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Heat Pump Retrofits

Large Scale Analysis for California

CEC Workshop on Equitable Building Decarbonization Program
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Mudit Saxena, CEO & Founder, XeroHome™ (Vistar Energy Inc.)
MSaxena@xerohome.com

XeroHome™

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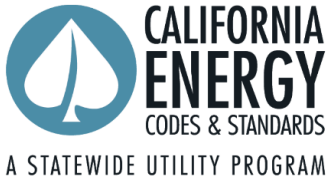


Each home pays different utility rates
Is in a different climate
Is built / used differently

14.2 Mil homes in CA

9 Mil. single-family

Will a heat pump upgrade result in utility bill savings?

Answer depends on several factors

Key variables impacting HP cost effectiveness

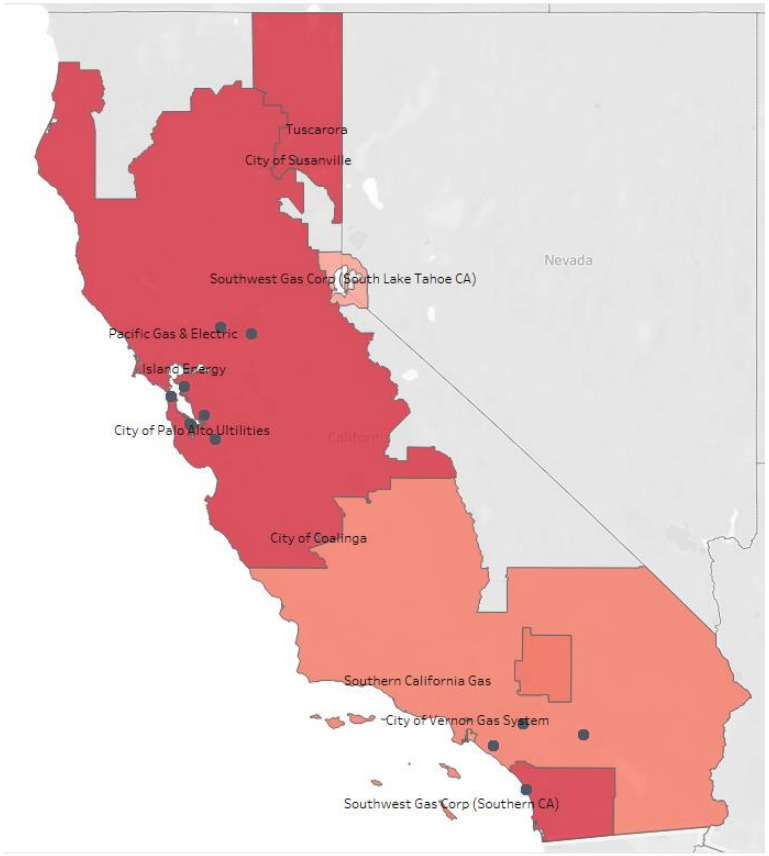
1. Utility rates – electric & gas
2. Existing equipment being replaced
3. Existing envelope condition
4. Usage pattern
5. Climate

California is a large and diverse state

Utility Rates

Electric Rate

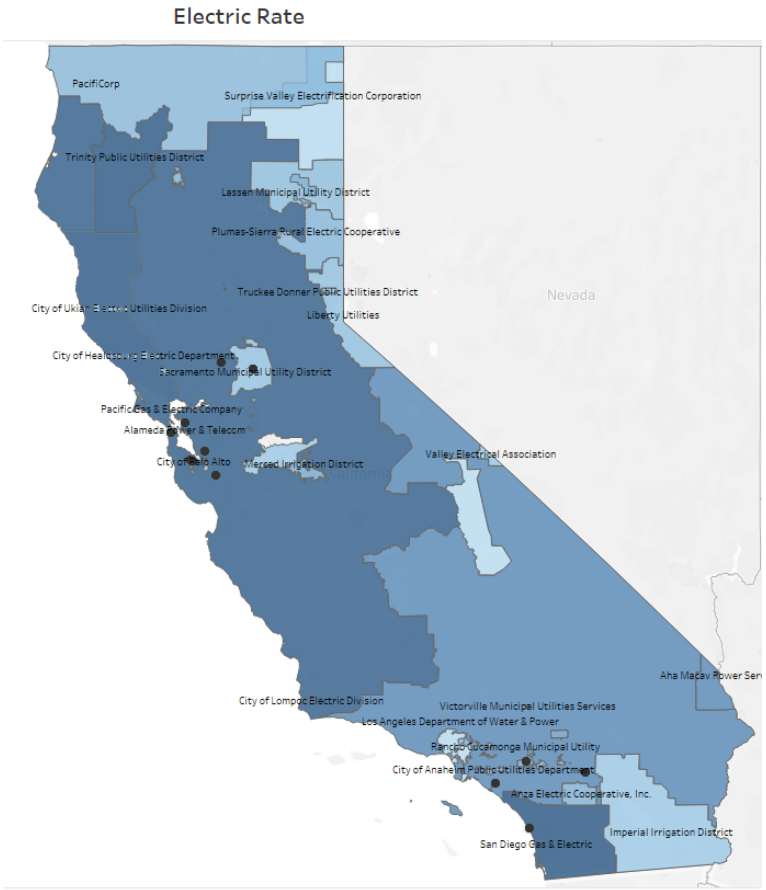
Gas Rate



Colors indicate low to high utility rates

California is a large and diverse state

Utility Rates

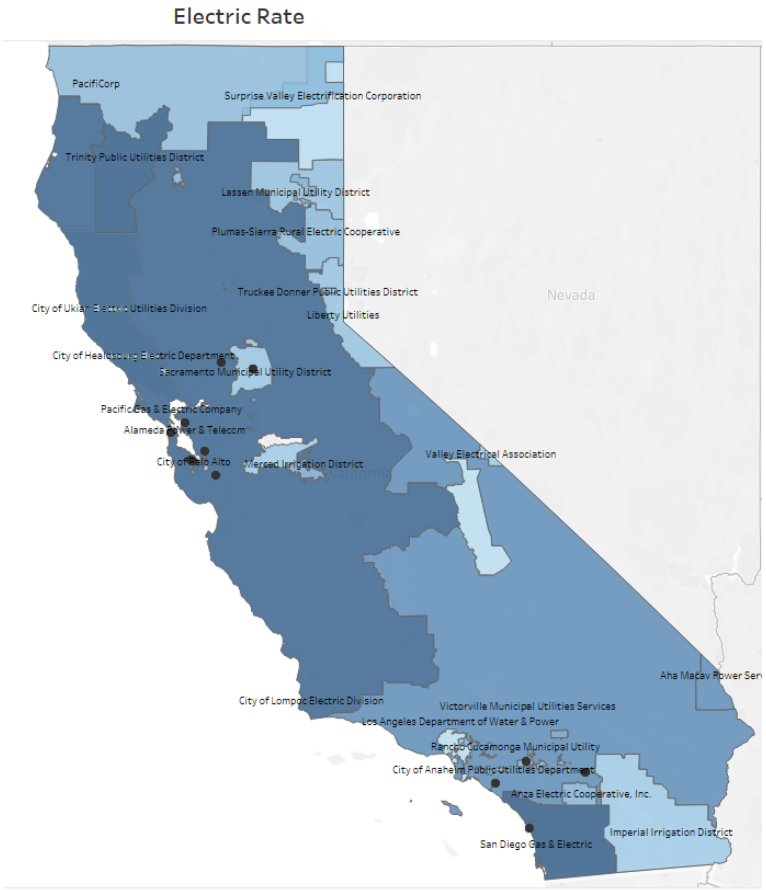


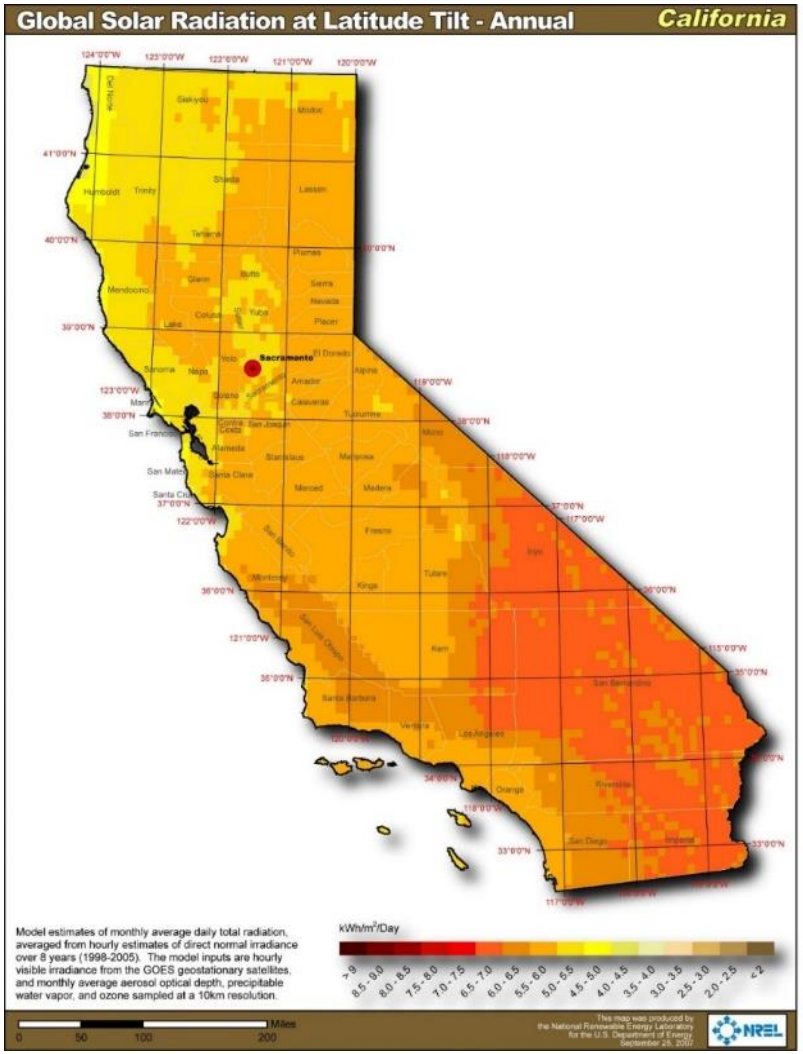
Colors indicate low to high utility rates

Chances of a heat pump replacement lowering utility bills … are higher in places where electricity rates are low compared to natural gas

California is a large and diverse state

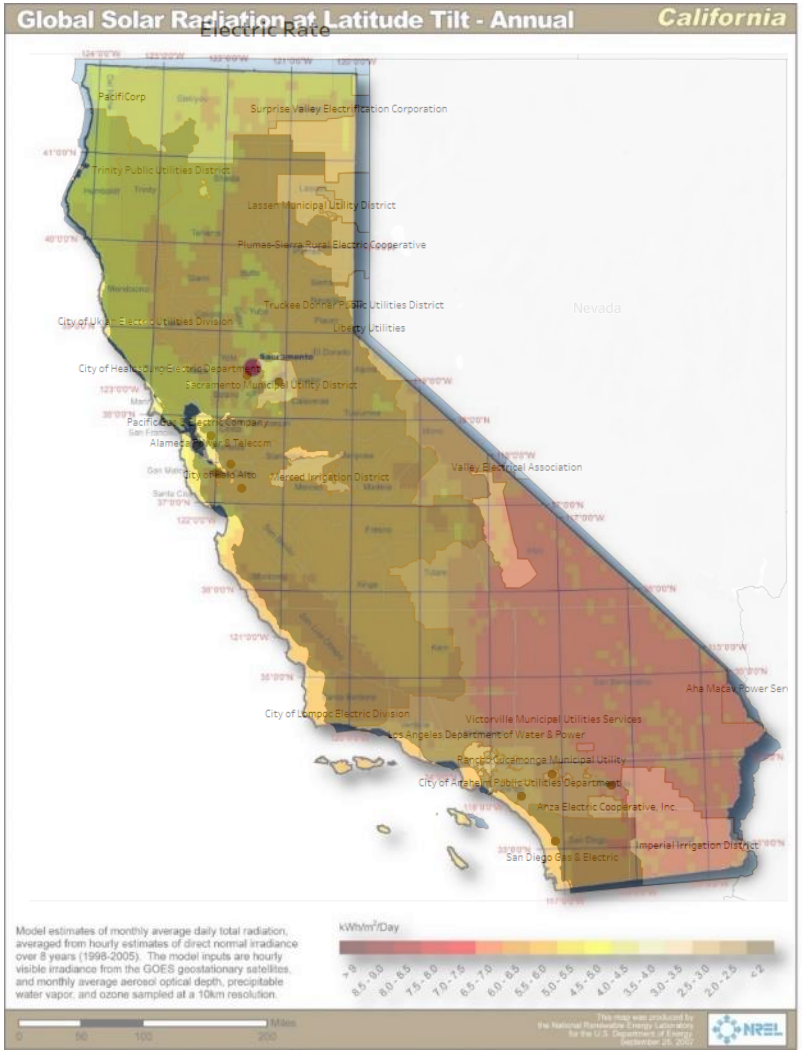
Heating and Cooling Need





California is a large and diverse state

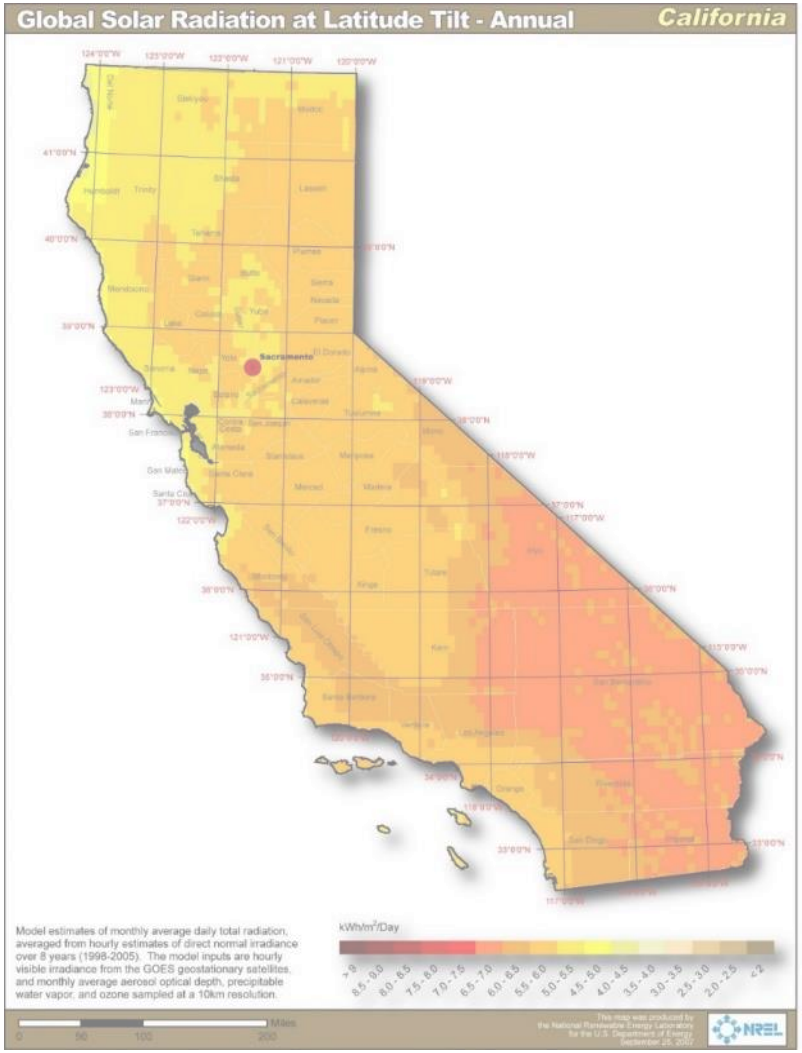
Heating and Cooling Need

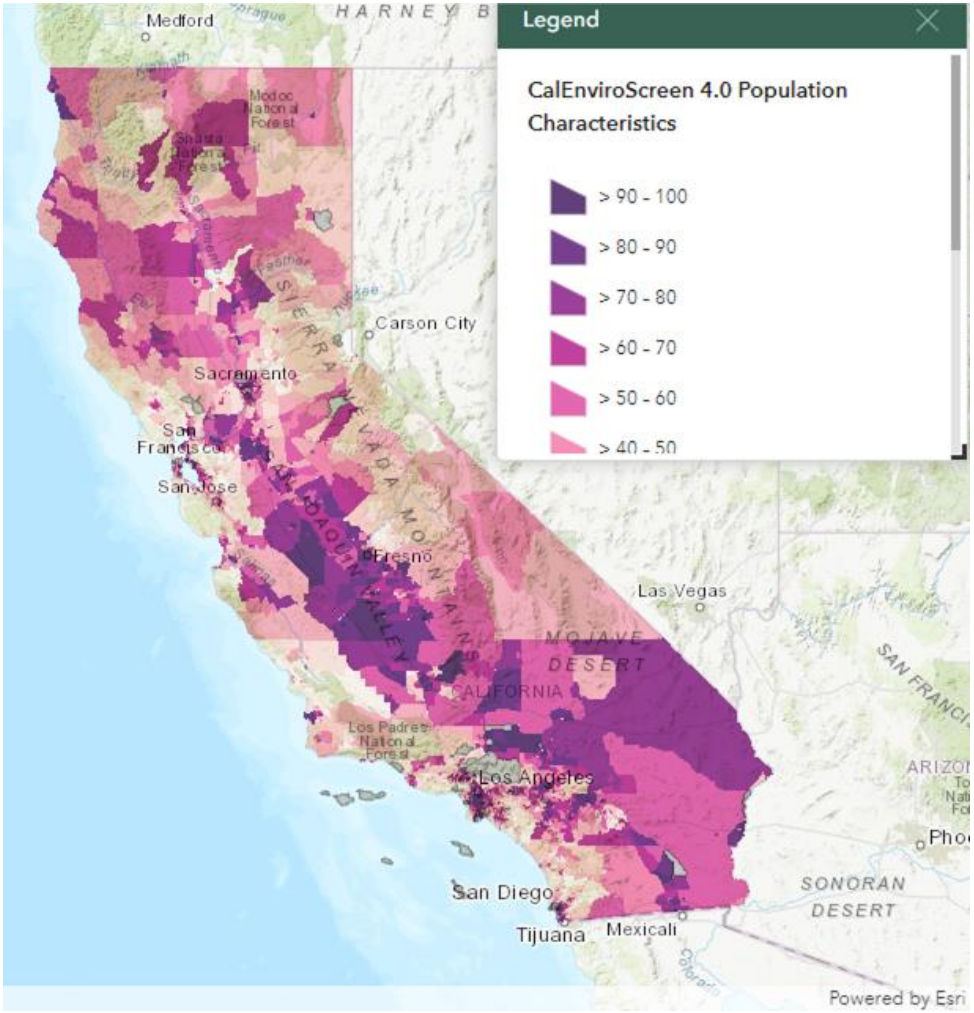


Heat Pump HVACs are more cost effective in places where there is greater heating and cooling needs

California is a large and diverse state

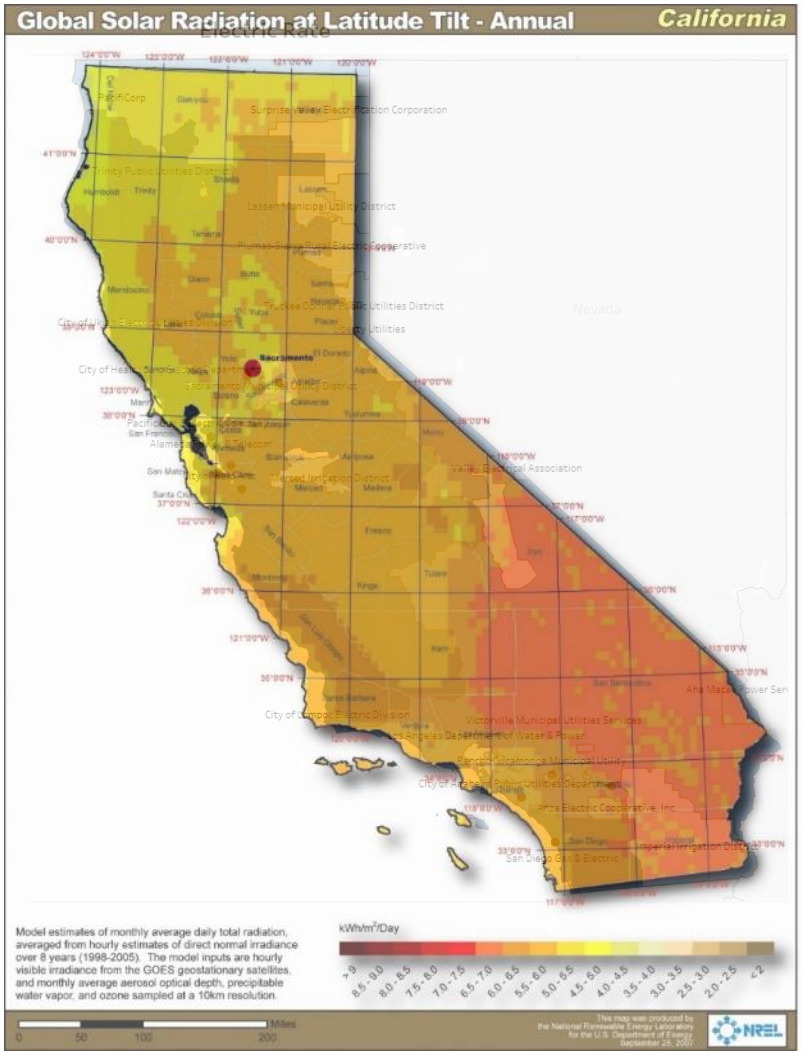
Environmental Justice Need





California is a large and diverse state

Environmental Justice Need



Data-driven, large-scale analysis can help the California Energy Commission identify priority areas of the state that can most benefit from electrification!

Buildings are complex …

But advanced calculation tools can be used to predict savings, prioritize upgrades

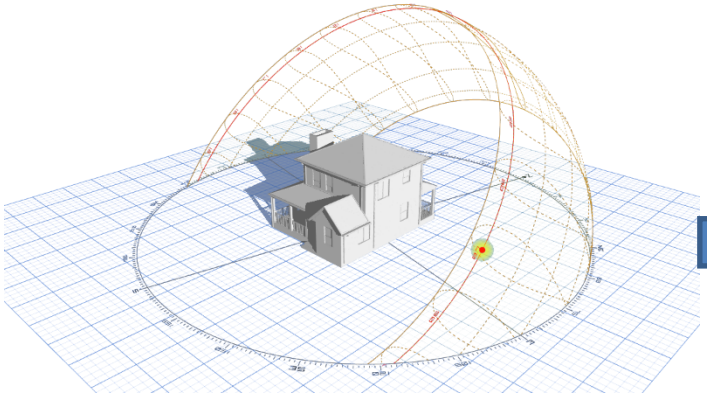
Electric TOU and Gas Rates

Marginal Carbon Intensity

Weather Data

Building Envelope Eff.

Historic energy usage

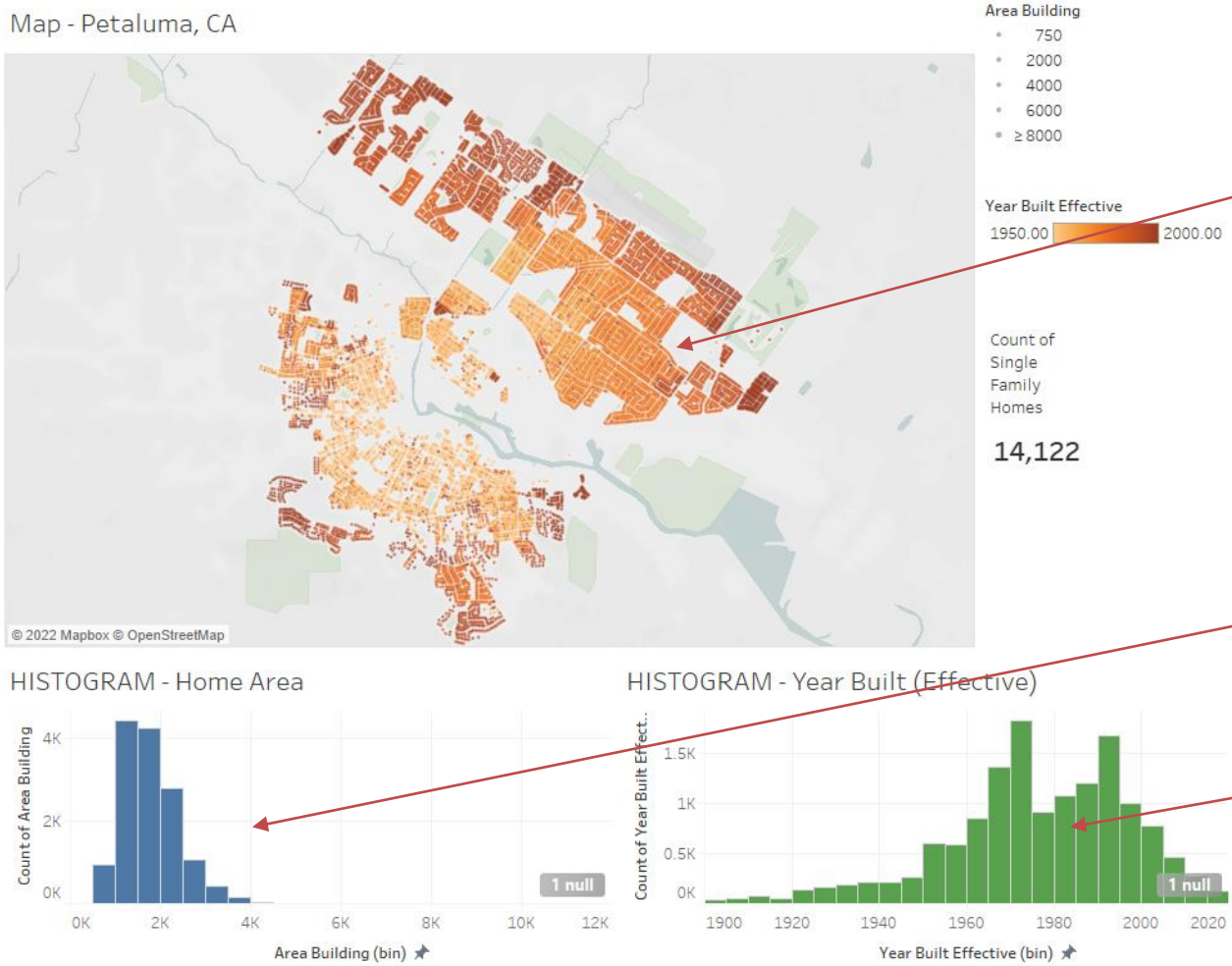


Energy Efficiency & Solar

Heat Pumps

Large Scale Energy Modeling Analysis

Petaluma, CA



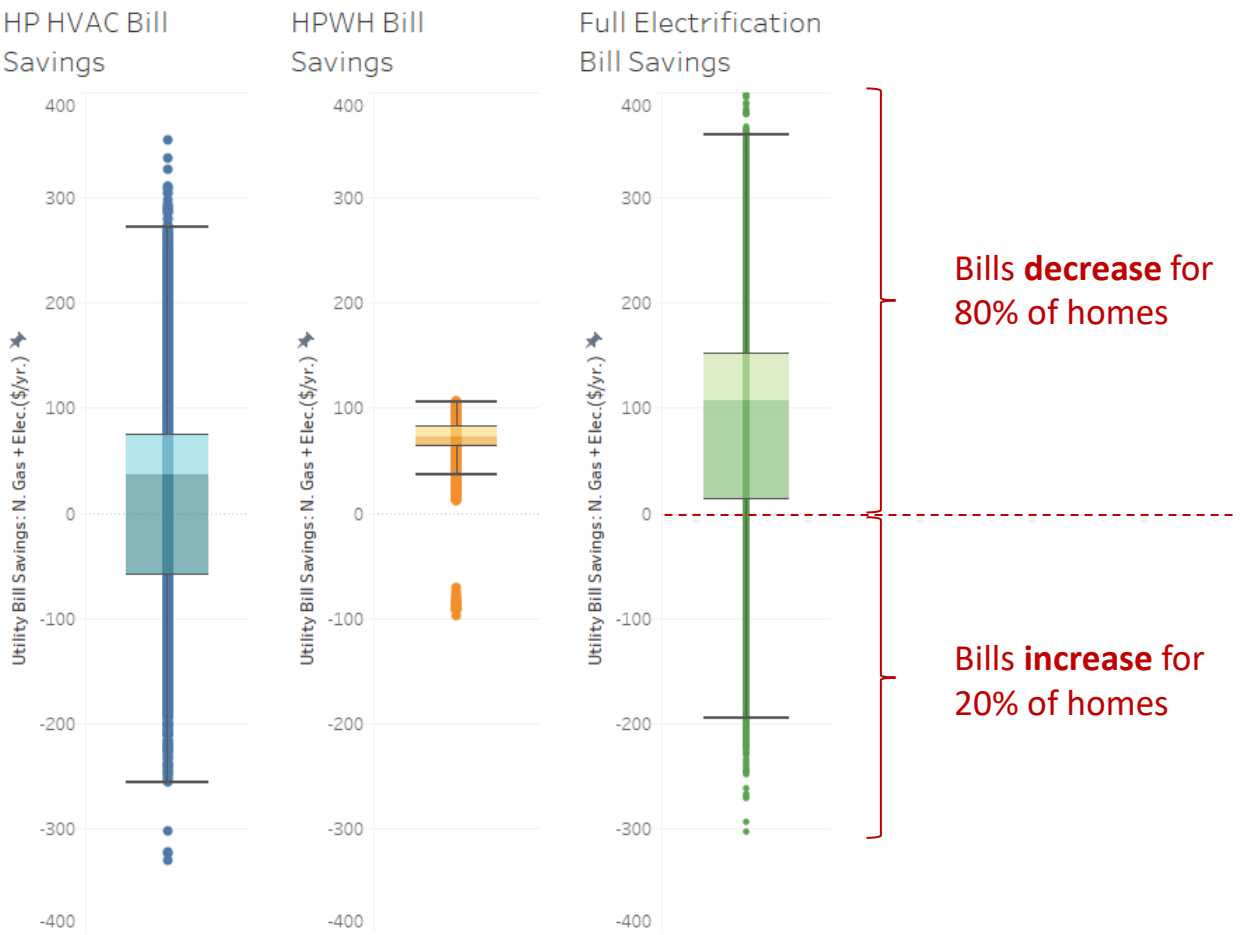
Each dot represents an energy model of a home

Most home sizes are between 1,300 to 2,600 sf
Median size: 1,900 sf

Most homes were built between 1924 and 1988
Median year built: 1956

Key Insight
Petaluma Residential Electrification Analysis

- Replacing existing space and water heating equipment with more efficient electric heat pumps, will result in lower utility bills for about 80% Petaluma homes.



Key Insight
Petaluma Residential Electrification Analysis

- For the **20% homes** where electrification raises utility bills … **energy efficiency** and **renewables** combined with **electrification** can create a positive savings ‘package’

Home

Electrification

Efficiency

Direct Install Program for Heat Pumps
Equitable Building Decarbonization Program

- Identify locations / home characteristics / usage patterns where heat pump replacements will result in utility bill savings
  - Prioritize LMI regions with higher equity needs and where utility bill savings are high with heat pumps.

- Where utility bill savings are harder … identify energy efficiency / renewables that when packaged with heat pumps result in guaranteed utility bill savings
  - Prioritize LMI homes that are great candidates for efficiency + electrification upgrades

Thank you
Questions?

Mudit Saxena
CEO & Founder, XeroHome
MSaxena@xerohome.com
Ph: 916-543-7186
https://about.xerohome.com

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