

# What compels us to do all electric buildings in CA?



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Southern California Edison

Perspectives





History tells us...

[Image from Google]

# What Have We Done?

- 1974 – Warren-Alquist Act in California
  - Established California Energy Commission (CEC)
- 1975 – Energy Policy and Conservation Act
  - U.S. Department of Energy's Appliance and Equipment Standards Program was authorized by Congress





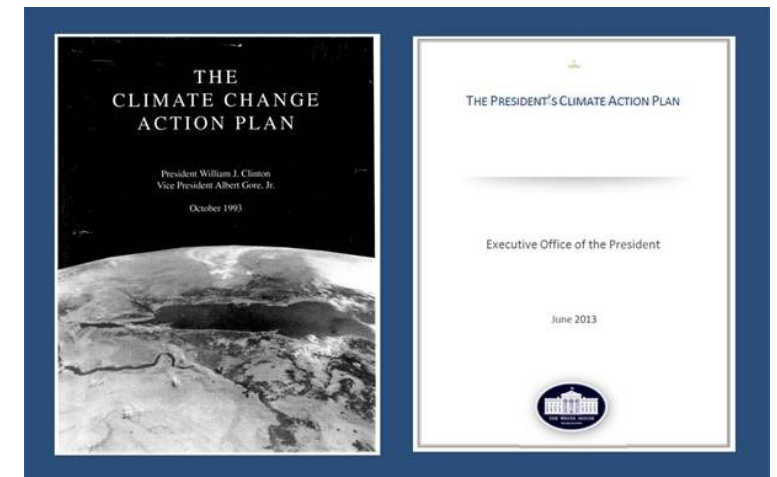


**Today's story is ...**

[Image from Google]

# What Are We Doing Now?

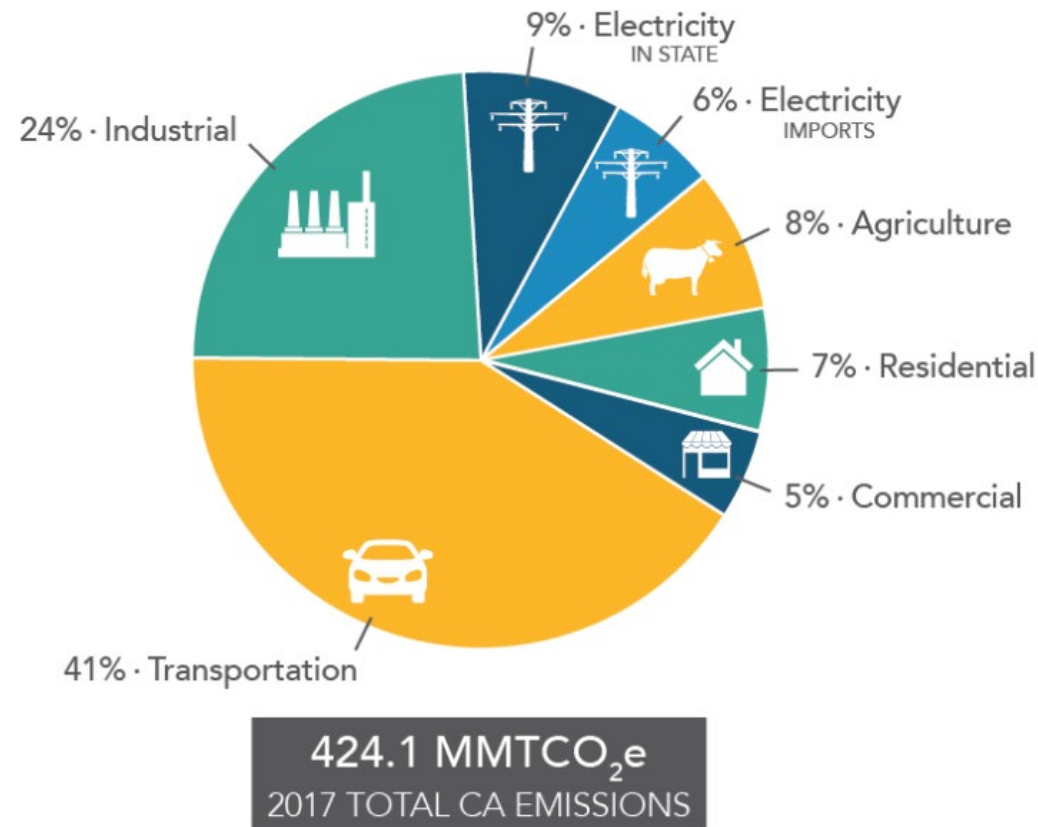
- 2006 – CA's Global Warming Solutions Act
- 2013 – Climate Action Plan by President Obama
  - Reducing carbon pollution by 3 billion metric tons cumulatively by 2030 through energy conservation standards



[Images from Google]

# Challenge: CA emits 424 Million Metric Tons of CO<sub>2</sub> A year\*

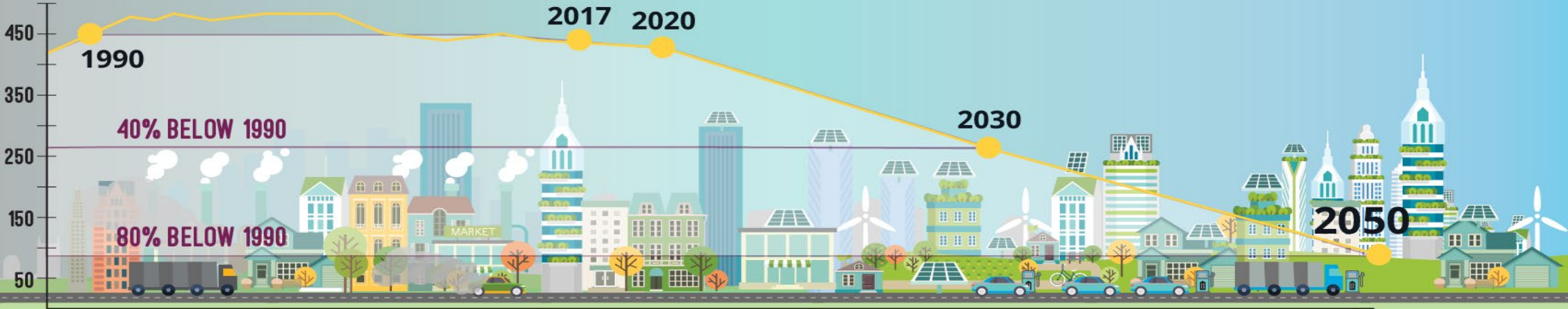
2017 GHG Emissions by Main Economic Sector



[Image: CA Air Resources Board]

# SCE's Clean Power & Electrification Pathway

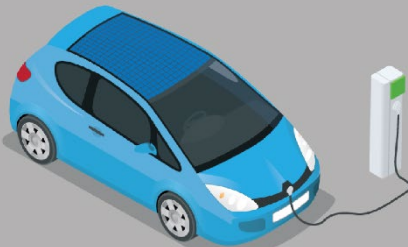
Million Metric  
Tons of CO<sub>2</sub>



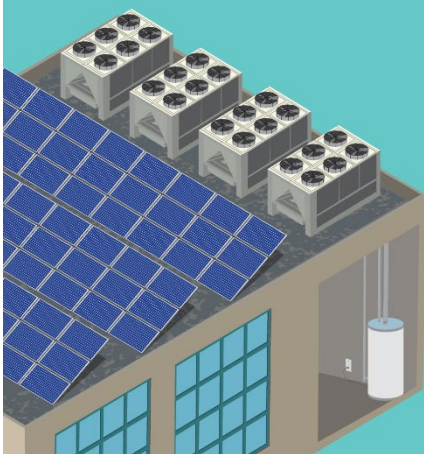
**DECARBONIZE THE  
ELECTRIC SECTOR**



**ELECTRIFY THE  
TRANSPORTATION  
SECTOR**

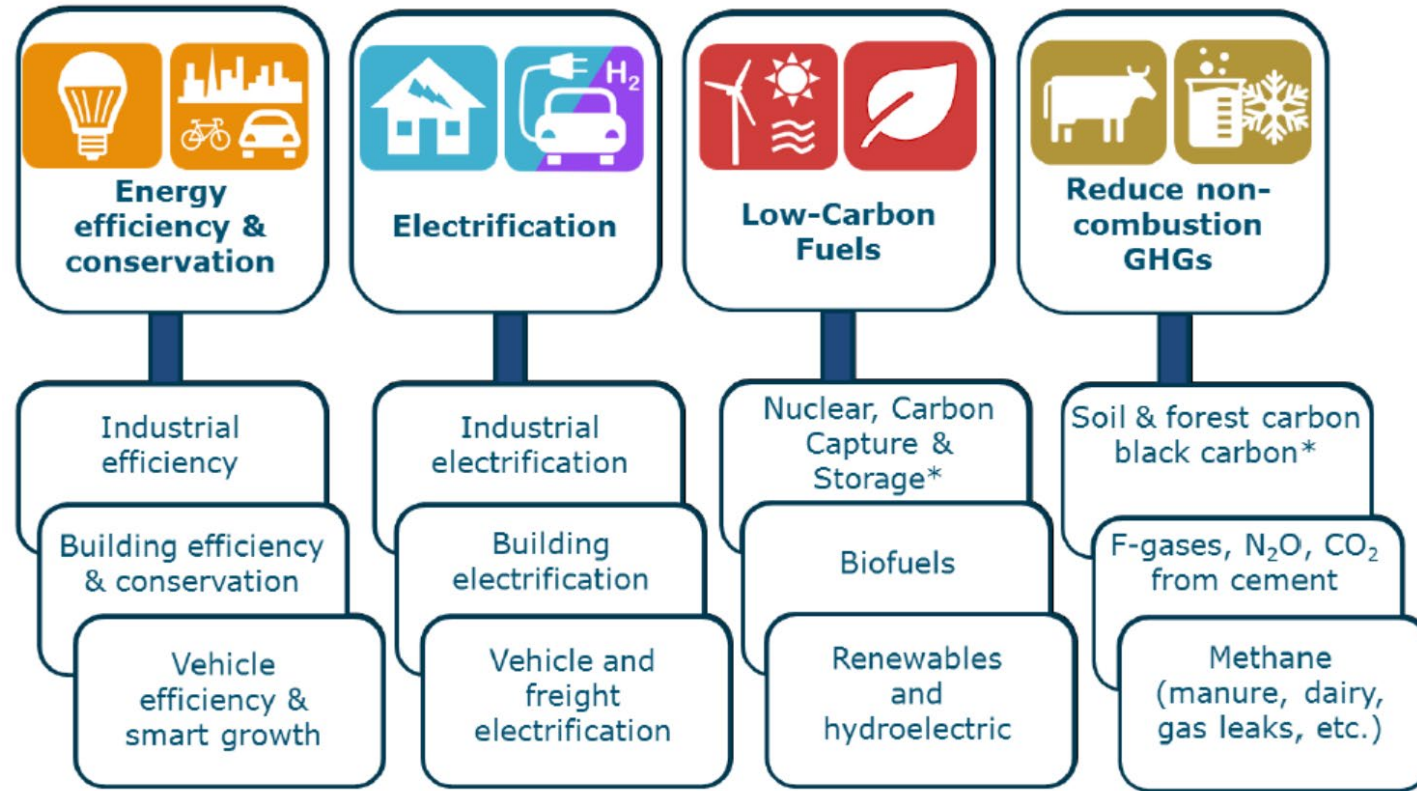


**ELECTRIFY  
BUILDINGS**





# Pillars of Decarbonization



# Building electrification is a cost-effective approach to meeting California's GHG reduction goals

- SCE's Clean Power Pathway (November 2017) identifies electrification of space and water heating as a cost-effective component of an economy-wide approach to meet California's goals.
- E3's "Deep Decarbonization in a High Renewables Future" (May 2018) identifies heat pumps in the leading order of cost effective GHG abatement measures.
- E3's "Residential Building Electrification in California" (April 2019) shows customer cost savings with electrification.



Energy Research and Development Division  
FINAL PROJECT REPORT

## Deep Decarbonization in a High Renewables Future

Updated Results from the California PATHWAYS Model

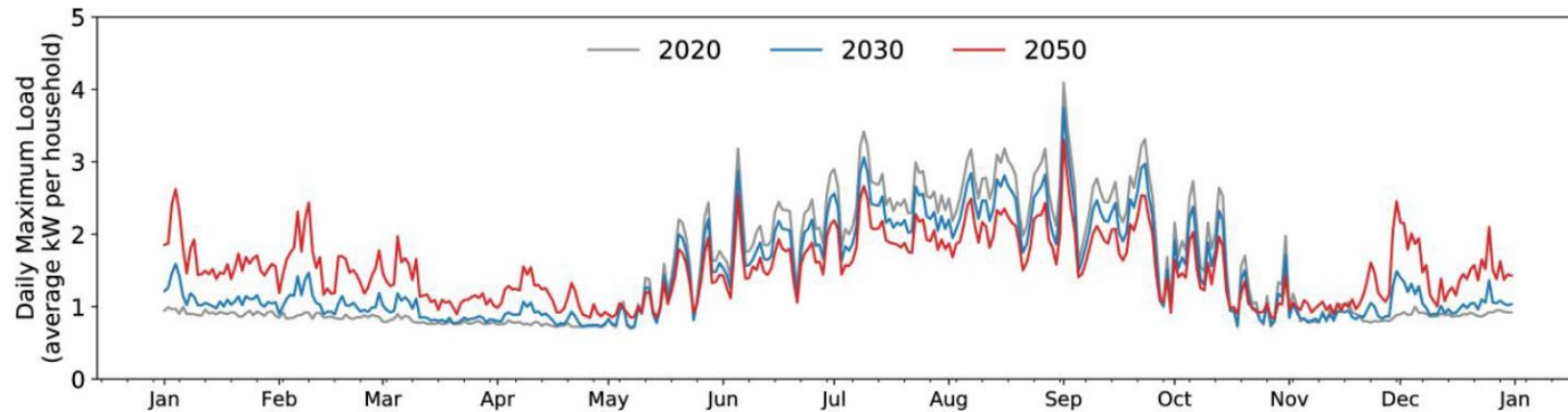
California Energy Commission  
Edmund G. Brown Jr., Governor

June 2018 | CEC-500-2018-012



How do we achieve the benefits of building decarbonization without negatively impacting the grid?

# High electrification of residential buildings is expected to improve the grid load factor without exacerbating the peak\*



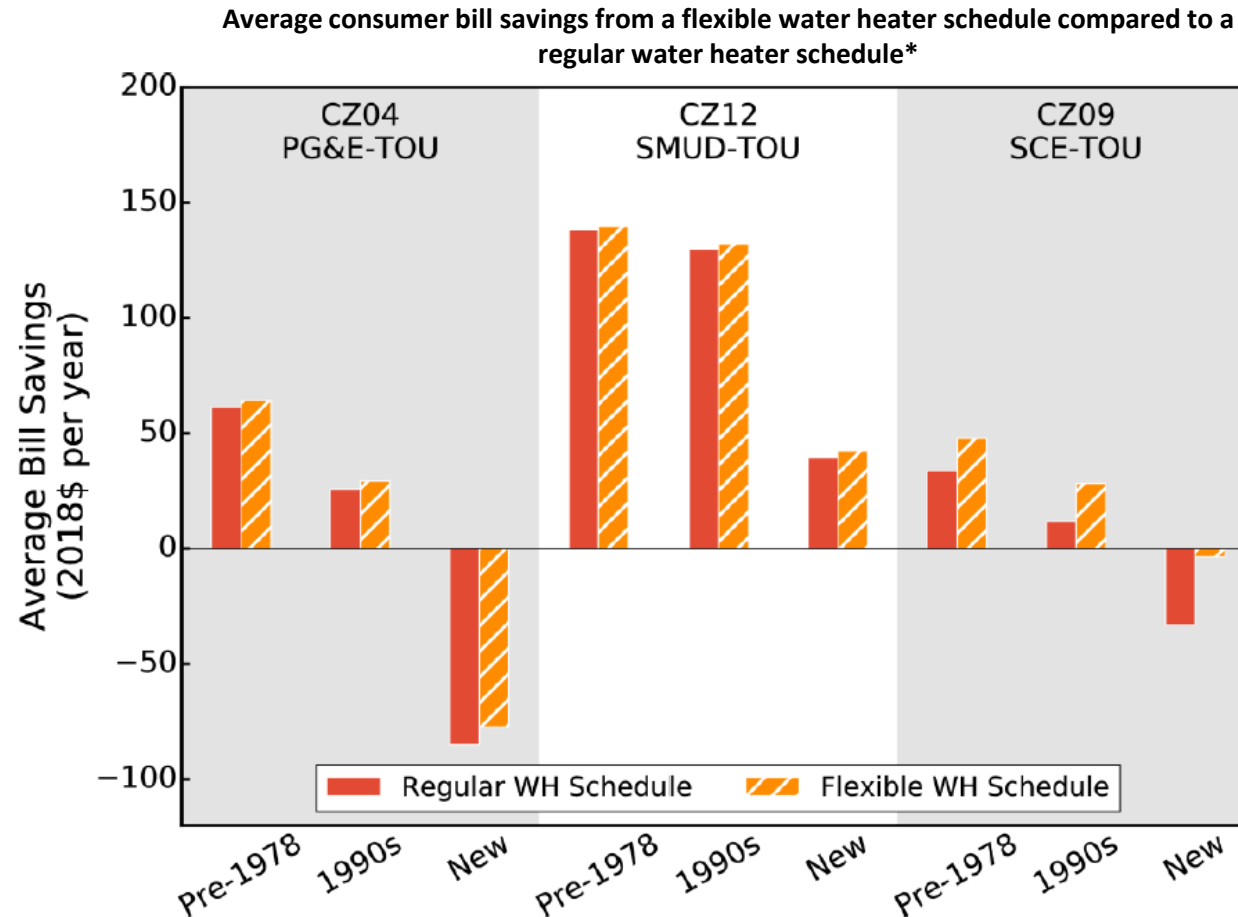
|  | 2020<br>Penetration<br>(% of stock) | 2030<br>Penetration<br>(% of stock) | 2050<br>Penetration<br>(% of stock) |
|--|-------------------------------------|-------------------------------------|-------------------------------------|
| Share of all-electric low-rise residential homes | 0%                                  | 26%                                 | 86%                                 |

Penetration represents the share of all-electric equipment among the entire stock of all fuel types.

- Slightly lower summer peak due to greater cooling efficiency with HVAC heat pump vs. A/C compressor
- Increased winter demand remains below summer peak demand levels under Typical Meteorological Year (TMY) weather conditions modeled
- Electrification contributes to a better utilization of the bulk power grid, as residential building load factor increases from 19% in 2018 to 26% in 2050
- Localized impacts at regional and distribution-level need to be further studied



# Appropriate TOU rates can encourage customers to use flexible water heating schedules



\*Assumes water heater runs at minimal power during the peak TOU hours and shifts the water heating to off-peak TOU hours

- Customer bill savings of flexible water heating are highest under the SCE TOU-4-9 rate structure due to the large TOU differentiation (\$0.12/kWh) in winter.
- Flexible water heating schedules generate little bill savings under PG&E and SMUD TOU rates, given the small difference (<\$0.04/kWh) between on-peak and off-peak
- New rate designs that encourage the use of flexible water heating would have larger differences in TOU periods, particularly in winter when water heating demands are higher.

# Challenges and Opportunities

# GHG Emissions per Fuel Type

Today's Outlook

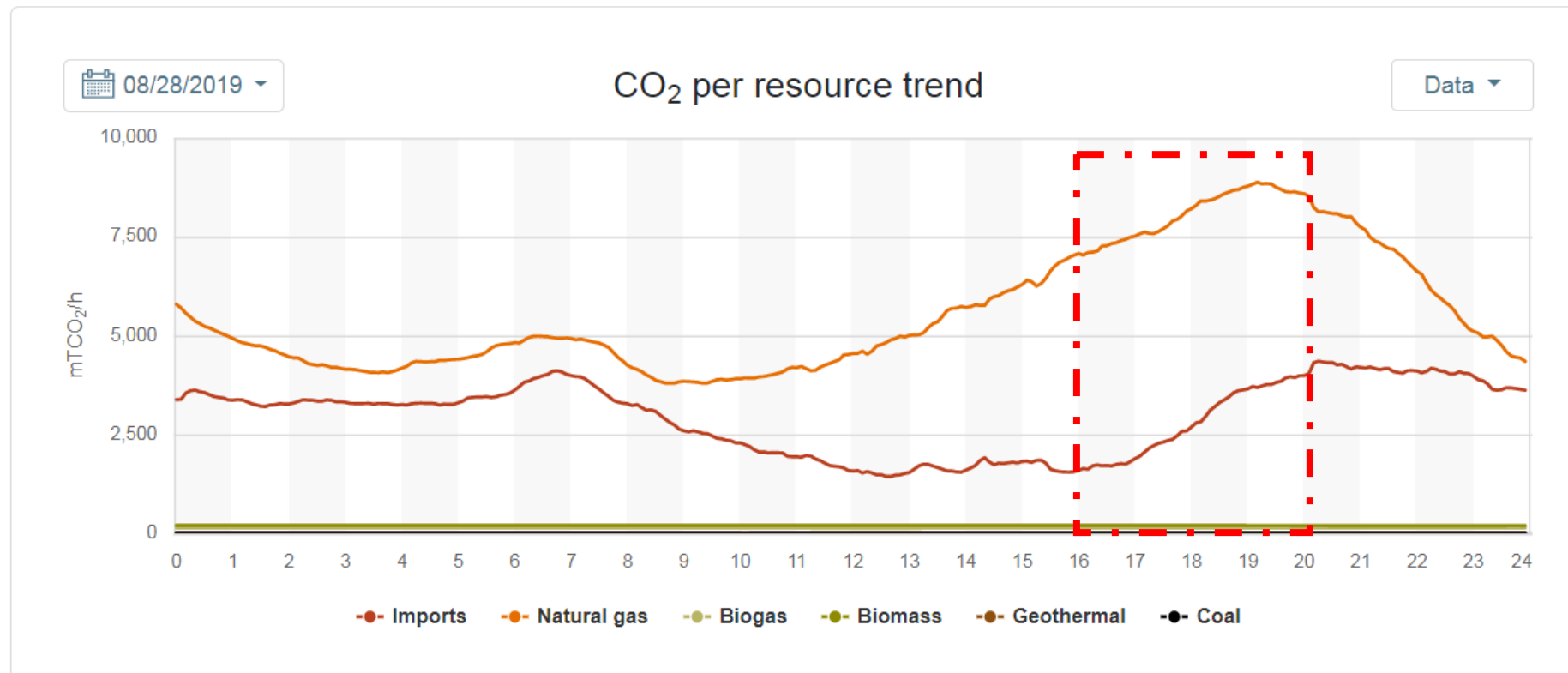
Demand

Supply

Emissions

Prices

AS OF 15:00 10/22/2019



[Source: California ISO, <http://www.caiso.com/TodaysOutlook/Pages/Emissions.aspx>]



# Grid is getting greener... with a challenge: curtailment

Today's Outlook

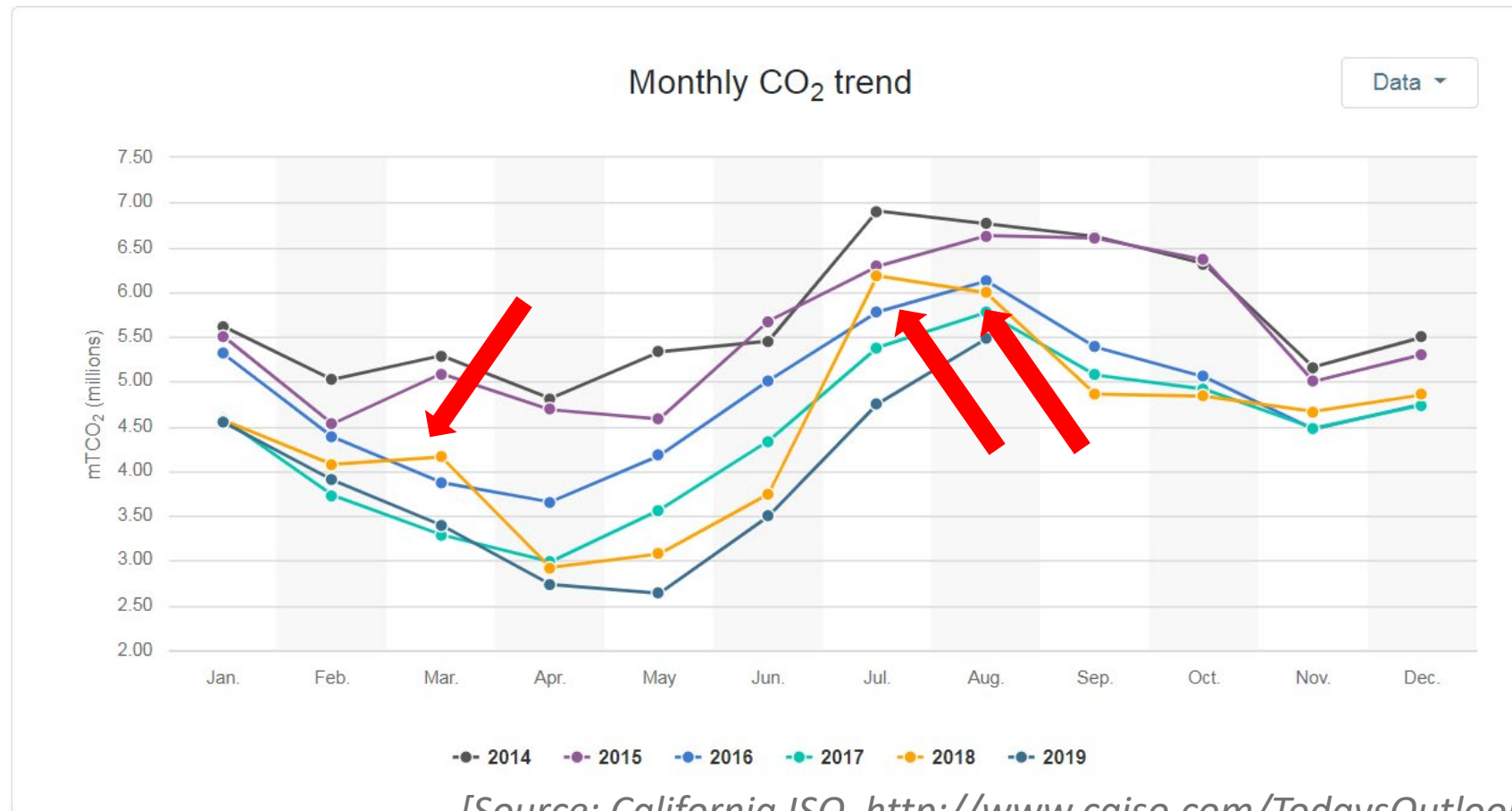
Demand

Supply

Emissions

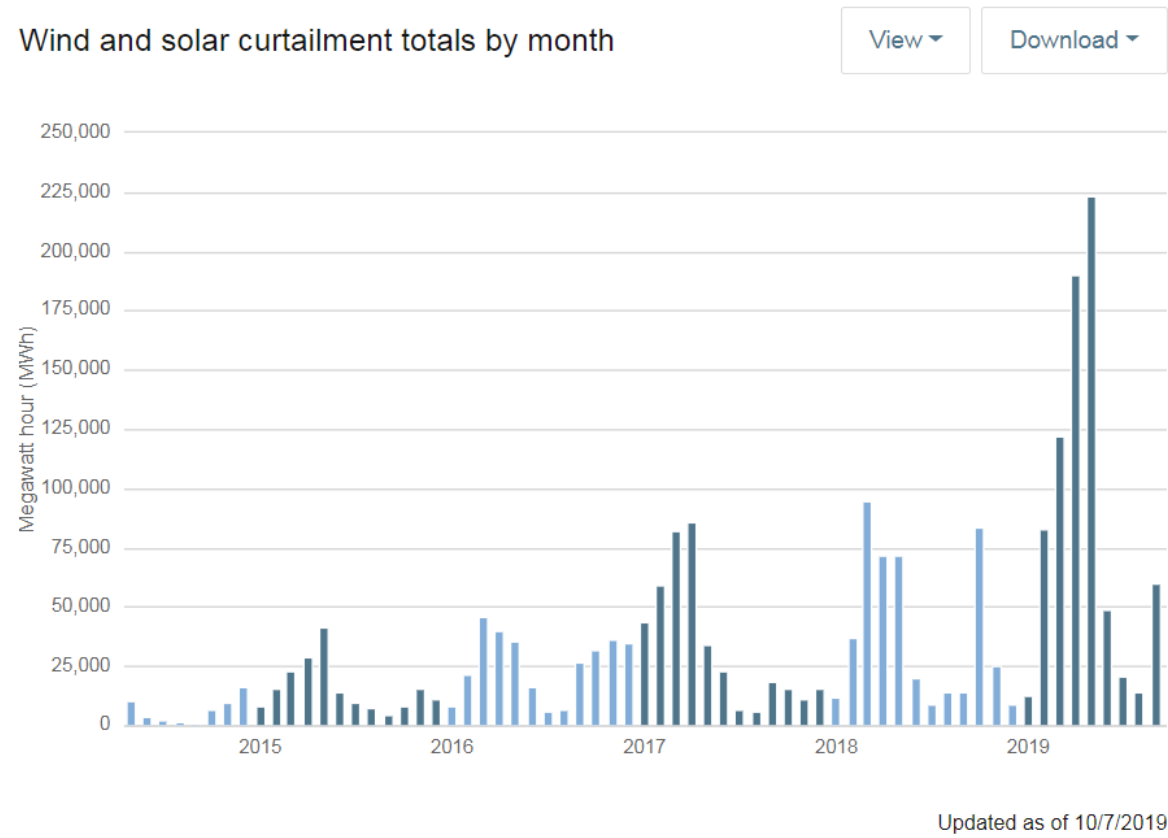
Prices

AS OF 15:05 10/22/2019



[Source: California ISO, <http://www.caiso.com/TodaysOutlook/Pages/Emissions.aspx>]

# Perspective: Curtailment



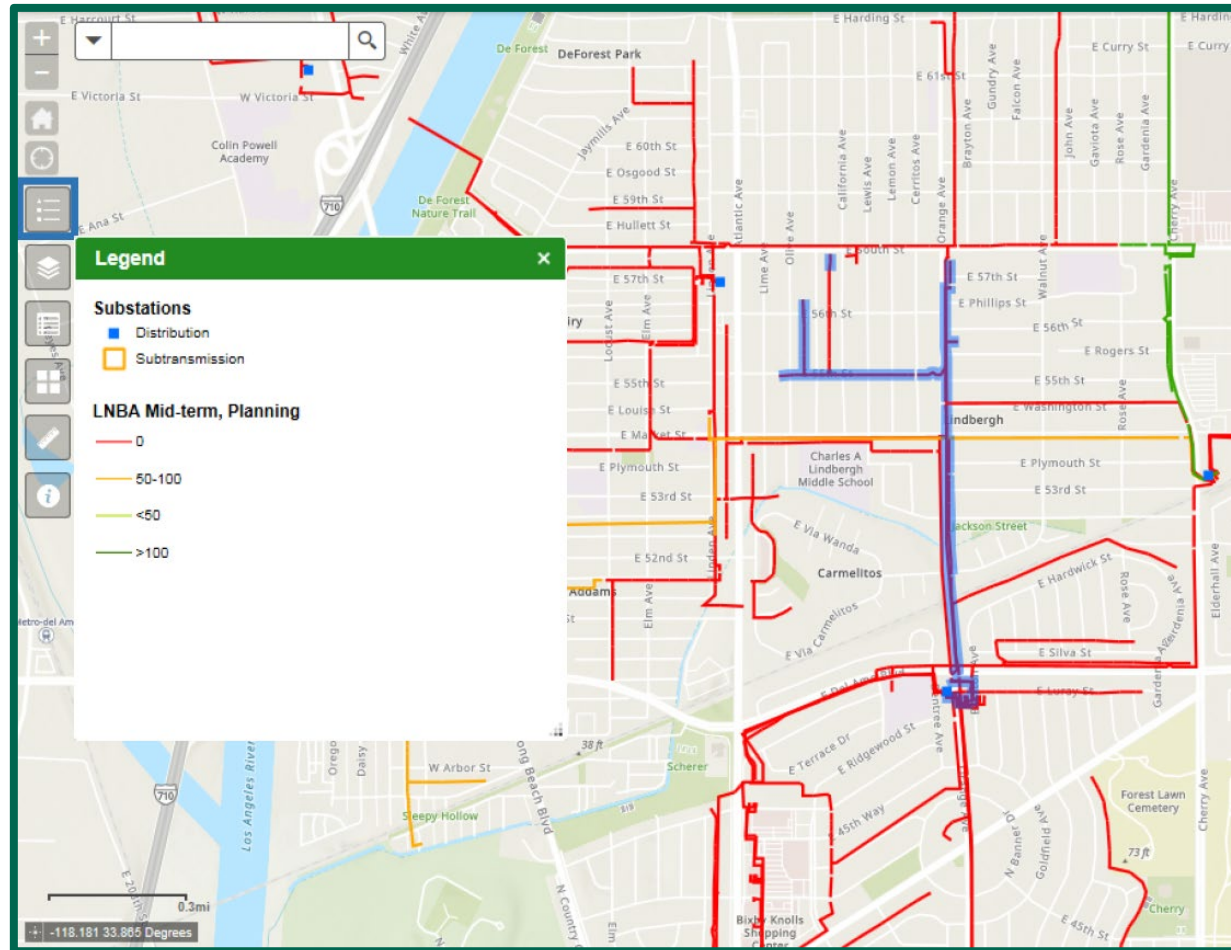
[Source: <http://www.caiso.com/informed/Pages/ManagingOversupply.aspx>]

Values



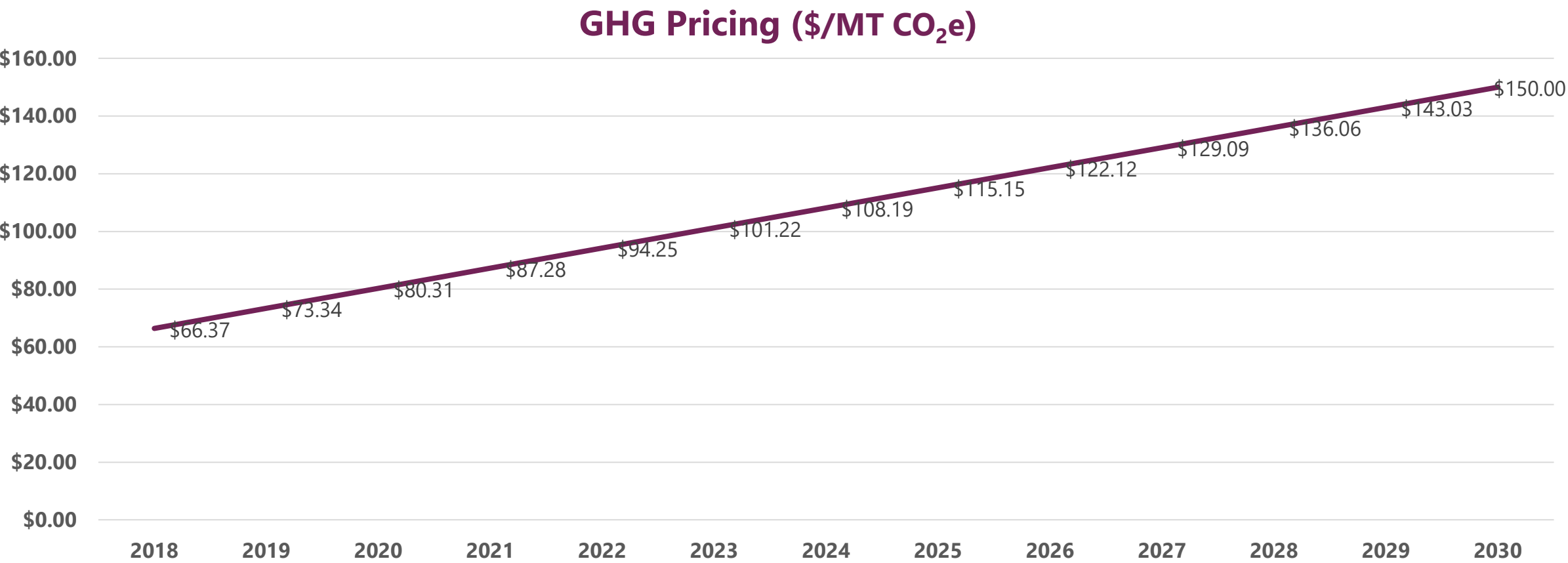
# Grid Value - Locational Net Benefit Analysis

Location-specific avoided electric grid cost to represent what the utility would have procured in the absence of Distributed Energy Resources.

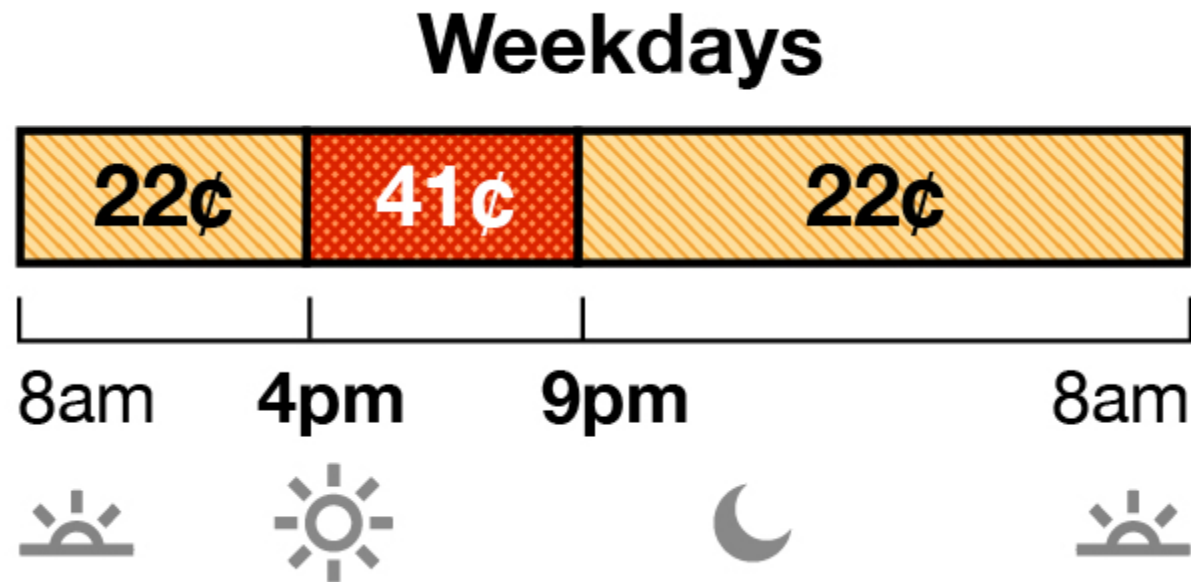


# Emissions Value – Integrated Resource Plan

“Umbrella” planning proceeding to consider all electric procurement policies and programs. To ensure CA has a safe, reliable, and cost-effective electricity supply.



# Current TOU Structure (Summer)





# Opportunity – Flexible Loads

Integrate Technologies...

# Make Non-Flexible Loads Flexible... and Communicate with Grid

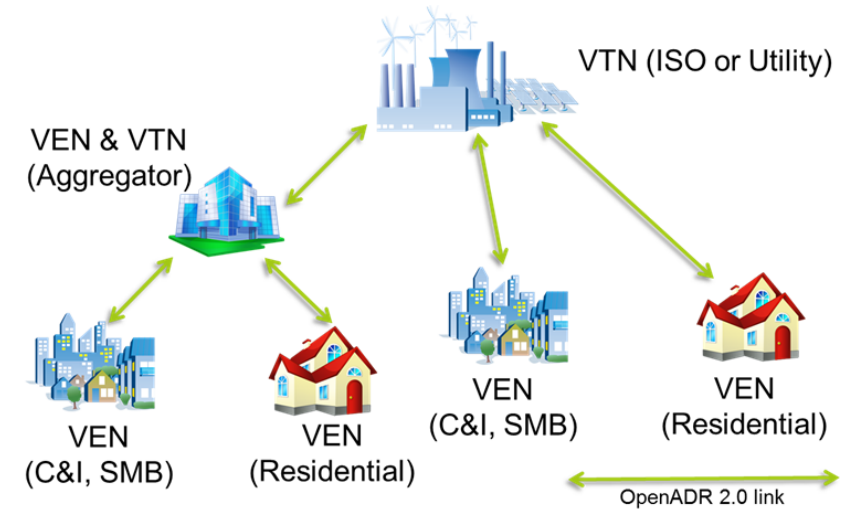
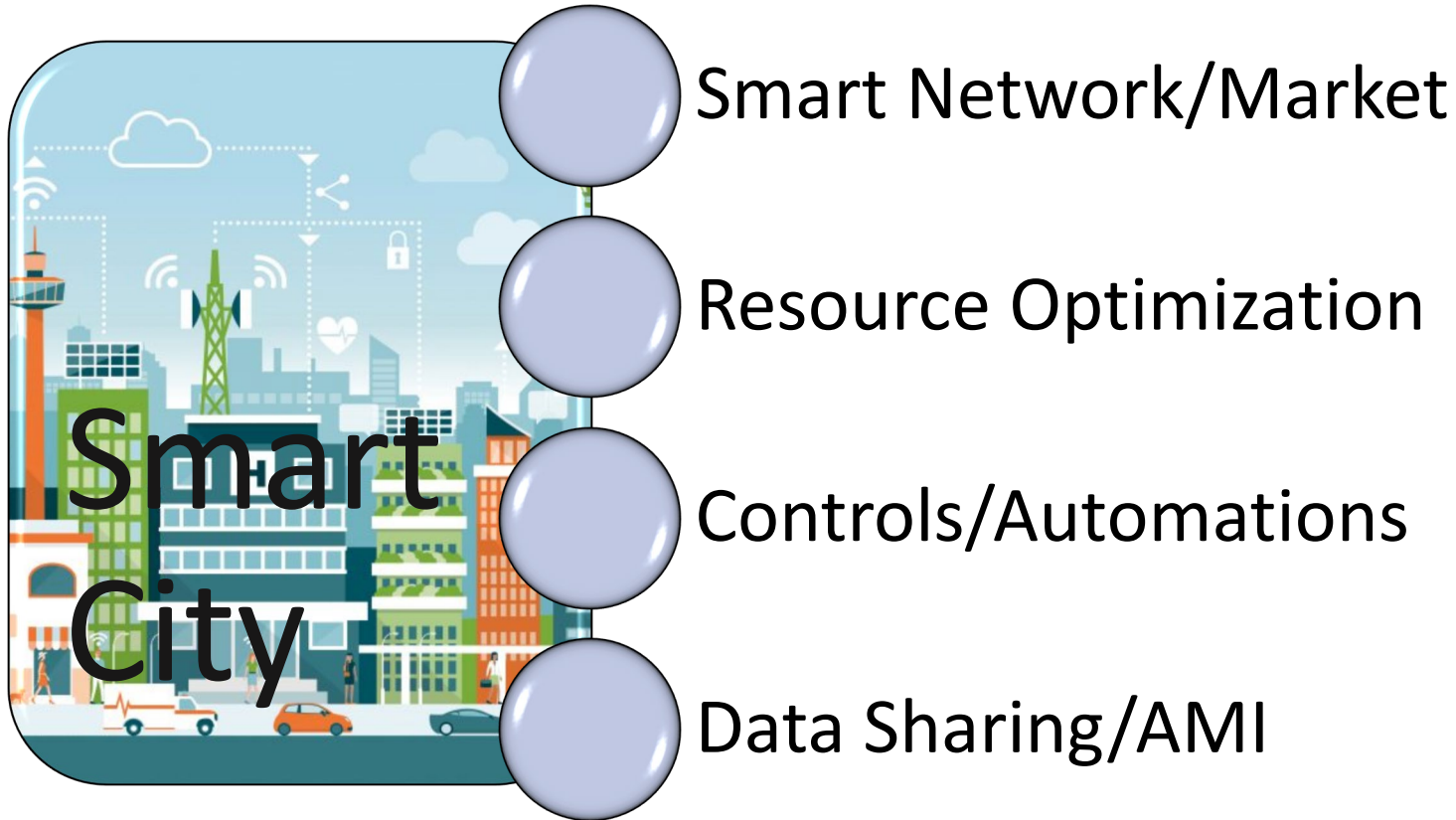


Flexible Loads

Non-Flexible Loads

Customer's Load Management

# Link Buildings to Grid



# All Electric Buildings – Just a Concept?

Not At All... It's already started



# Cities Are Considering All Electrics

City of Alameda  
Arcata  
Atherton  
Belmont  
Berkeley  
Brisbane  
Burlingame  
Campbell  
Carlsbad  
Chula Vista  
Cloverdale  
Colma  
Culver City  
Cupertino  
Davis

Emeryville  
Fairfax  
Fresno  
Gilroy  
Hayward  
Healdsburg  
Hillsborough  
Los Altos  
Los Altos Hills  
City of Los Angeles/LADWP  
County of Los Angeles  
Madera  
Marin County  
Menlo Park  
Millbrae

Milpitas  
Morgan Hill  
Mountain View  
Oakland  
Pacifica  
Palo Alto  
Petaluma  
Portola Valley  
Redwood City  
Sacramento  
San Diego  
San Francisco  
San Jose (via NBI)  
City of San Luis Obispo  
City of San Mateo

San Mateo County  
Santa Clara County  
Santa Cruz  
Santa Monica  
Santa Rosa  
SMUD  
Sebastopol  
Sonoma Clean Power  
Sonoma County  
Stockton  
Sunnyvale  
SVCE/PCE  
University of CA (UCOP)  
West Hollywood  
Windsor  
Woodside





Thank You!