What compels us to do all electric buildings in CA?

Charles J. Kim, P.E.
Southern California Edison
Perspectives
History tells us...
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

[Images from Google]
Today’s story is ...
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
Challenge: CA emits 424 Million Metric Tons of CO$_2$ A year*
SCE’s Clean Power & Electrification Pathway

Million Metric Tons of CO2

1990
2017
2020
2030
2050

40% BELOW 1990
80% BELOW 1990

DECARBONIZE THE ELECTRIC SECTOR

ELECTRICIFY THE TRANSPORTATION SECTOR

ELECTRICIFY 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 loading order of cost effective GHG abatement measures.

• E3’s “Residential Building Electrification in California” (April 2019) shows customer cost savings with electrification.

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*

- 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

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

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.
“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)

![Weekdays graph with rates: 22¢, 41¢, 22¢, and times: 8am, 4pm, 9pm, 8am]
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

Smart City

1. Smart Network/Market
2. Resource Optimization
3. Controls/Automations
4. Data Sharing/AMI
All Electric Buildings – Just a Concept?

Not At All... It’s already started
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Thank You!