

Clean Power and Electrification Pathway – Southern California Water Dialogue

April 25, 2018

James Pasmore, SCE

About Southern California Edison

Who We Serve

We delivered more than 87 billion kWh of electricity in 2015 and powered a total of

- 15 million people
- 180 incorporated cities
- 15 counties
- 50,000 square miles of service area
- 5,000 large businesses
- 280,000 small businesses

How We Do It

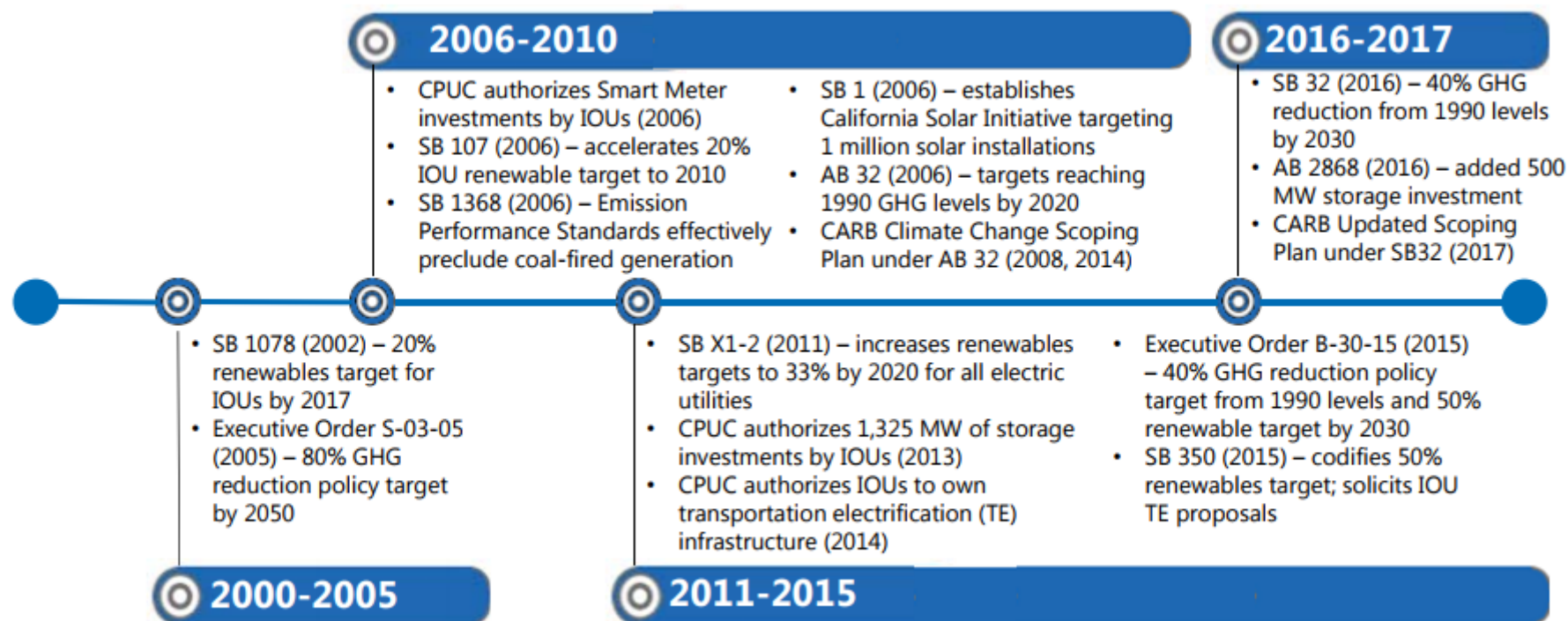
To deliver power safely, reliably and affordably, we monitor and maintain a vast electricity system:

- 12,782 miles of transmission lines
- 90,401 miles of distribution lines
- 1,433,336 electric poles
- 720,800 distribution transformers
- 2,959 substation transformers

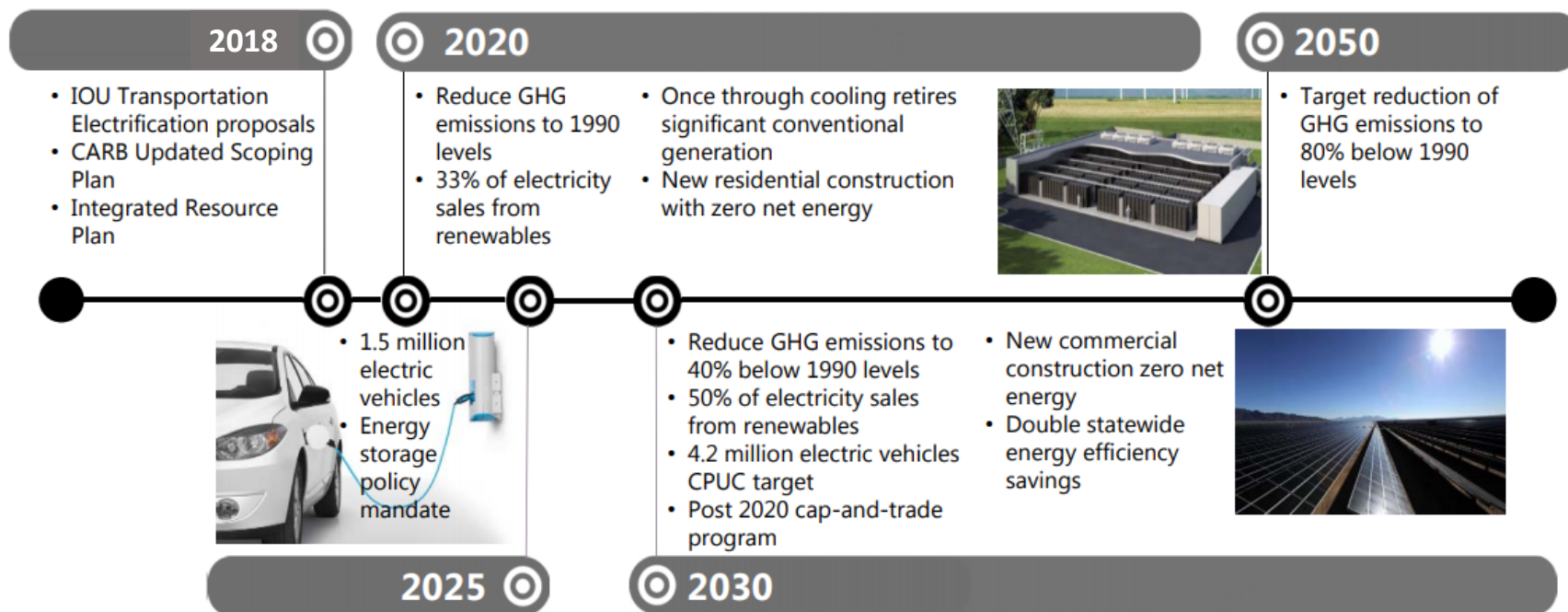


■ SCE Service Territory

California Climate Policies – Timeline



California Climate Policies – Future Timeline



Achieving California's expansive energy and environmental policy goals will require taking foundational steps to evolve the electric grid and further develop new technologies

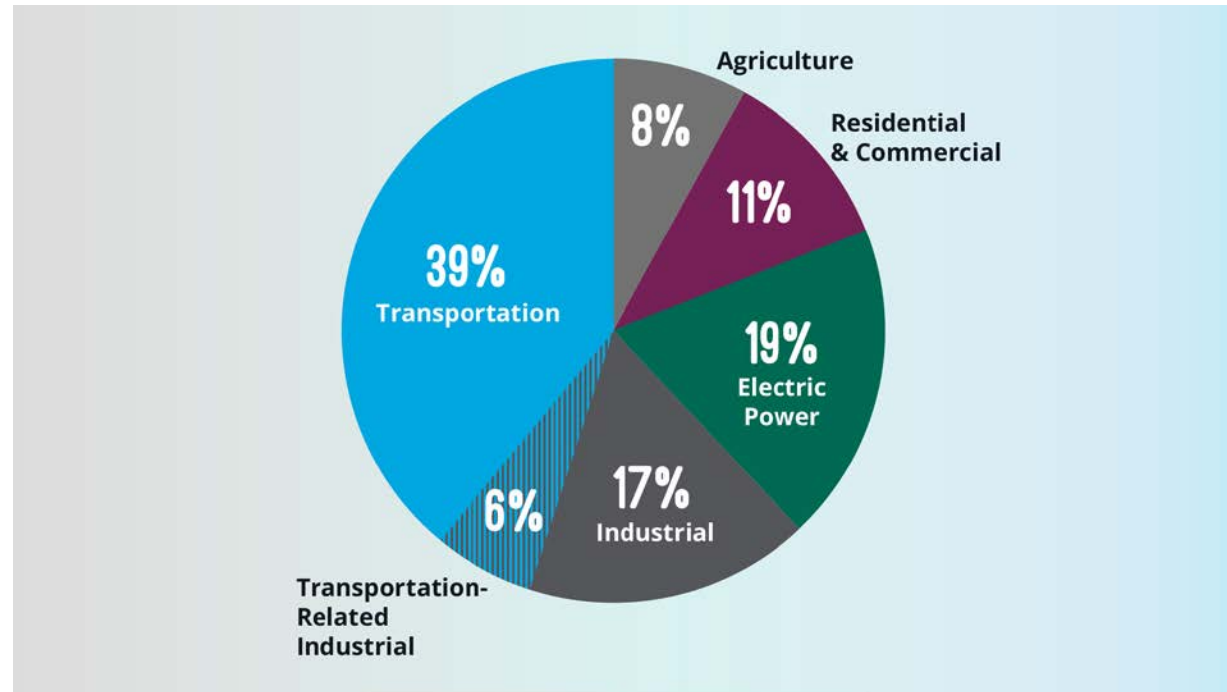


Emissions contributors

- The largest contributor is **transportation**, followed by the electric sector.

Industrial, and commercial and residential sectors trail not too far behind.

- The most **practical and economical** way to create real change is for sectors to **work together** to find an affordable alternative to fossil fuels.





SCE's integrated solution

**DECARBONIZE THE
ELECTRIC SECTOR**



**ELECTRIFY THE
TRANSPORTATION
SECTOR**



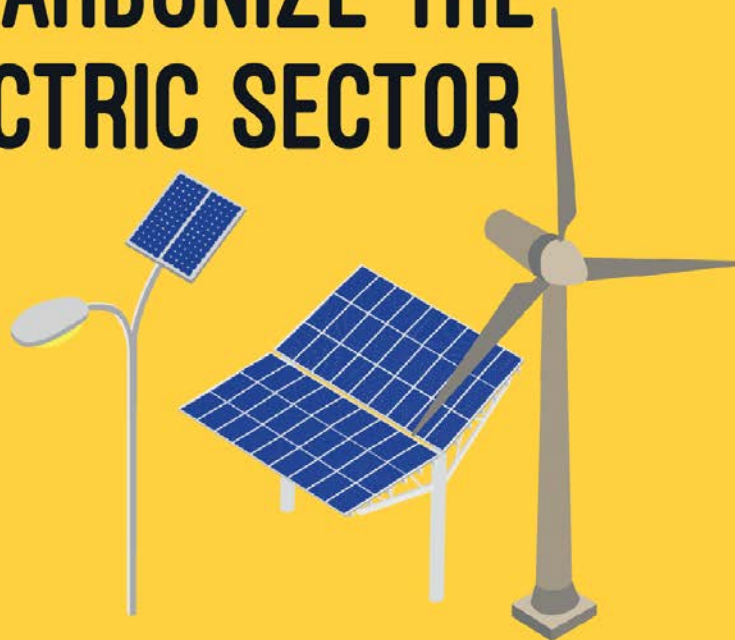
**ELECTRIFY
BUILDINGS**



**Clean the power grid. And
electrify.**

Solution Part 1: Clean the power grid

DECARBONIZE THE ELECTRIC SECTOR

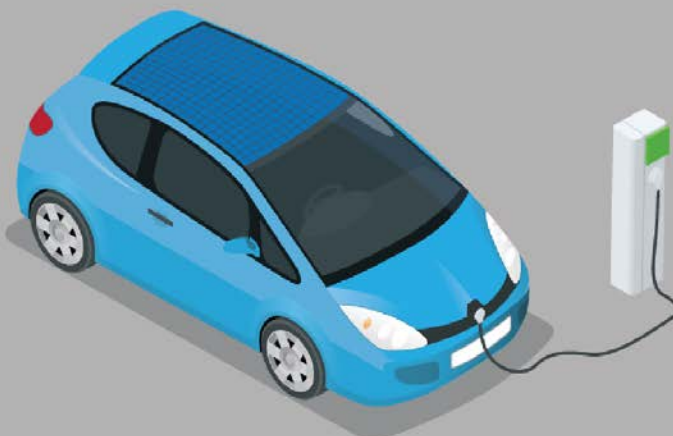


- By 2030, create an electric generation mix powered by at least **80% carbon-free resources**.
- More **solar, wind, hydropower** and other zero-emission sources, along with **battery storage**.
- Currently at about 40%.



Solution Part 2: Electrify vehicles

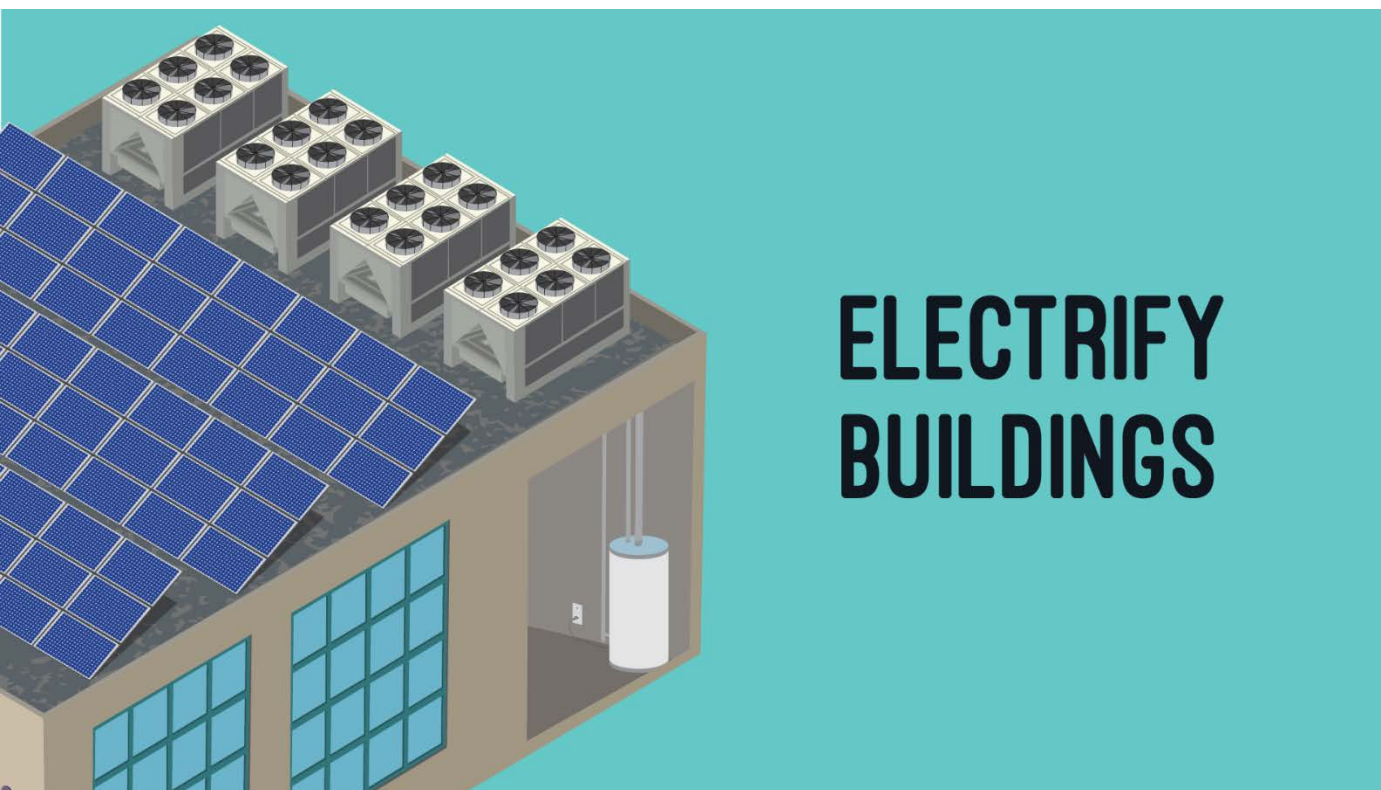
ELECTRIFY THE TRANSPORTATION SECTOR



- By 2030, **electrify 25% of cars and trucks** – about 7 million in total.
- Transportation accounts for **39%** of emissions today.
- Use **zero-emission** electric generation to power zero-emission vehicles.



Solution Part 3: Electrify buildings



ELECTRIFY BUILDINGS

- By 2030, electrify **one-third** of space and water heating in buildings.
- Buildings use **fossil fuels** for space & water heating, and they **don't need to**.
- Now powered by clean, **affordable** electricity.

SCE's Clean Power and Electrification is an alternate path to achieve California's 2030 GHG reduction goals

SCE embarked in an economy-wide analysis of GHG reduction measures and paths aimed at generating an informed view on the optimum approach for meeting the state's 2030 GHG reduction goals

- As a first step SCE developed an **economy-wide view** of the expected abatement from existing and expected policies along with the forecasted economic adoption of low carbon technologies and fuels
- With this reference “economic” scenario, a **gap of 48 millions of metric tons (MMT) CO₂e** remains to the 2030 emissions target
- Analysis of the measures and paths with a framework of **cost, feasibility to meet the 2050 goals** resulted in the Clean Power and Electrification scenario as the measure set that represented the preferred end state
- This future state requires further and faster de-carbonization of the electric sector, pushing to **70% renewables** along with aggressive electrification of transportation (**7M electric vehicles (EV)** on the road) and buildings (**~5.3M heat pumps** in homes and **up to 30% electrification of commercial space and water heating** end uses)
- Increased **transportation and building electrification only partially offsets future load losses** from assumed Energy Efficiency (EE) and distributed solar photovoltaic (DGPV)

How RPS Requirements Are Changing TOU Periods

– “The Duck Curve”

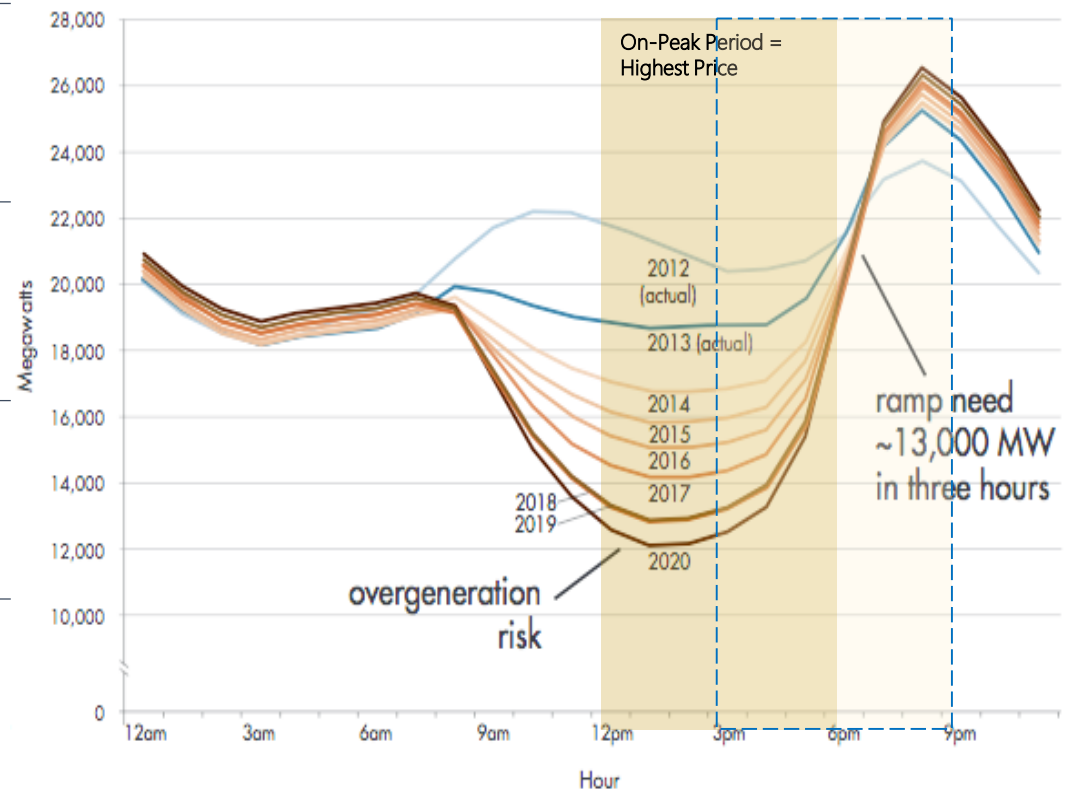
By 2020, when 33% of CA's electricity is mandated to come from renewable resources, the net load ^{1/} curve is expected to look like a duck

The 33% RPS requirement is making mid-day energy less expensive through greater supply. Load net of wind and solar drops during the day and peaks in the late afternoon/early evening.

The California ISO (CAISO) has identified this over-supply condition to occur primarily in the Spring and on weekends

SB350's ^{2/} 50% RPS requirement will exacerbate this impact and emphasizes the urgency of this work.

California's Investor Owned Utilities (IOU) are re-assessing their current TOU periods to determine the potential need to shift Time-of-Use (TOU) periods for all customer classes to later in the day

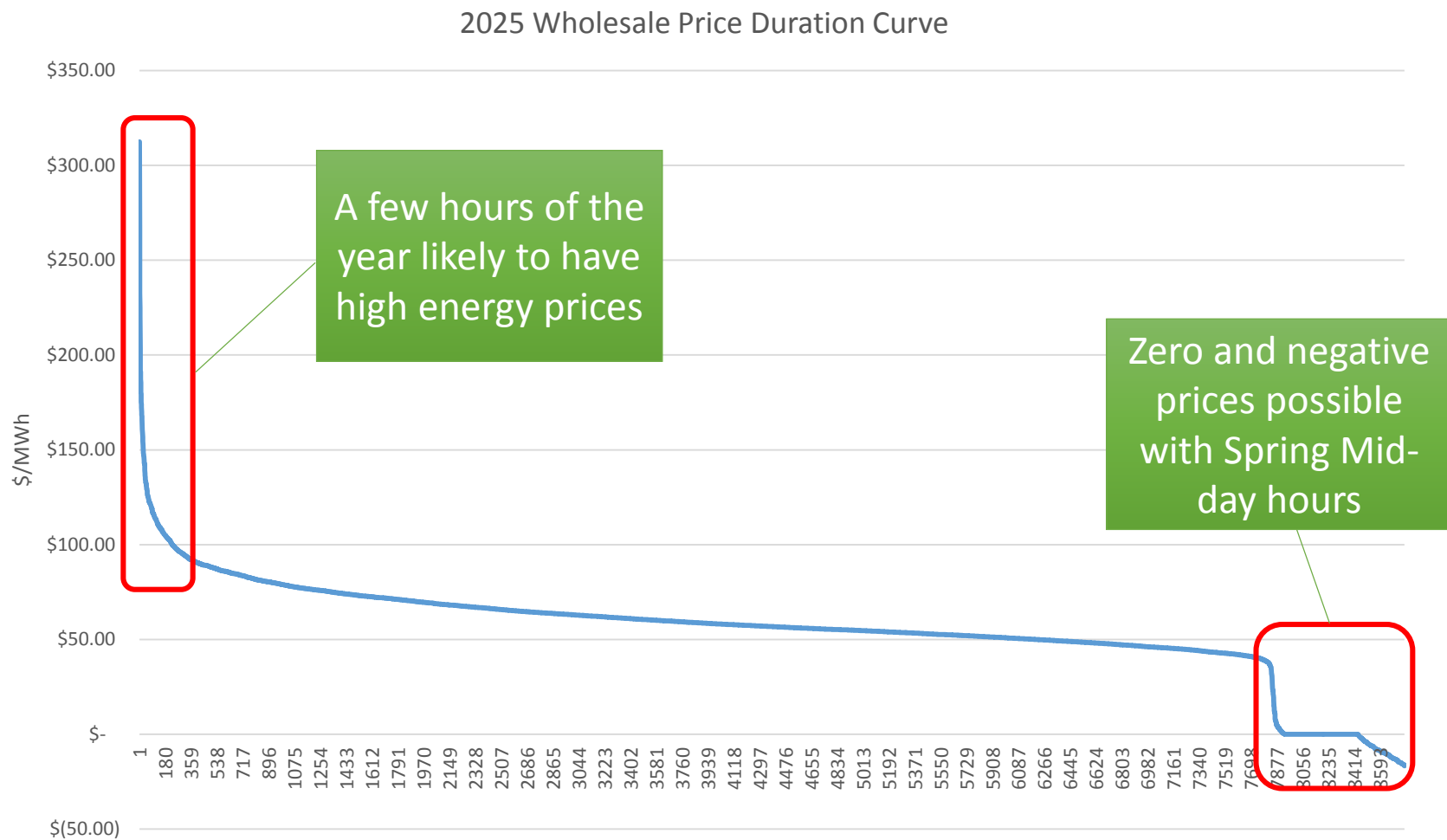


Source: Net load curves for March 31, from 2012 to 2020, based on analysis by CAISO.

^{1/} Net Load as defined by the CAISO: The difference between forecasted load and forecasted electricity production from variable generation resources, wind and solar.

^{2/} SB350 (2015) increased CA's commitment to clean power, including solar.

Future wholesale market electricity prices may offer opportunities for load management and opportunistic electricity use



Preferred Resources Pilot (PRP)

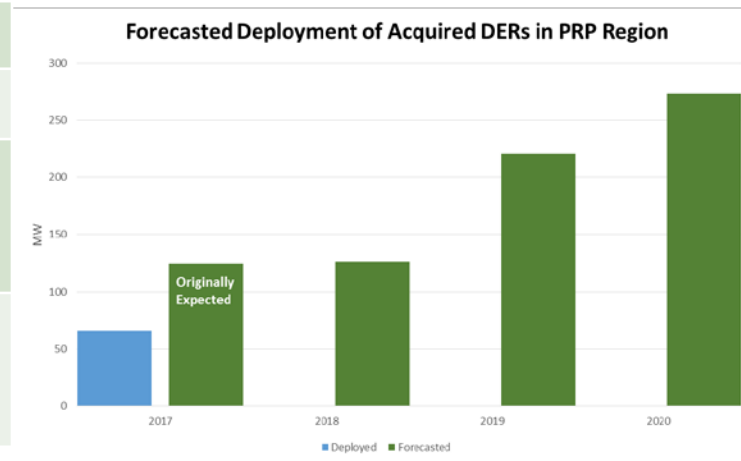
PRP Goal: Validate the untested CAISO and CEC assumptions in the ability of a portfolio of DERs to deliver energy when, where, and for as long as needed.

2018 PRP Milestone 1:

- Demonstrate the ability to **acquire** and **deploy** a mix of preferred resources to offset demand expected in 2022 in the PRP region.
- **Measure** the deployed PRP resources performance capabilities for offsetting incremental load on six peak days in the PRP region and determining their capability to serve the load above a baseline value set by the 7th day peak level.

Work Stream	Status	Notes
Acquisition	✓	273 MW of DERs acquired.
Deployment	➡	66 MW of the 273 MW deployed.
Operations	🕒	PRP resource testing will take place after sufficient resources are deployed currently forecasted for October 2018.
Measurement	➡	Measurement data will be provided by the contracted resources providers once DERs are deployed.

Forecasted Deployment



2018 Planned Focus

- Continue advocating for approval of PRP RFO 2 contracted DERs (105 MW).
- Support the deployment of an additional 42 MW of contracted DERs by 10/1/2018.
- Measure DERs contributions toward 2018 PRP Region peak and publish findings in 2018 PRP Milestone report.

Questions???

James Pasmore

Account Manager

(714) 973-5759

James.Pasmore@sce.com