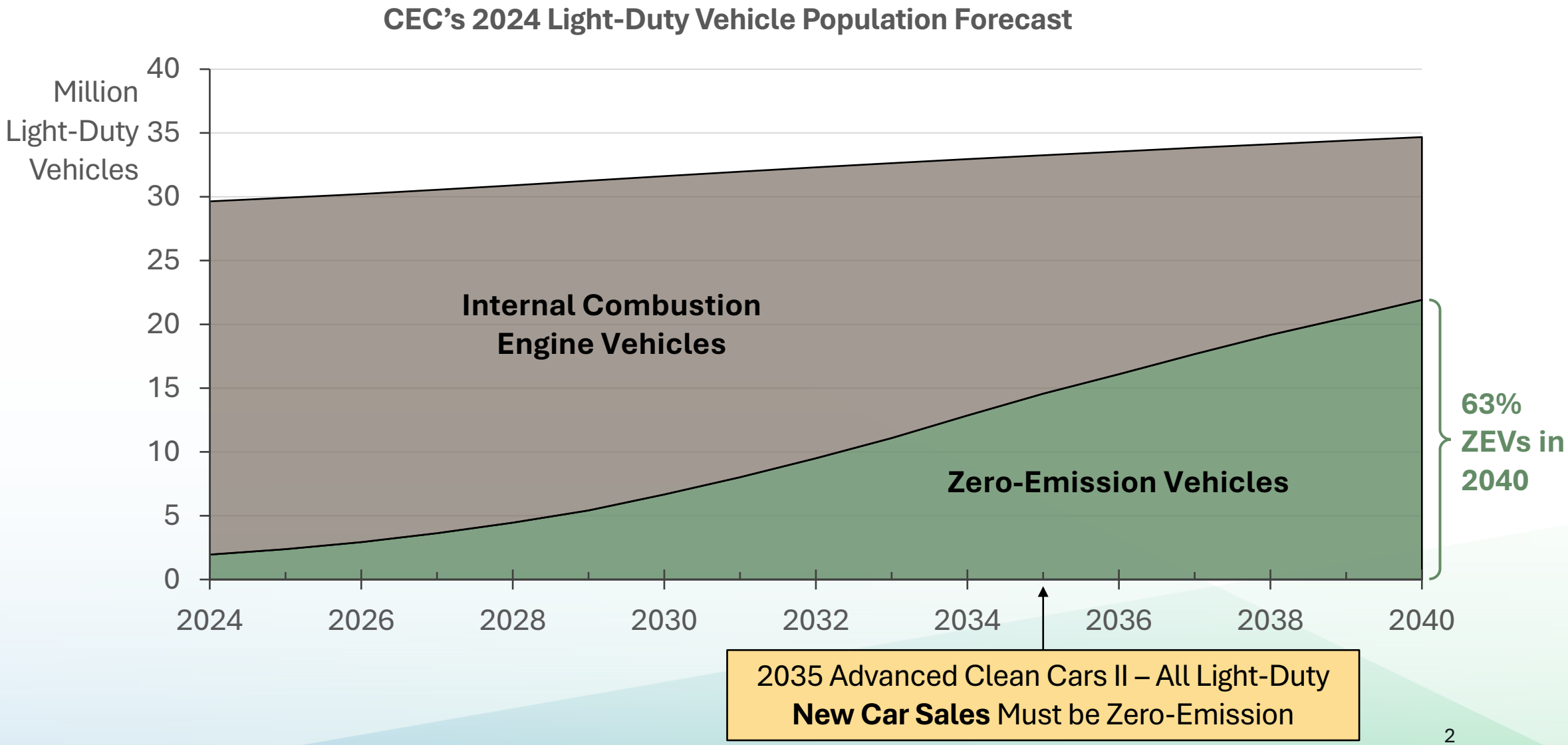
Opportunities to Reduce Electricity Costs with Electric Vehicles

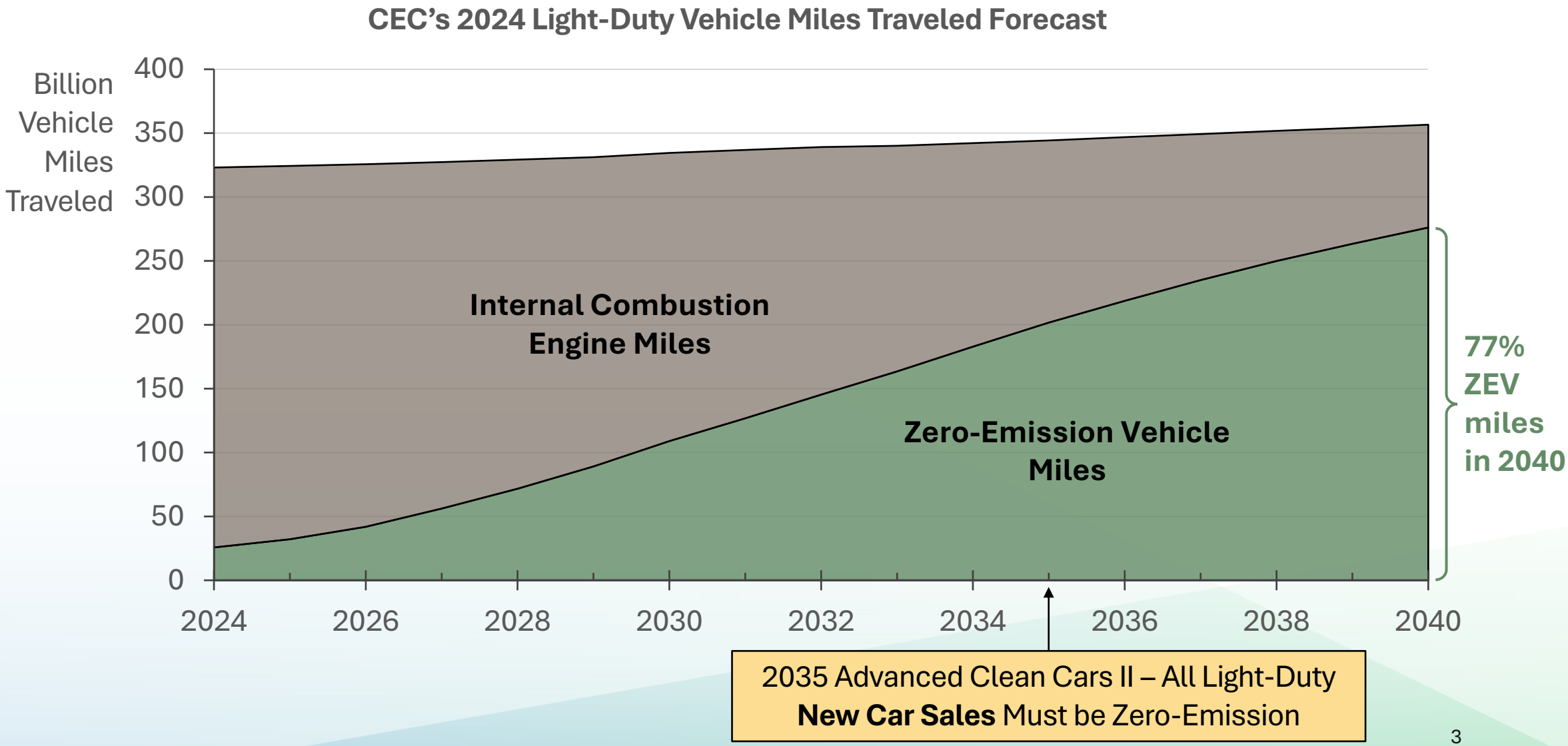
Quentin Gee, Ph.D.

Energy Assessments Division, California Energy Commission

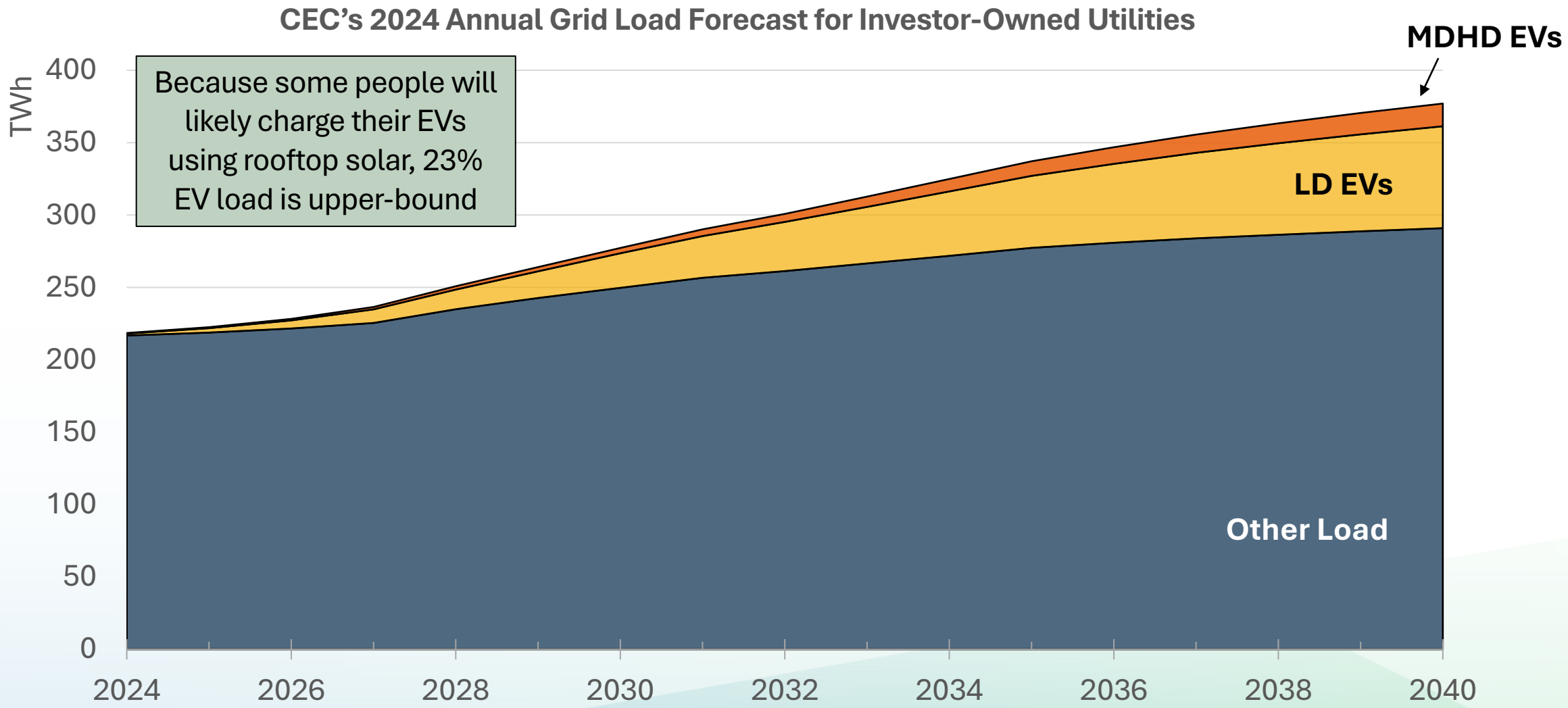
EV Adoption will Increase



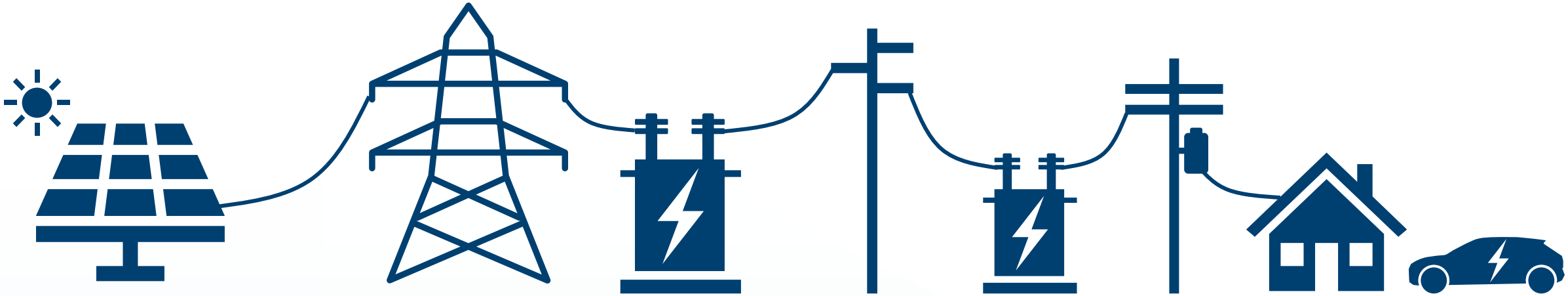
EVs Will Represent Most Miles Traveled



EVs Will Represent ~23% of Annual Grid Load in 2040



Many Upgrades and Many Locations to Meet Increasing Electricity Demand



Generation

Transmission

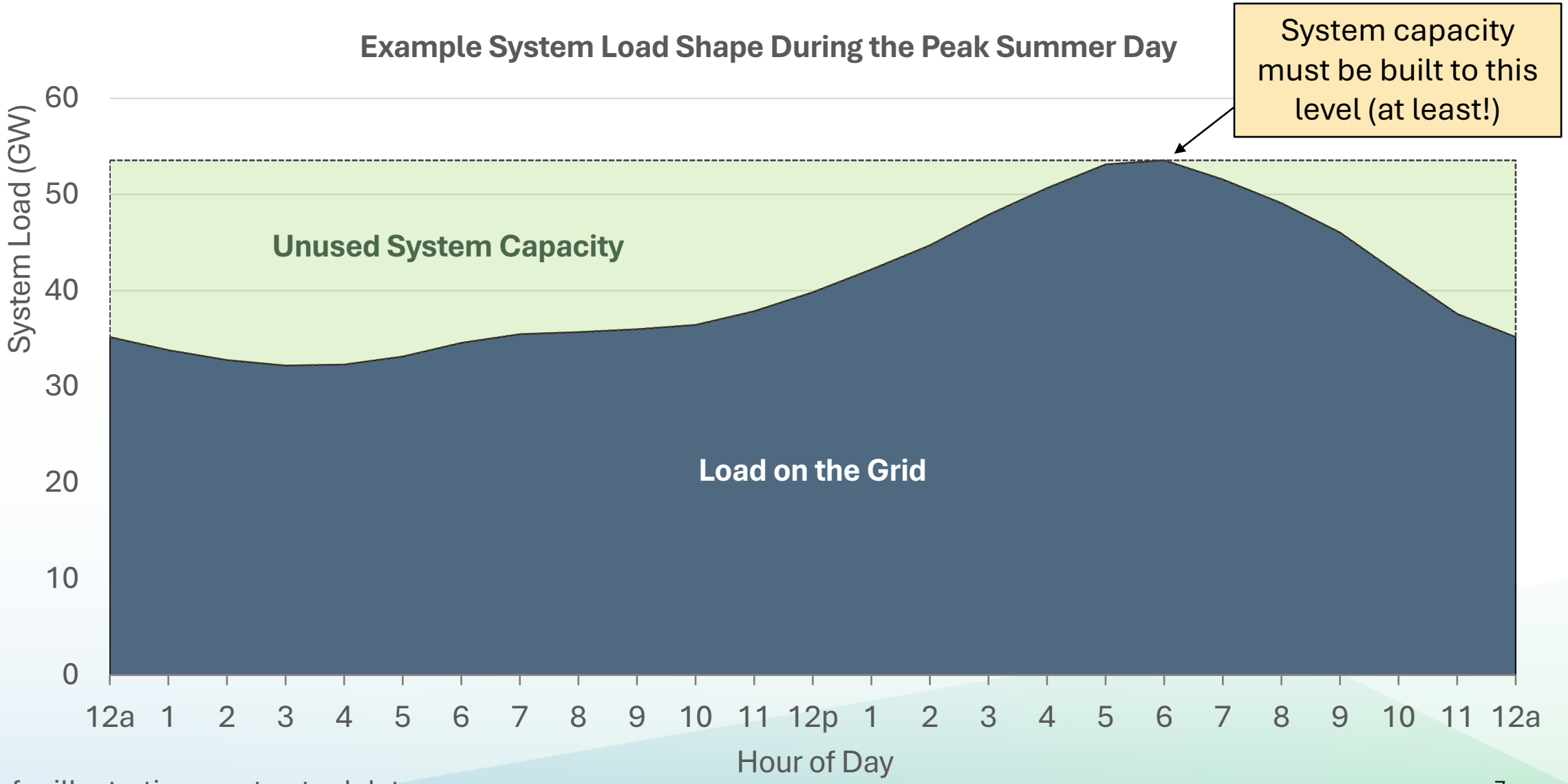
Distribution

“Marginal Costs” in Perspective

Imagine

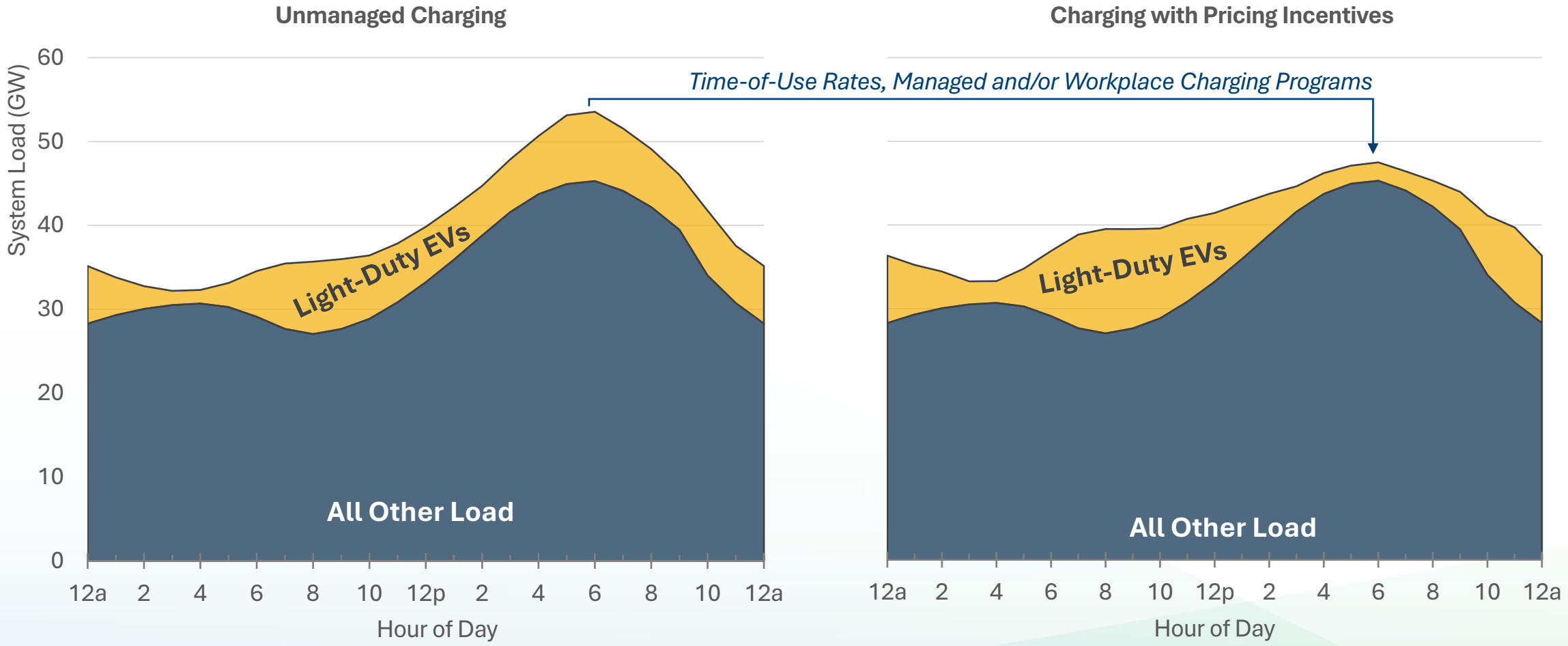
- A factory costs $100k per day to operate
- Expand to +$10k per day in additional operations costs
- Daily output will increase by 20%
- **Per unit output** cost (marginal cost) goes down
- An increase in costs can mean lower costs **per unit of output**

The Grid (Sometimes) has Excess Capacity



Example for illustration – not actual data

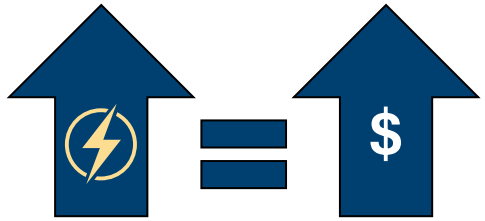
Effective Integration Can Reduce Buildout Costs



Example for illustration – not actual data

“Downward Pressure” Potential

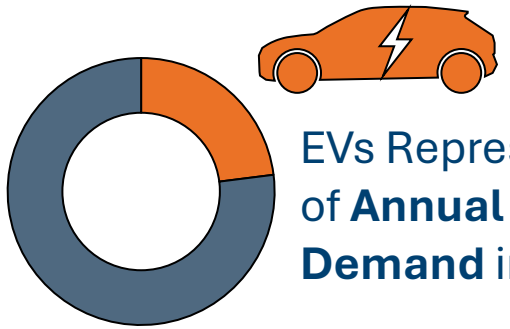
1



More Electricity Sales

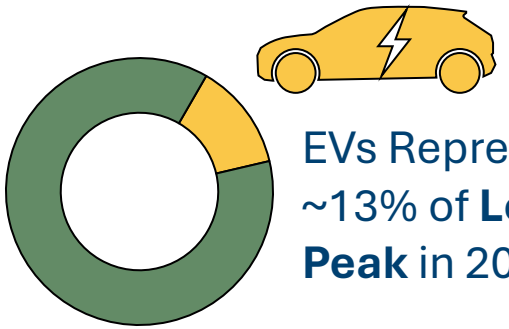
More Grid Expansion Costs

2



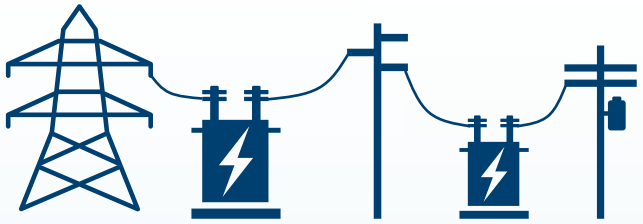
EVs Represent ~23% of **Annual Electricity Demand** in 2040

3



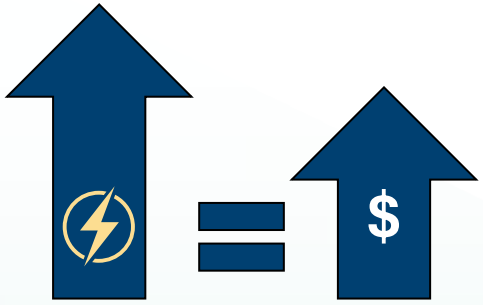
EVs Represent ~13% of **Load at Peak** in 2040

4



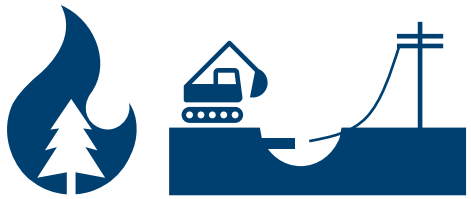
Many (or even most) Grid Expansion Costs Relate to **Load at Peak**

5



Grid upgrade costs are spread over more kWh of electricity, meaning grid upgrades for EVs may contribute to lower costs for all ratepayers

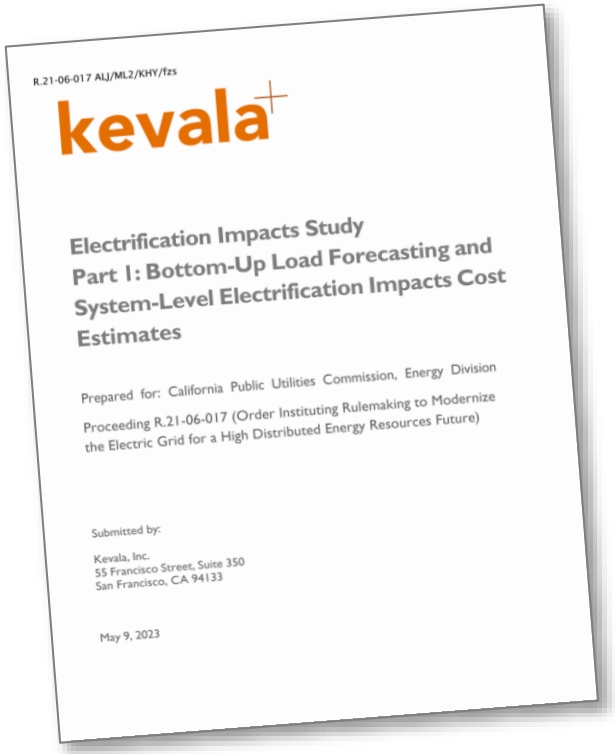
6



Other costs (e.g., wildfire risk mitigation, undergrounding) may lead to overall cost increases, but EVs would be a benefit

Grid Expansion Costs: 2023 Kevala Report

- Used CEC's 2022 forecasted EV Population
- Did not use CEC's forecasted load profiles
- Up to $50 billion in grid expansion costs through 2035
- Did not address of downward pressure potential


R.21-06-017 ALJ/ML2/KHY/fzs

kevala

Electrification Impacts Study
Part I: Bottom-Up Load Forecasting and System-Level Electrification Impacts Cost Estimates

Prepared for: California Public Utilities Commission, Energy Division
Proceeding R.21-06-017 (Order Instituting Rulemaking to Modernize the Electric Grid for a High Distributed Energy Resources Future)

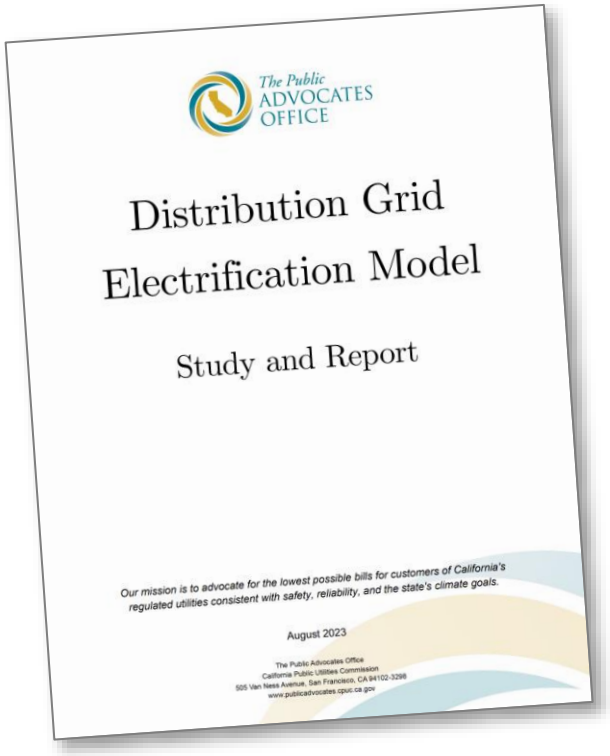
Submitted by:

Kevala, Inc.
55 Francisco Street, Suite 350
San Francisco, CA 94133

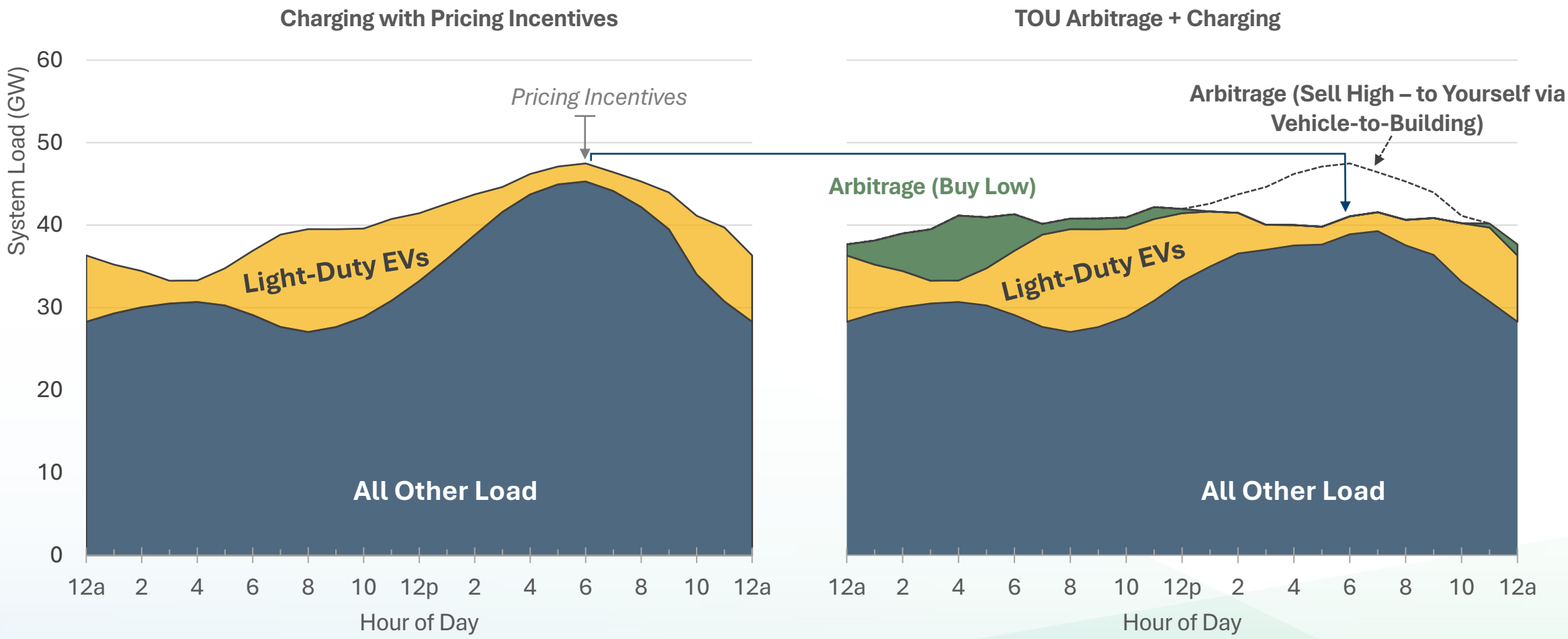
May 9, 2023

Grid Expansion Costs: 2023 CPUC Public Advocates Office Report

- Used CEC's 2022 forecasted EV Population
- Also used CEC's 2022 forecasted load profiles
- Up to $26 billion
- Downward Pressure Potential
  - *"…upward pressure on rates due to increased infrastructure costs due to electrification is **more than offset** by downward pressure on rates due to the increased consumption of electricity resulting from electrification. **All ratepayers, even those who cannot (or choose not to) electrify, could financially benefit from electrification**."*
  - 1.2 to 5.6 cents savings (for all ratepayers) per kWh downward pressure in the mid-case
- Extra capacity add for EVs introduces more capacity for other electrification efforts
- 2.0 results expected in 2025



Time-of-Use Arbitrage from Vehicles can Help the Grid



People Using EVs as Batteries Gives the Opportunity to Avoid High TOU Rates and Decrease System Load

Example for illustration – not actual data

Thank You!

Quentin Gee, Ph.D.
Energy Assessments Division
quentin.gee@energy.ca.gov