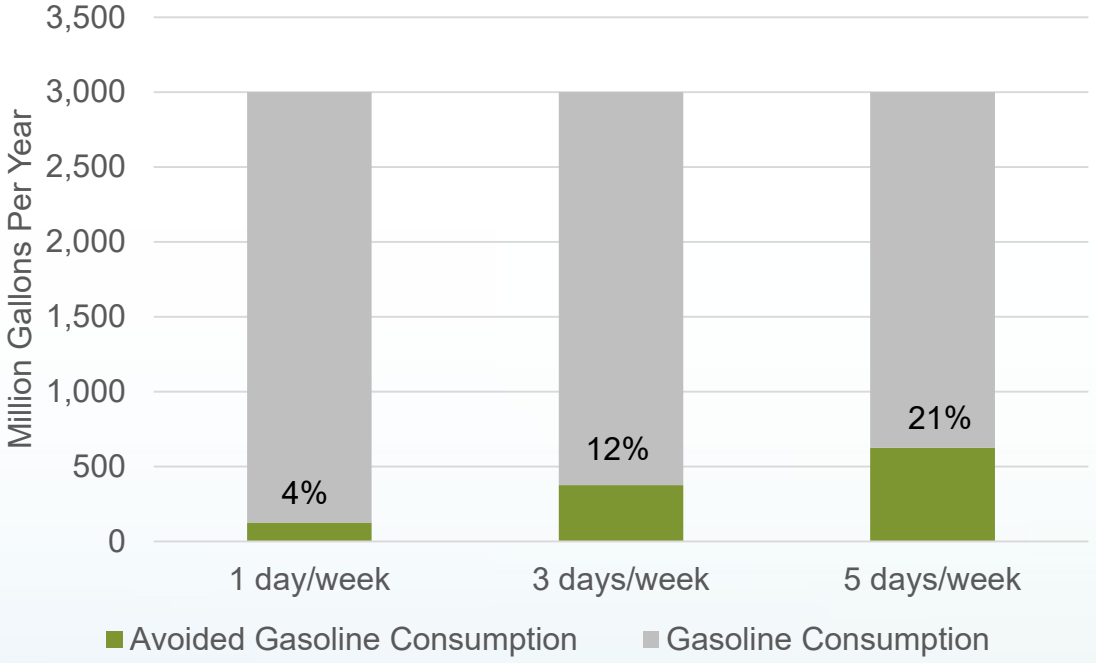
Telecommuting Scenario

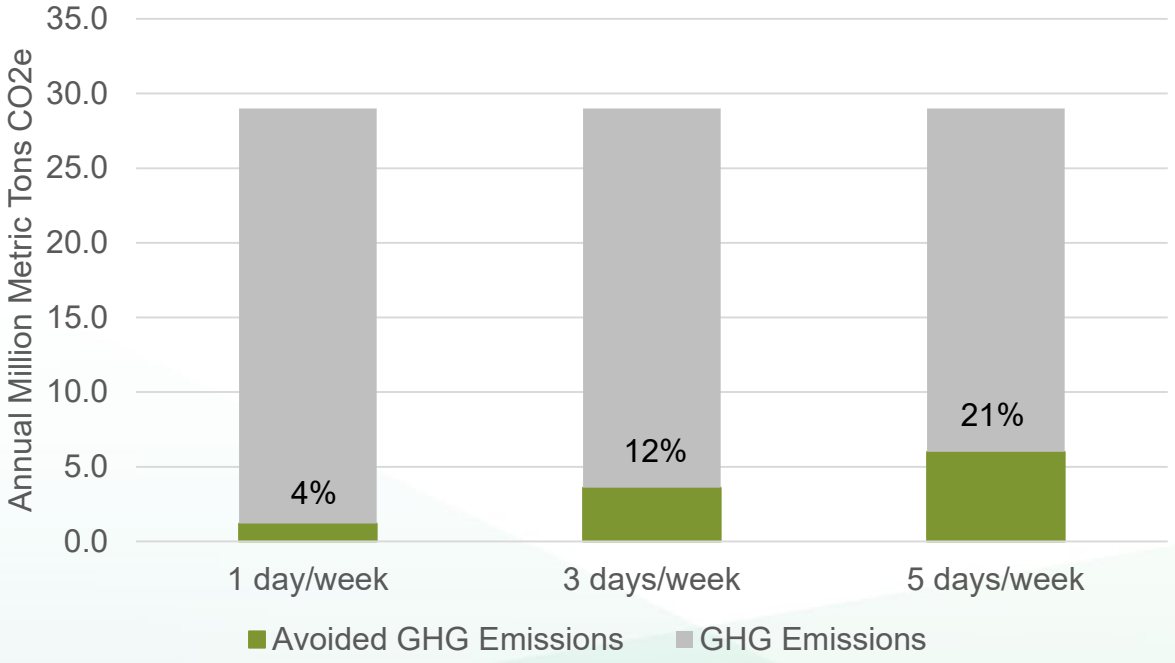
- Estimates gasoline and GHG emission savings if increased levels of telecommuting continue after COVID-19
- Data Sources
  - Workforce: US Census
  - Commuting: US Census and CA Statewide Travel Demand Model
  - Emission rates: CARB's EMFAC 2017 database
  - Fuel efficiency: CEC staff analysis of DMV data
- Assumptions
  - Limited to two sectors that account for 22% of CA's workforce, and 41% of CA's work-at-home force
    - "Information and finance and insurance, and real estate and rental and leasing"
    - "Professional, scientific, and management, and administrative and waste management services"
  - Only single drivers provide savings (excludes those who take public transit or carpool)

Telecommuting Scenario

Out of 13.7 million single commuters, we assumed 2.8 million single commuters (from two sectors) were eligible to telecommute

Preliminary estimated reductions in gasoline consumption and GHG emissions from telecommuting





Source: van der Werf presentation at the July 22, 2020, Demand Analysis Working Group Meeting

EV Charging Load Shape Scenarios

- Stakeholders and Commissioners were interested in examining grid impacts of worst and best case EV charging scenarios
- These scenarios were developed outside of the EV Infrastructure Load Model, as they ignore the effect of time-of-use rates
- Best case scenario explores the impact on the grid if EV charging was managed to minimize GHG emissions
- Worst case scenarios explore the impact on the grid if all EV charging occurs during the peak hours
  - Preliminary examples are shown using the 2019 IEPR results, and will be updated with the 2020 IEPR Update results when available

EV Charging Scenario – Best Case

EV charging is managed to reduce GHG emissions, for vehicle categories assumed to have the flexibility to charge mid-day

Mid-Case 2030 Average Grid GHG Emission Intensity Factors (Statewide)

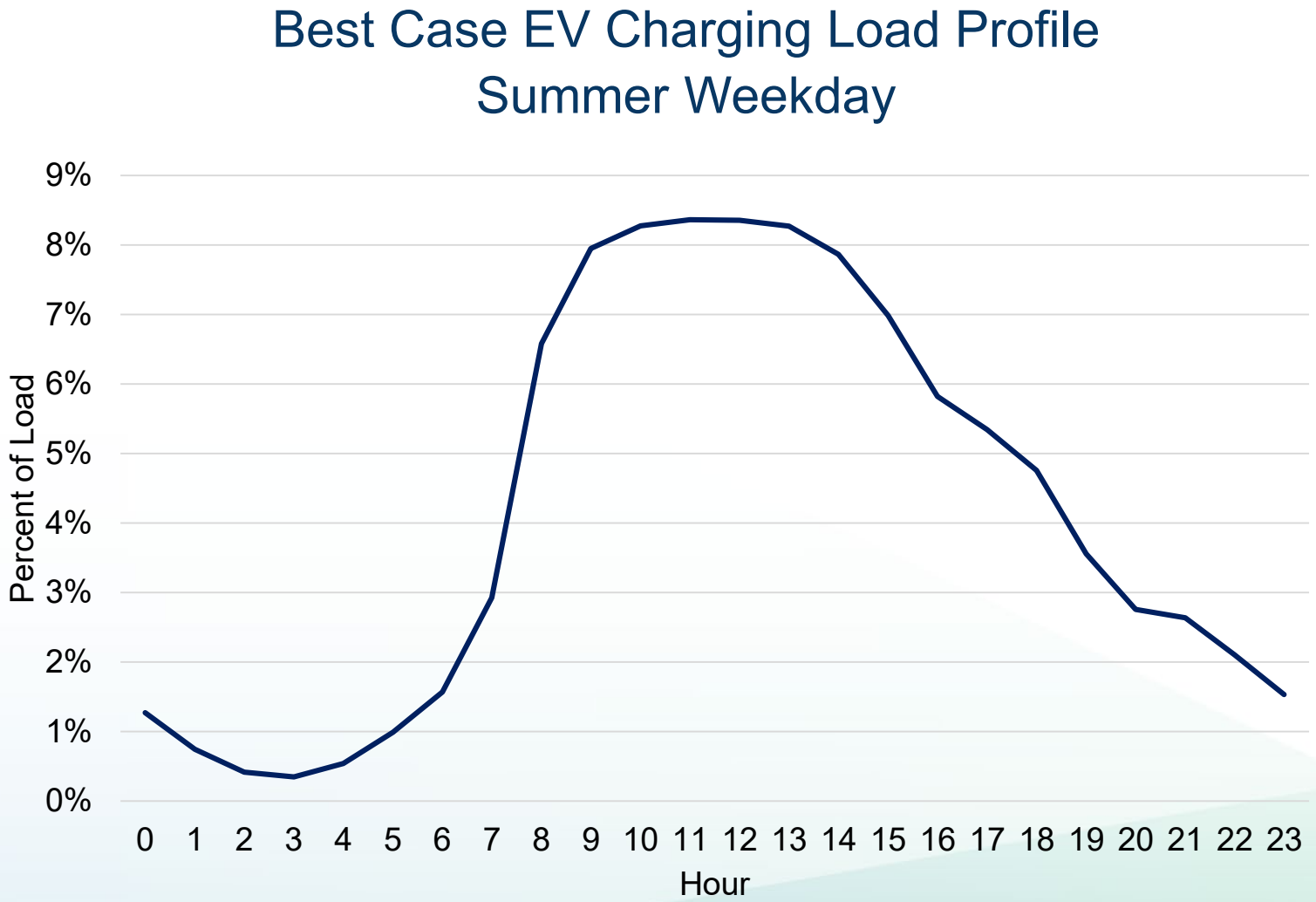
HOURS

Month

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	0.186	0.195	0.199	0.200	0.197	0.186	0.169	0.162	0.127	0.079	0.064	0.060	0.059	0.064	0.073	0.135	0.166	0.145	0.141	0.146	0.153	0.162	0.174	0.181
2	0.159	0.166	0.172	0.172	0.168	0.156	0.142	0.136	0.080	0.050	0.043	0.041	0.041	0.042	0.046	0.070	0.140	0.130	0.119	0.122	0.129	0.136	0.147	0.153
3	0.138	0.145	0.148	0.146	0.139	0.124	0.117	0.120	0.073	0.045	0.040	0.039	0.039	0.039	0.040	0.043	0.080	0.110	0.097	0.101	0.106	0.117	0.126	0.133
4	0.104	0.108	0.110	0.108	0.099	0.092	0.089	0.083	0.047	0.039	0.036	0.036	0.036	0.036	0.037	0.038	0.047	0.074	0.068	0.081	0.080	0.082	0.090	0.098
5	0.088	0.093	0.095	0.093	0.088	0.084	0.081	0.067	0.042	0.037	0.036	0.036	0.036	0.036	0.035	0.038	0.045	0.055	0.058	0.084	0.085	0.076	0.077	0.084
6	0.094	0.101	0.105	0.107	0.106	0.101	0.090	0.064	0.045	0.039	0.038	0.037	0.037	0.037	0.038	0.041	0.046	0.057	0.065	0.087	0.101	0.088	0.088	0.095
7	0.161	0.168	0.173	0.174	0.172	0.169	0.160	0.139	0.089	0.070	0.066	0.064	0.064	0.065	0.071	0.084	0.098	0.105	0.115	0.132	0.140	0.146	0.153	0.159
8	0.210	0.219	0.224	0.226	0.221	0.213	0.207	0.188	0.102	0.076	0.070	0.069	0.070	0.072	0.079	0.095	0.123	0.128	0.134	0.147	0.155	0.165	0.186	0.199
9	0.217	0.226	0.229	0.228	0.222	0.211	0.207	0.202	0.118	0.079	0.072	0.069	0.069	0.071	0.081	0.107	0.141	0.141	0.147	0.160	0.174	0.188	0.199	0.208
10	0.208	0.215	0.217	0.217	0.210	0.198	0.189	0.190	0.122	0.069	0.057	0.054	0.054	0.056	0.062	0.094	0.141	0.133	0.141	0.152	0.165	0.180	0.189	0.199
11	0.198	0.204	0.208	0.207	0.205	0.196	0.182	0.169	0.096	0.065	0.058	0.056	0.057	0.062	0.079	0.143	0.163	0.144	0.147	0.154	0.161	0.170	0.182	0.189
12	0.211	0.218	0.222	0.223	0.221	0.213	0.198	0.188	0.136	0.088	0.075	0.071	0.071	0.078	0.094	0.167	0.179	0.159	0.159	0.163	0.171	0.180	0.193	0.202

Source: CEC Staff

EV Charging Scenario – Best Case (cont.)

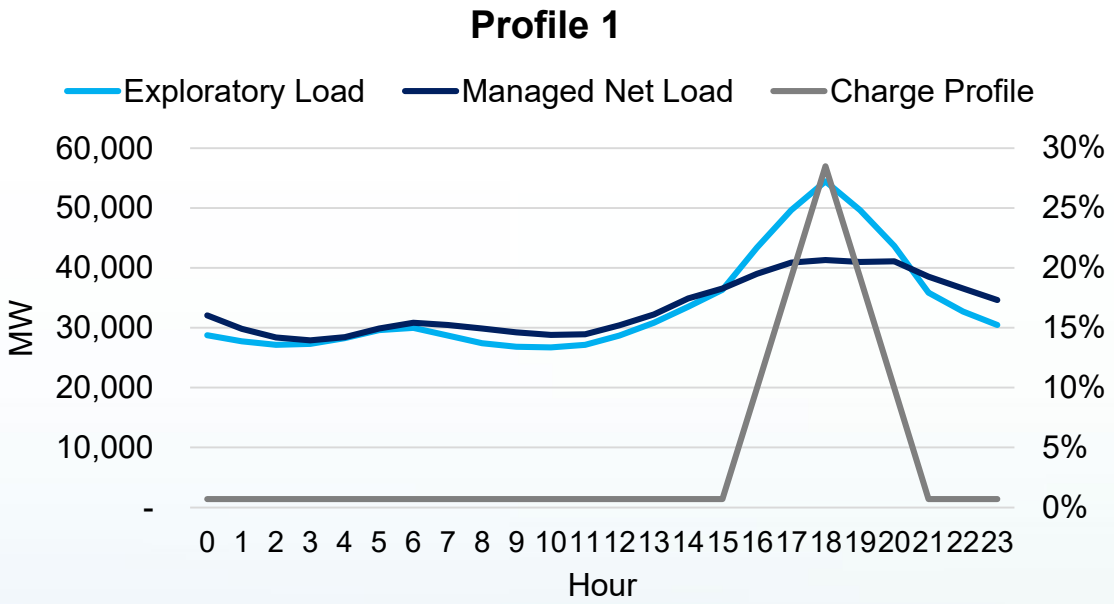


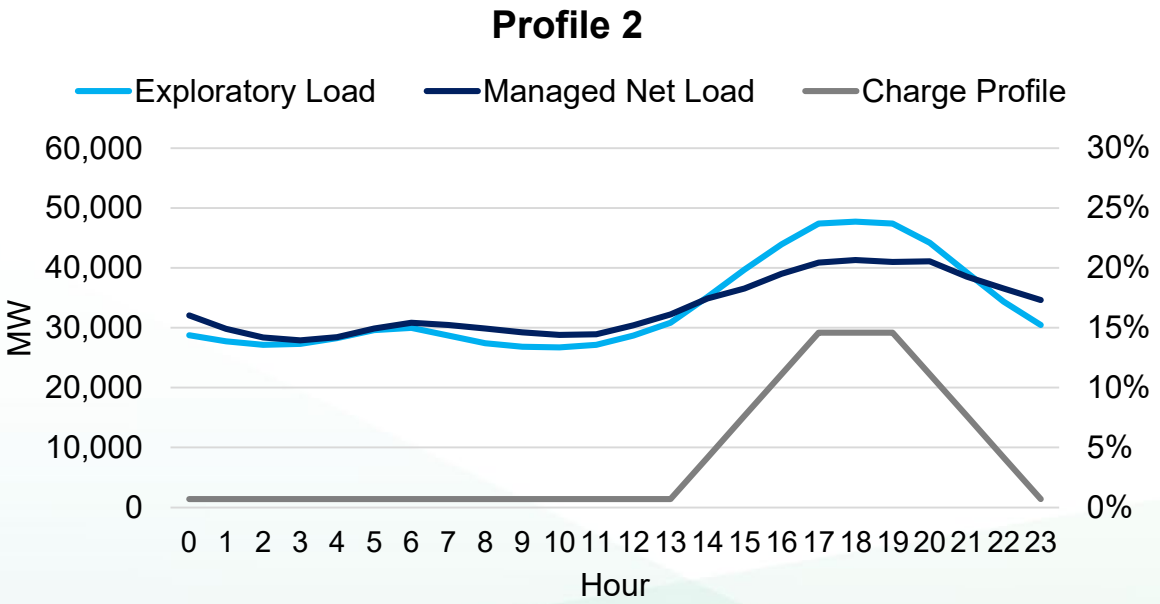
Source: CEC Staff

EV Charging Scenario – Worst Case(s)

All EVs charge during the peak demand hours

Preliminary Analysis of Summer Weekday Exploratory EV Charging Profiles added to Forecasted CAISO Summer Weekday Load in 2030





Source: 2019 IEPR CED Hourly Demand Forecast High-Low Scenario for 2030 and CEC Staff

Thank You!