DOCKETED	
Docket Number:	21-lEPR-06
Project Title:	Building Decarbonization and Energy Efficiency
TN #:	239442
Document Title:	Presentation - GHG Value of EE for a Zero Carbon Electric Grid
Description:	S1.3D_Eric Cutter_E3
Filer:	Raquel Kravitz
Organization:	Energy + Environmental Economics
Submitter Role:	Public
Submission Date:	8/24/2021 8:29:49 AM
Docketed Date:	8/24/2021

GHG Value of EE for a Zero Carbon Electric Grid

IEPR Commissioner Workshop on the Role of Energy Efficiency in Building Decarbonization

August 24, 2021

Energy+Environmental Economics

Eric Cutter
Sr. Director – Distributed Energy Resources

Electrification and Doubling of EE Goal

Energy+Environmental Economics

Electrification and EE are key pillars to meet long-term economy-wide carbon goals

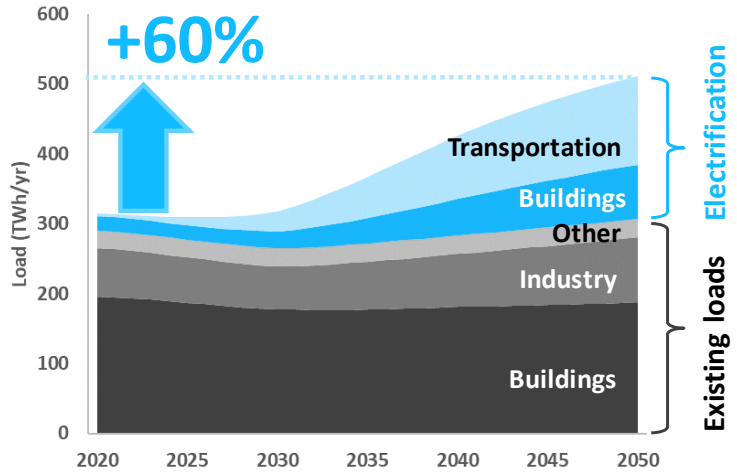
Energy efficiency & conservation

Electrification

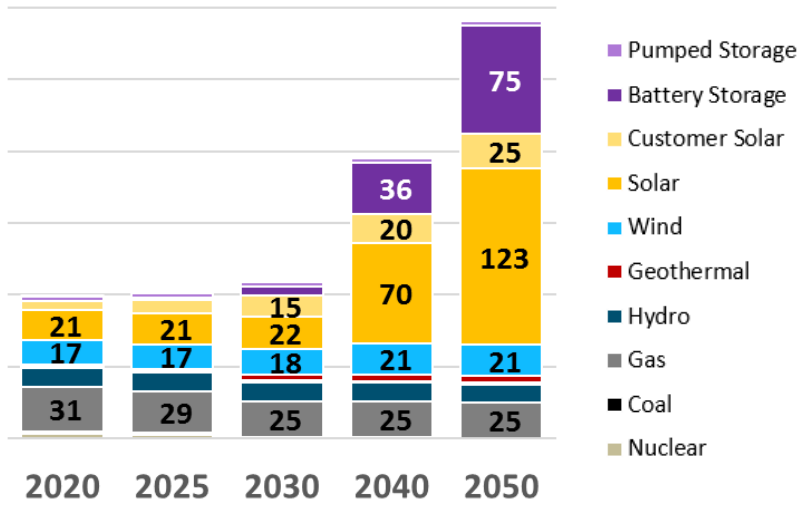
Low carbon electricity

Low carbon fuels

California Electric Loads under Deep Carbon Reductions



California Electric Resources under Deep Carbon Reductions

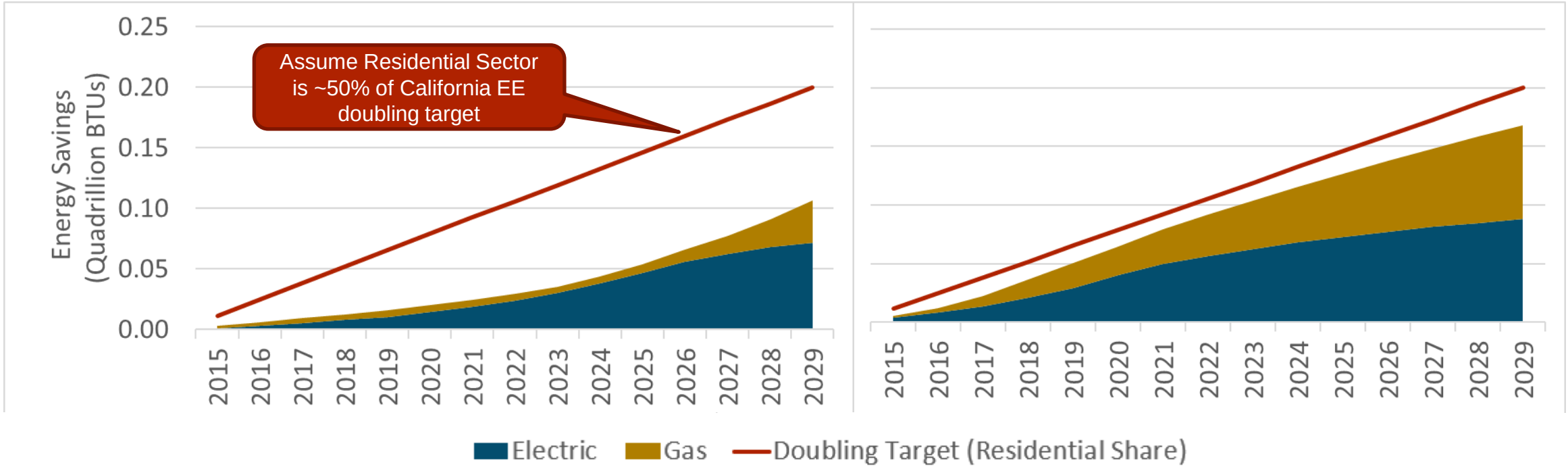


Electrification and EE play a key role in meeting societal carbon goals in all scenarios!

Two Goals: Residential building electrification compared to doubling of EE – Near Term

High Electrification Scenario for Residential Buildings

2019 EE Action Plan for Residential Sector



Illustrative comparison: Residential building electrification energy savings is roughly 60% of aggressive EE portfolio and half of doubling target by 2030

https://www.ethree.com/e3-quantifies-the-consumer-and-emissions-impacts-of-electrifying-california-homes/

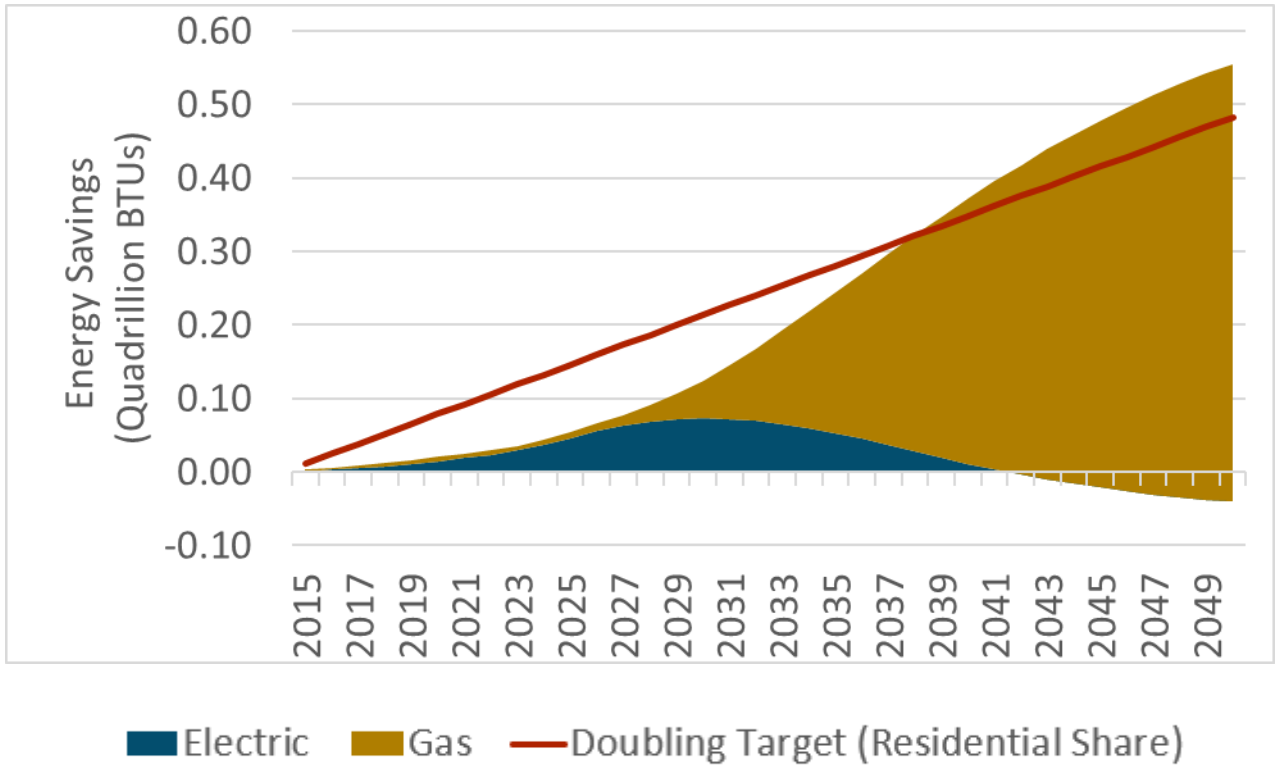
https://www.energy.ca.gov/programs-and-topics/programs/energy-efficiency-existing-buildings

Two Goals: High electrification can exceed doubling of EE target in long term

Residential electrification saves electricity in the near term and much more natural gas in the long term

By 2040 electrification can exceed doubling of EE target

This level of electrification would require additional funding and support for market transformation



https://www.ethree.com/e3-quantifies-the-consumer-and-emissions-impacts-of-electrifying-california-homes/

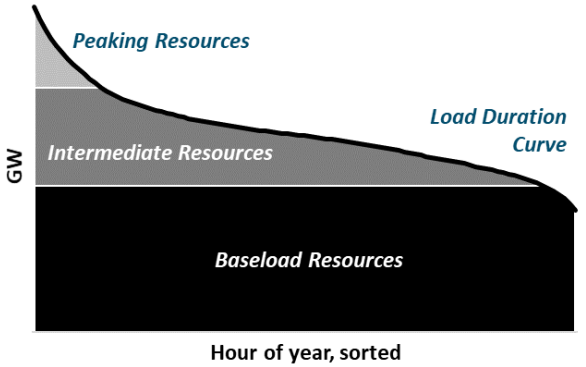
Value of Electrification and EE in Zero Carbon Planning

Energy+Environmental Economics

New planning paradigm

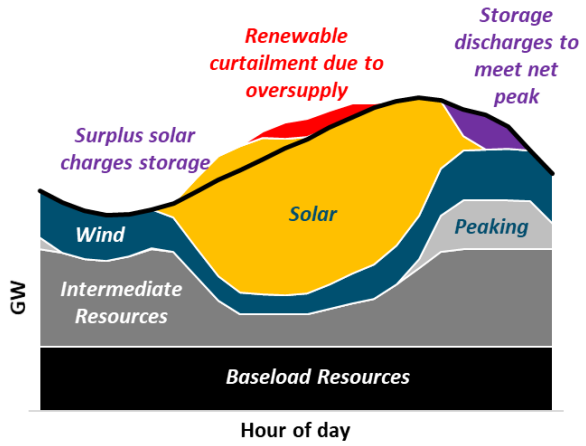
+ Old Paradigm: CCGT/CT is marginal resource

- ~ 60% Variable
- Planning grid for peak capacity
- Focus on efficient grid dispatch
- **Value of EE is reduced marginal cost and emissions of fossil generation**



+ New Paradigm: Solar and storage is marginal resource

- ~ 90% fixed cost
- Planning grid for to meet a given GHG target
- Focus on efficient capital investment and reliable grid operation with renewables and DER
- **Value of EE is reducing the total portfolio cost to meet a given GHG target**

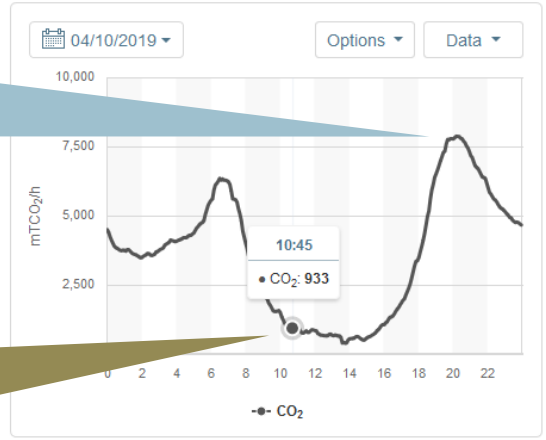


EE can avoid investment in solar and storage

GHG emissions framework for EE and electrification

Marginal emissions

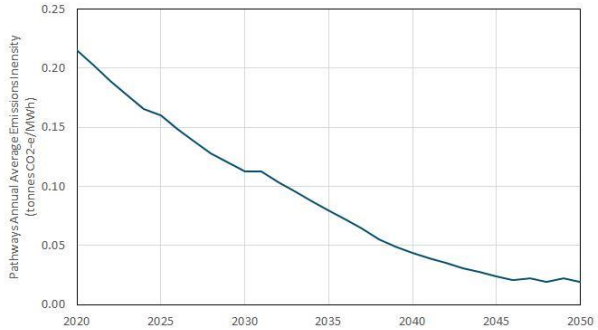
Load shape matters, saving energy on-peak…



… saves more GHG than in the middle of the day

+ **Implementing EE reduces short-run marginal grid emissions**

Emissions intensity



+ **Over long-run grid emission intensity declines to meet GHG goal**

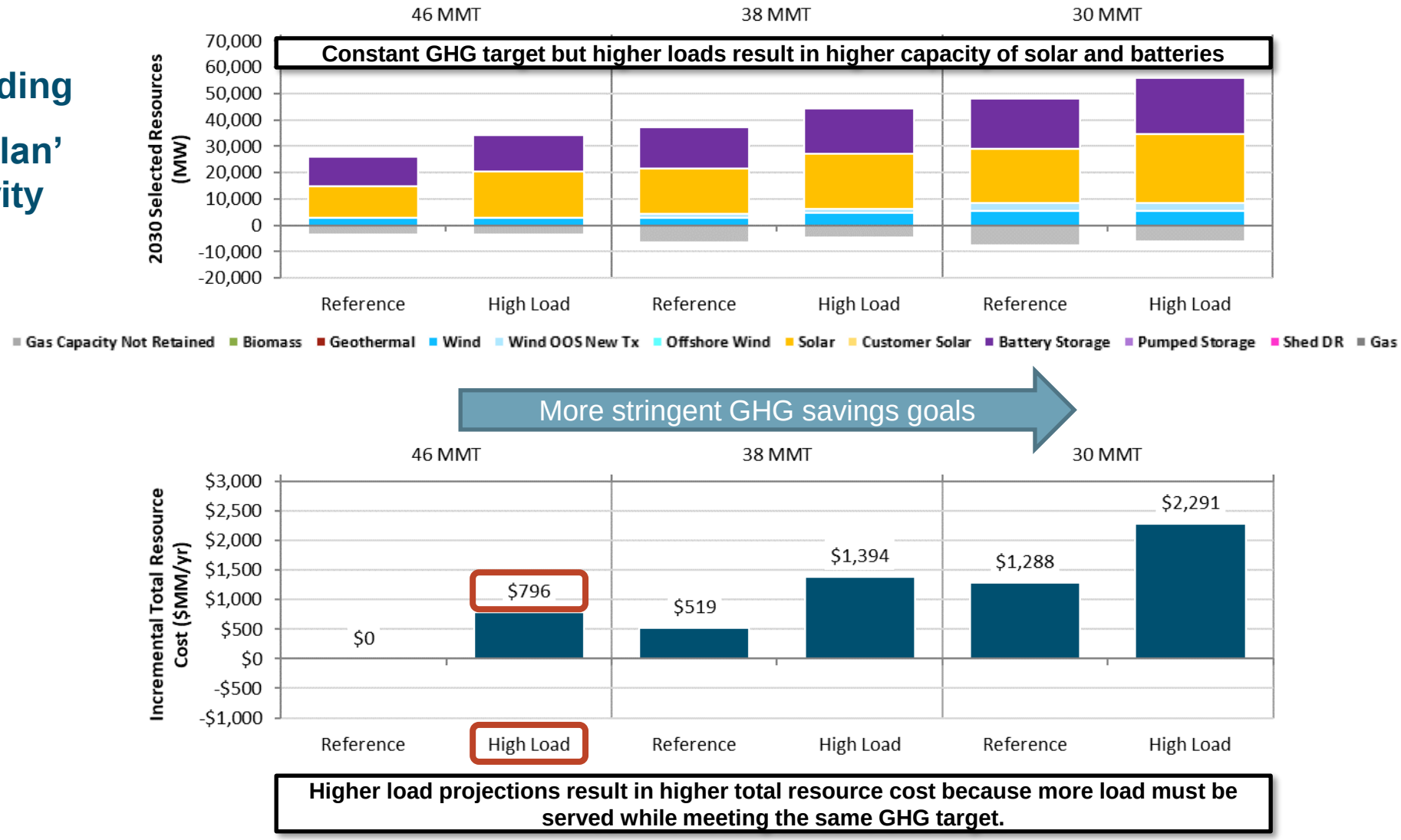
Portfolio rebalancing

+ **Planned resource portfolio rebalanced regularly to meet grid emissions intensity target**

GHG target will be met, but portfolio cost will be lower with energy efficiency and electrification

Value of EE – Lower portfolio cost to meet GHG target

- CPUC 2019 Integrated Resource Plan Proceeding
- Compare 'Reference Plan' with high load sensitivity
- High load increases portfolio cost by $800 Million/year in 46 MMT case

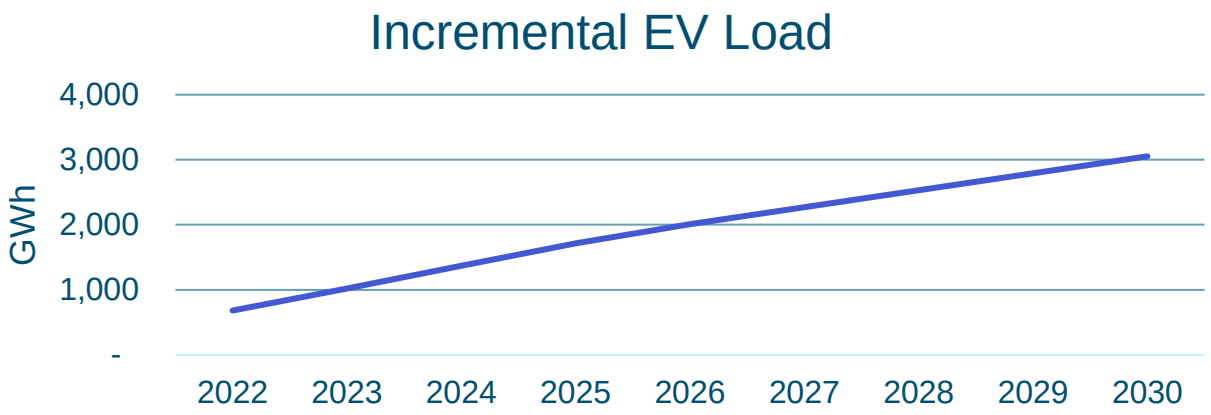


Impact of Load Shape (illustrated with EVs)

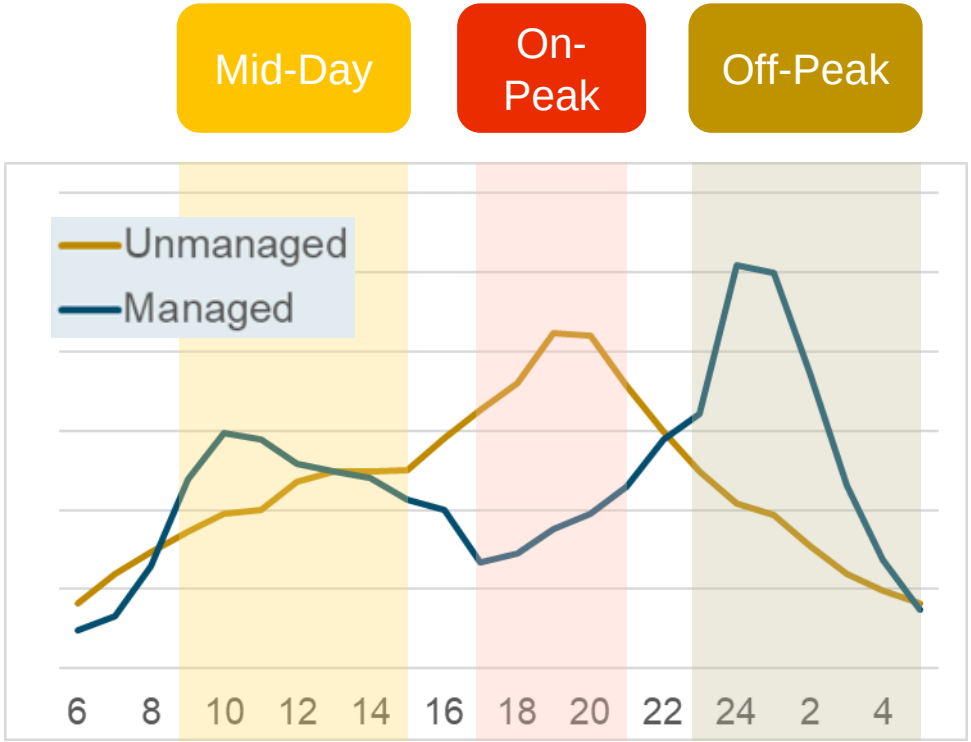
Energy+Environmental Economics

2019-2020 CPUC IRP modeling of EV load

- **IRP models least-cost portfolio to meet reliability and clean energy targets**
- **38 MMT Preferred System Plan (PSP) including ~4 Million EVs in 2030**
  - 2020 CEC IEPR Load Forecast
- **Two high EV scenarios (8 million EVs by 2030)**
  - Managed Charging
  - Unmanaged charging



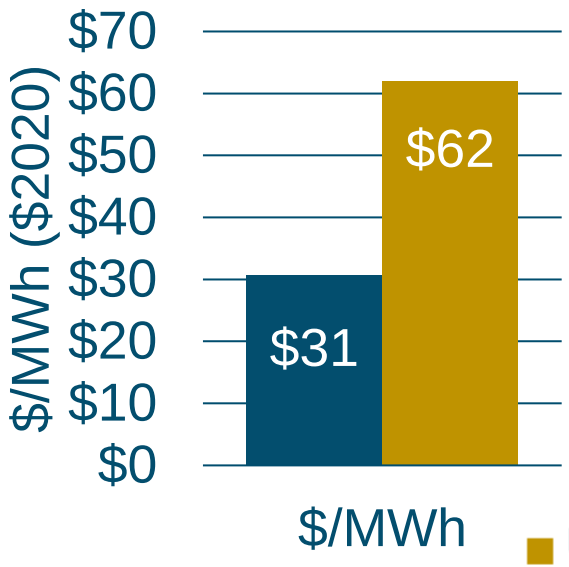
Light Duty Vehicle Charging Shapes

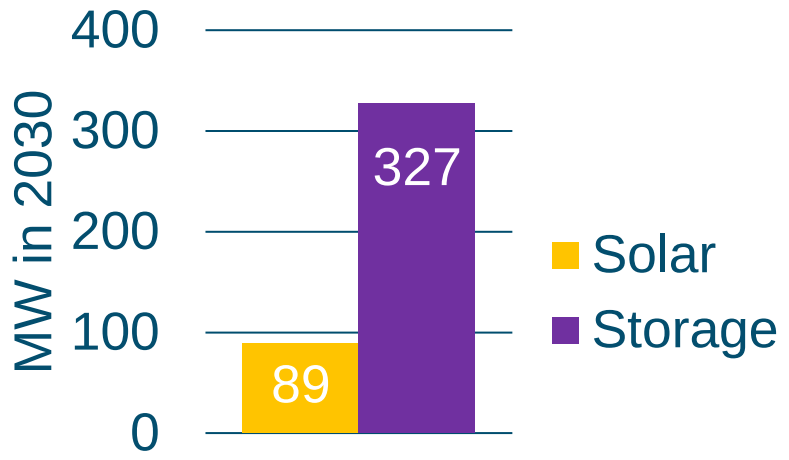


https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-power-procurement/long-term-procurement-planning/2019-20-irp-events-and-materials

CPUC IRP - Incremental cost of high EV scenario

- **Calculate incremental cost of high EV scenario above preferred system plan through 2030 ($2020)**
  - Utility Revenue Requirement (RRQ)
- **With managed load shape, incremental cost is $323 million at a levelized cost of $31/MWh**
- **With unmanged load shape, costs double to $652 million at a levelized cost of $62/MWh**
- **Unmanged load shape requires additional 89 MW of solar and 327 MW of storage in 2030**





Additional solar and storage required in 2030 for unmanaged EV charging shape

Thank You

Eric Cutter

Senior Director – Distributed Energy Resources

eric@ethree.com

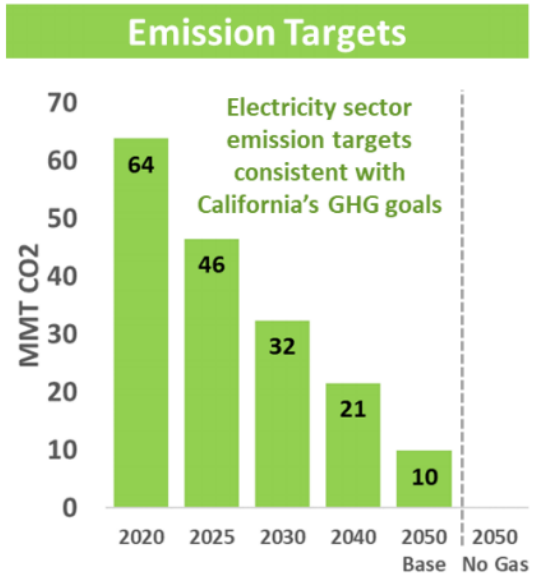
415-391-6268

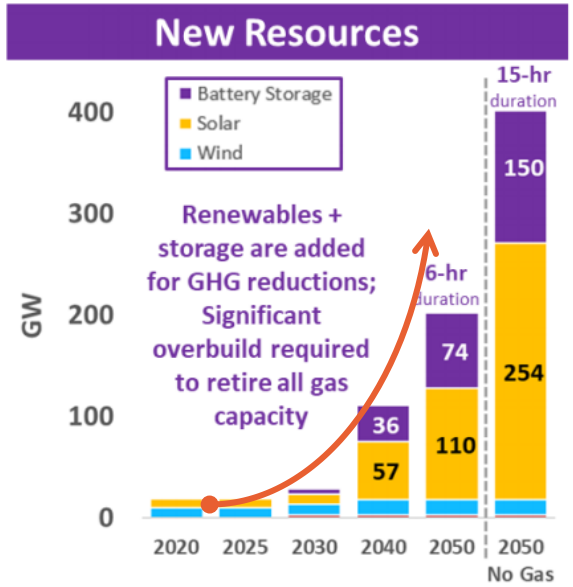
Energy+Environmental Economics

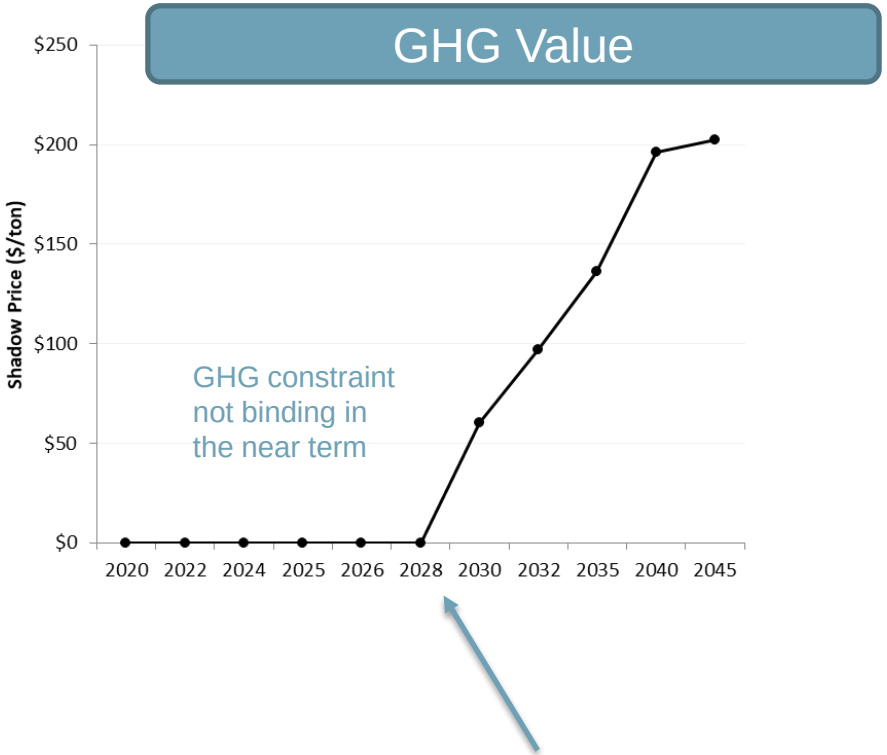
Translating to $/Ton

Energy+Environmental Economics

Translating IRP modeling to $/ton value

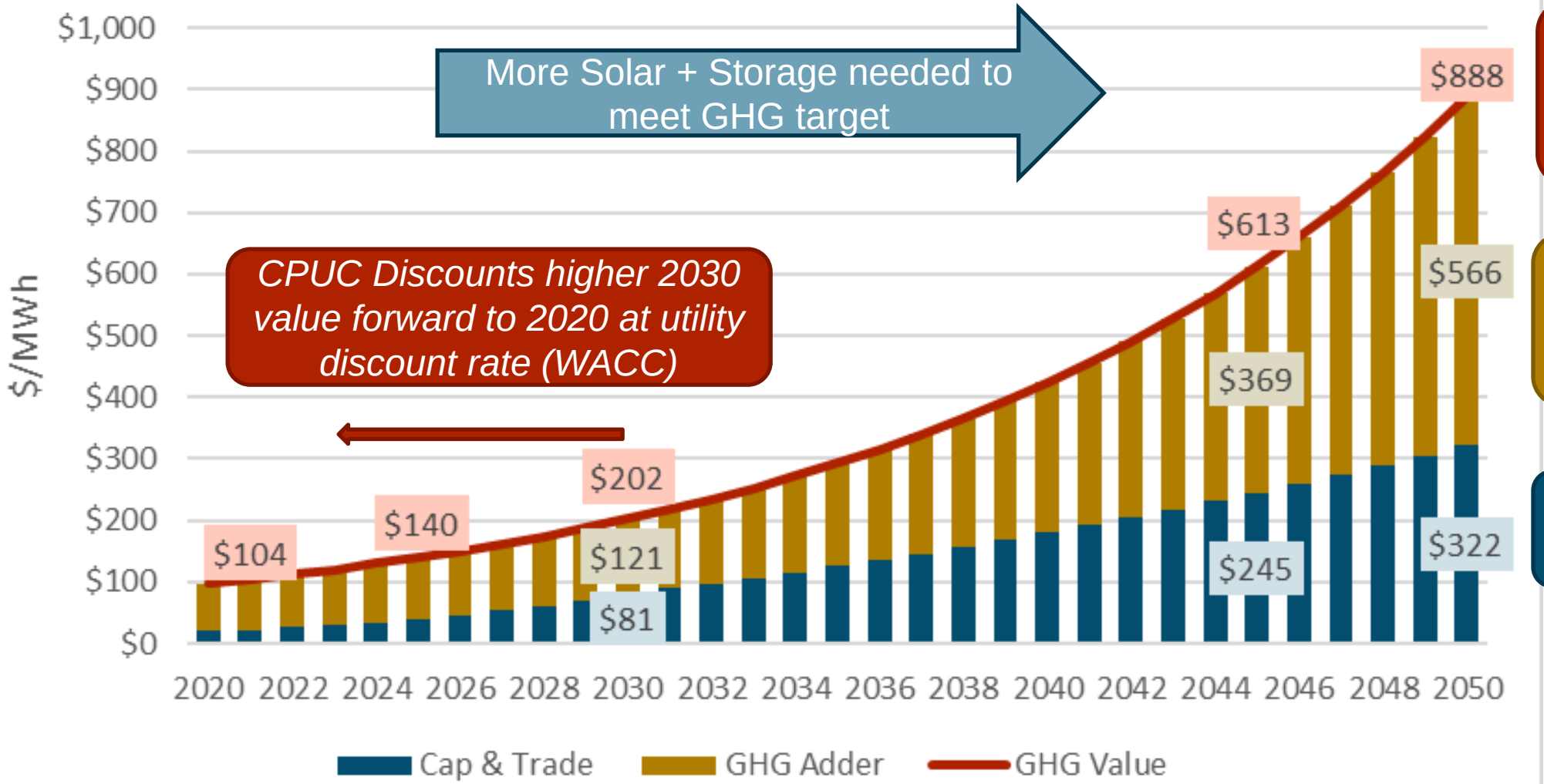






- **Marginal solar + storage resource cost in capacity expansion modeling sets the 'shadow price' for GHG emissions (**When GHG targets are 'binding'**)**
- **Shadow price for GHG tends to be low in near-term because renewables in resource portfolio exceed near-term GHG (and clean energy) targets**

2020 CPUC GHG Avoided Cost Value



Electric Sector GHG Abatement Cost

Electric Sector GHG Adder

Economy-wide Cap & Trade