

Statewide Codes and Standards

Existing Single Family Homes Cost Effectiveness Study Update

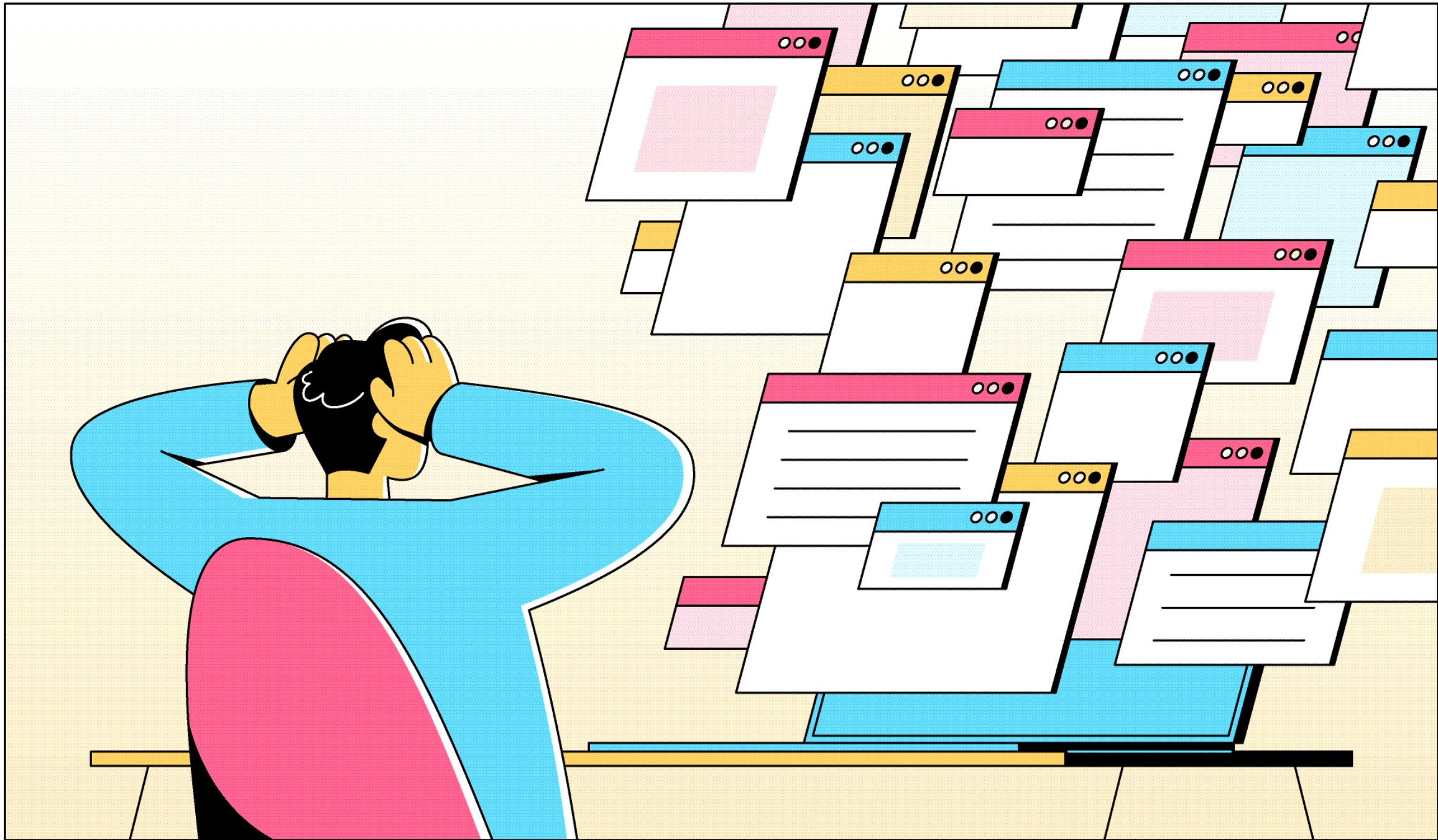
September 11, 2024



Agenda

- Greetings and Introduction
- Single Family Retrofits Study Updates
- Cost Effectiveness Explorer:
Existing Home Results
- Study Results and Implications
- Building A Policy in the Explorer
- Q&A and Wrap-Up

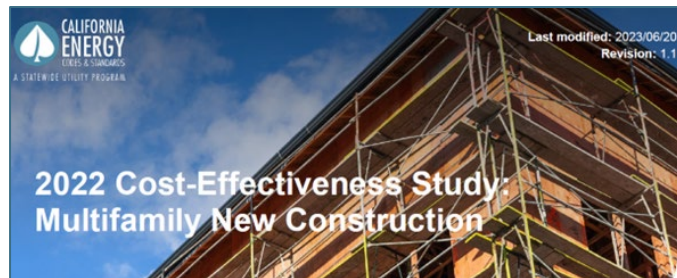
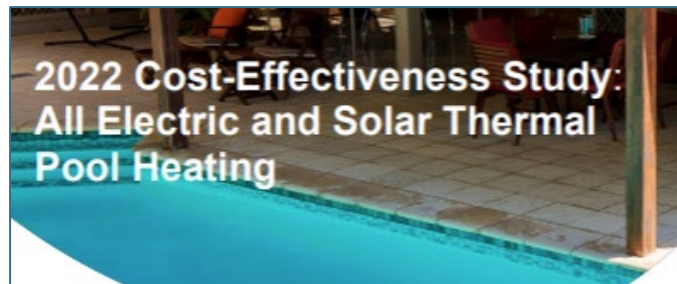




Legal Requirements for Amendments to the Building Standards

All Parts (1-12):	In Addition, Part 6 (Energy):
Finding that amendment is reasonably necessary because of local climatic, geological, topographic or environmental conditions	Cost-effective (as determined by local jurisdiction)
Compliance with local requirements for ordinances	May not preempt federal regulations (appliances for which there is a federal efficiency standard)
Compliant with all state laws	More stringent than state requirements (diminution of energy consumption)
Updated for each new building code cycle	<p>Disclaimer: We are not lawyers and nothing here is legal advice. Local government staff should discuss any policy decisions with their city or county attorney. CEC approval does not guarantee preemption protection.</p>
Filed with the State	
Accessible to the public	

Cost-Effectiveness: A Critical Step in the Process



Why do we need cost-effectiveness studies?

- Document compliance with CEC requirements
- Inform Ordinance Development
- Understand and Communicate Impacts
- Identify local and regional opportunities

Studies support a range of local energy codes

- Building Efficiency and Decarbonization
- Water Efficiency
- Pool Heating
- Plus...

Existing Single Family Study Update



What's new?

- New tariffs and rates
- Updated Costs
- Additional measures
 - Heat pump variations
 - Equipment replacement

Where does it lead?

- Specific measure requirements
- FlexPath: more options for compliance
- AC Replacements



Study Updates

Overview

- Updated costs through a contractor survey
- Utility tariff escalation sensitivity analysis
- Net Billing Tariff (NBT) Rate
- Updated software (2025 CBECC-Res research version)
- Utility Rates
- New Measures: Ductless HVAC, HPWH Tank Locations

Contractor Surveys

- **Goal:** Capture current pricing for HVAC, plumbing, envelope and air-sealing, and PV installation
- **Method:** Leverage existing relationships
- **When:** Summer of 2023
- **Takeaways:**
 - Higher costs in update compared to previous study
 - Many factors that can impact costs



Methodology: Vintages

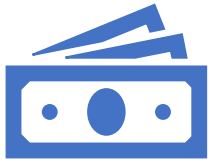
Prototype Characteristics:

	Specification
Existing Conditioned Floor Area	1,665 ft ²
Num. of Stories	1
Num. of Bedrooms	3
Window-to-Floor Area Ratio	13%
Attached Garage	2-car garage

Assumptions:

- Individual space conditioning and water heating systems, one per single family building.
- Split-system air conditioner with natural gas furnace.
- Small storage natural gas water heater.
- Gas cooktop, oven, and clothes dryer.
- Three Vintages: Pre-1978, 1978-1991, 1992-2010

Methodology: Cost-Effectiveness



2 Methodologies

1. “On-Bill” customer focus
 1. IOU TOU rates based on region
 2. Rate escalation over time
2. Long-term System Cost (LSC):
Long-term cost of operating California’s energy system



Assumptions

- 30-year analysis period

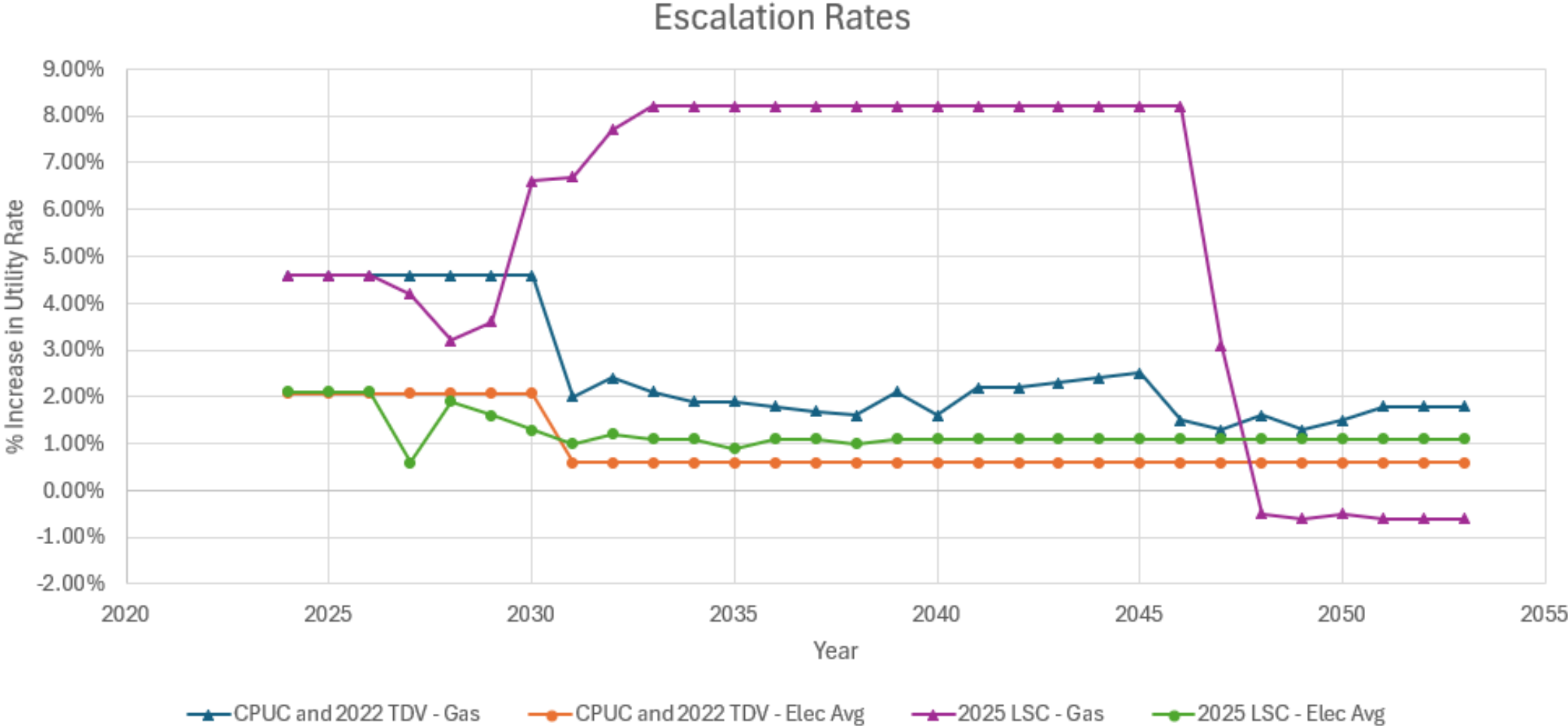


Metrics

Net Present Value

NPV = PV of benefit – PV of cost

Escalation rates



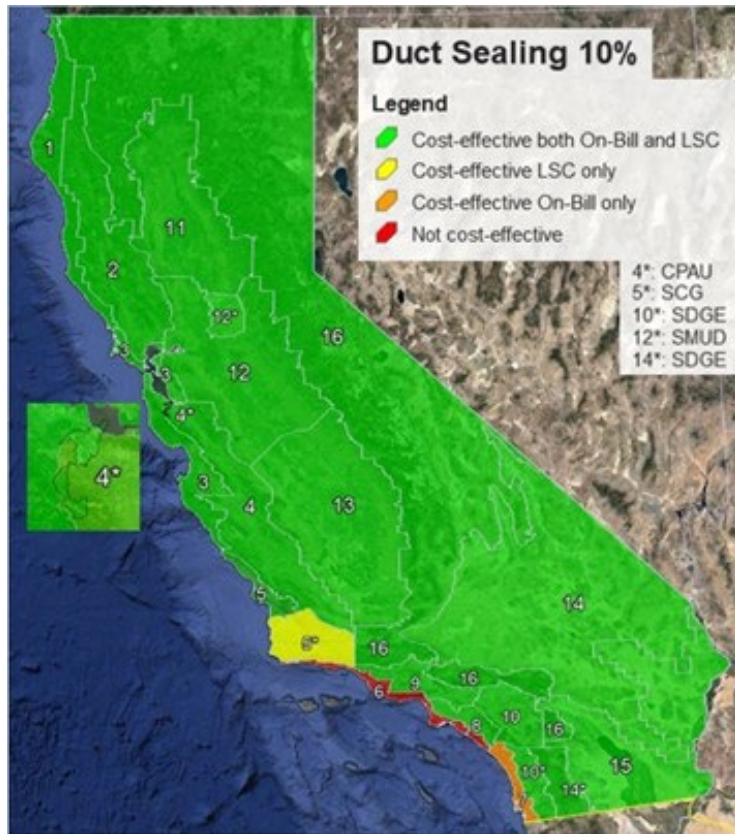


Explorer: Existing Home Results

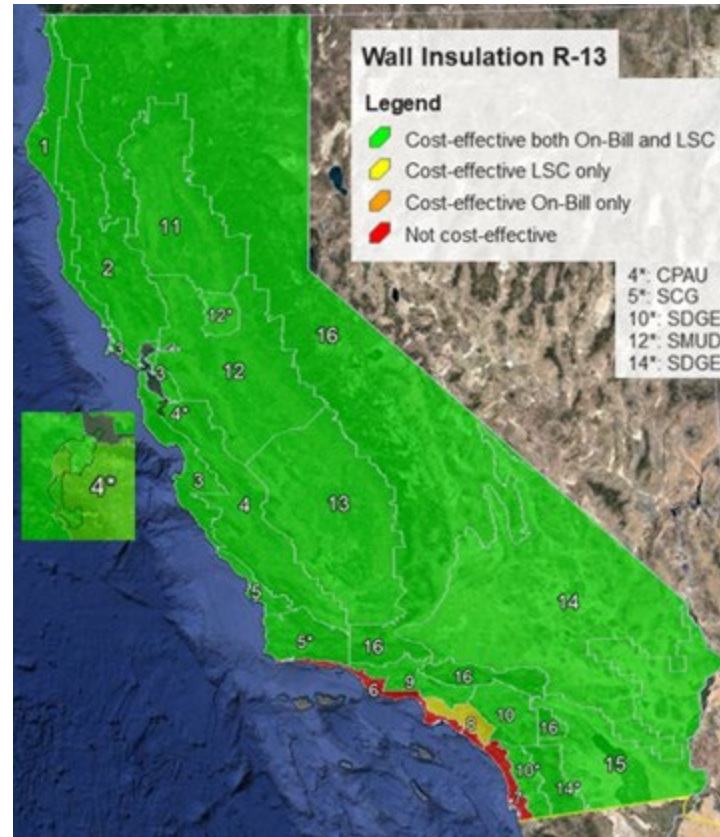


Study Results and Implications

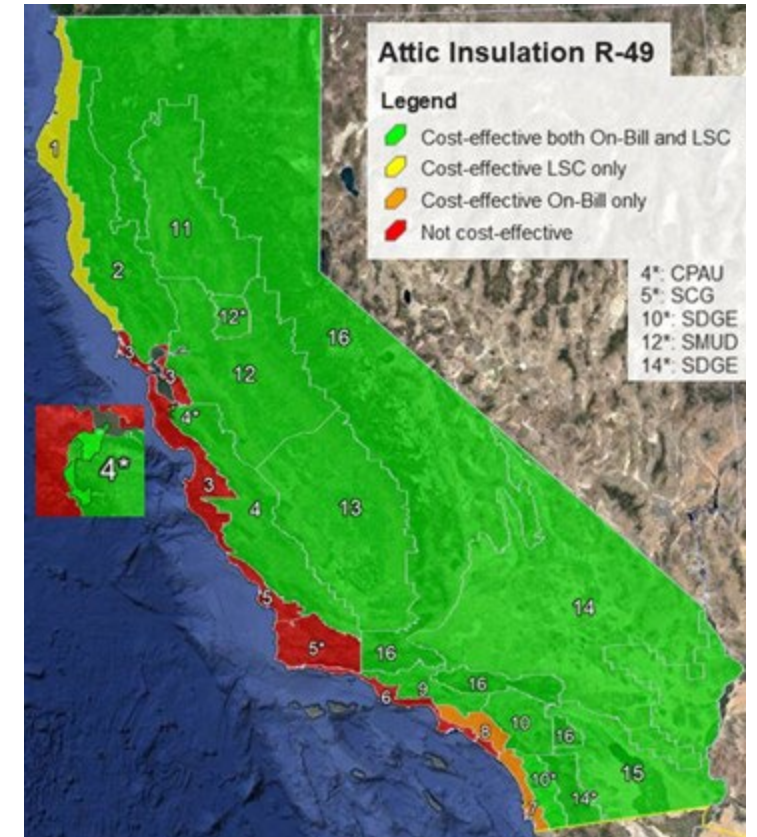
Results: Ducts & Envelope



Duct Sealing (10% leakage)
[Pre-1978]

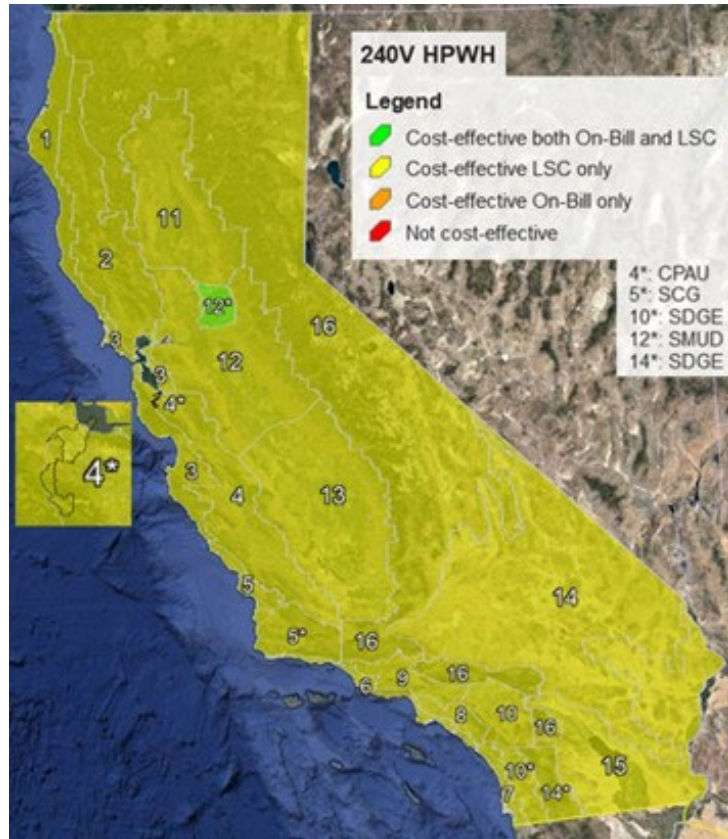


R-13 Wall Insulation
[Pre-1978]

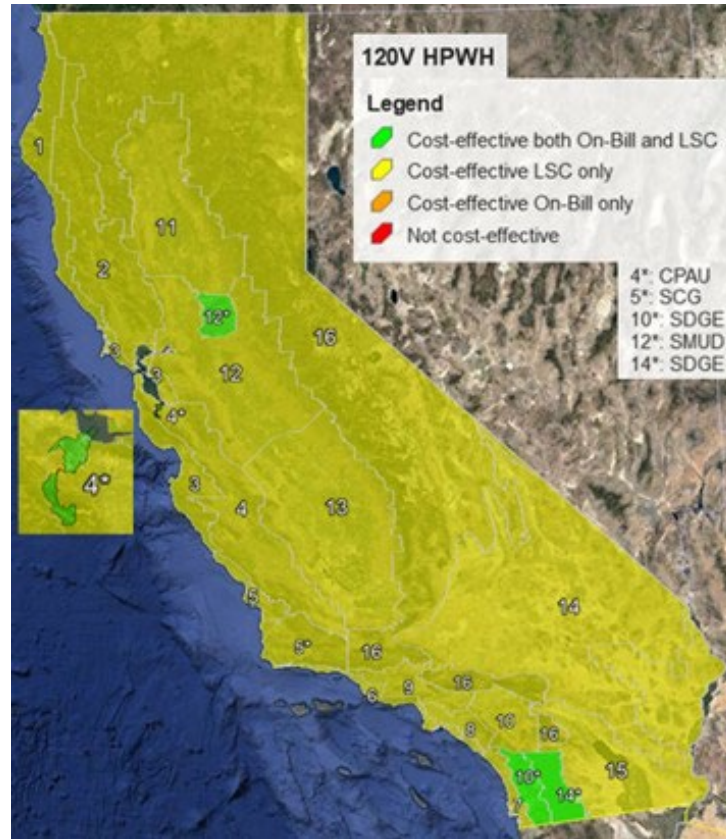


R-49 Attic Insulation
[Pre-1978]

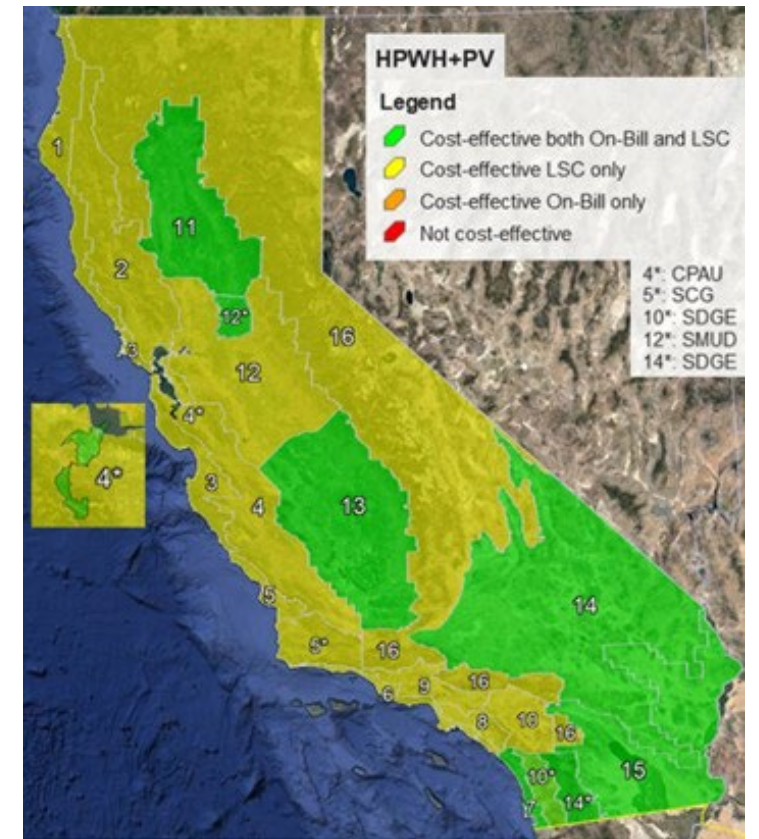
Results: Water Heating



240V Federal Min HPWH
[1992-2010]

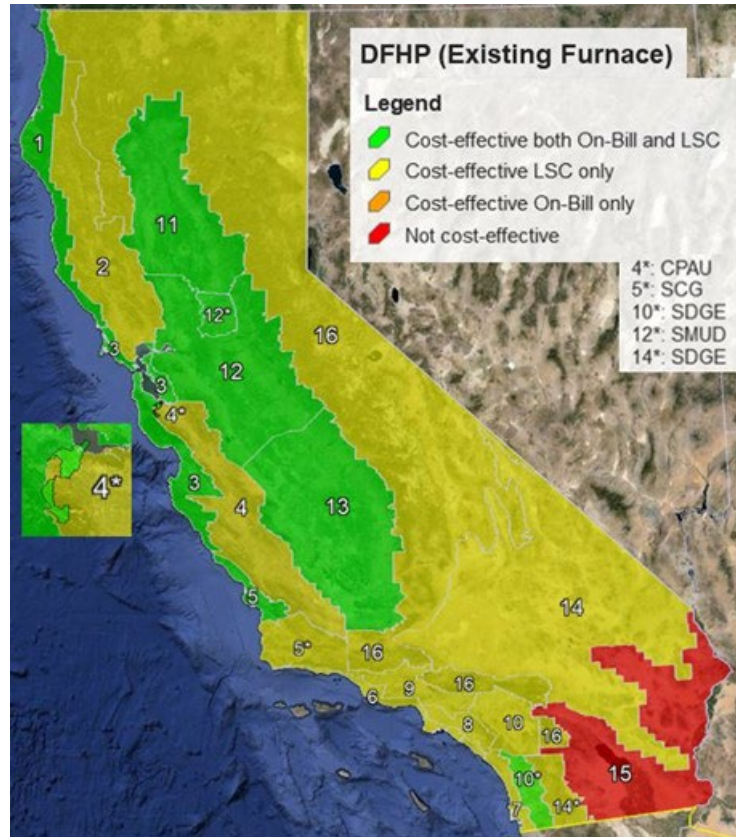


120V Market Standard
NEEA HPWH
[1992-2010]
Public

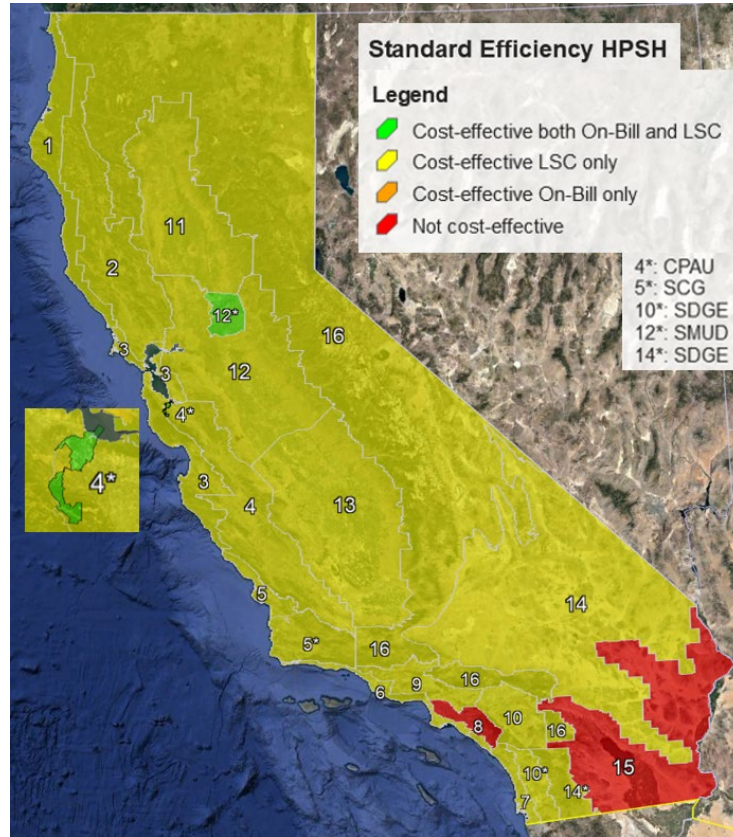


HPWH + 3kW PV
[1992-2010]

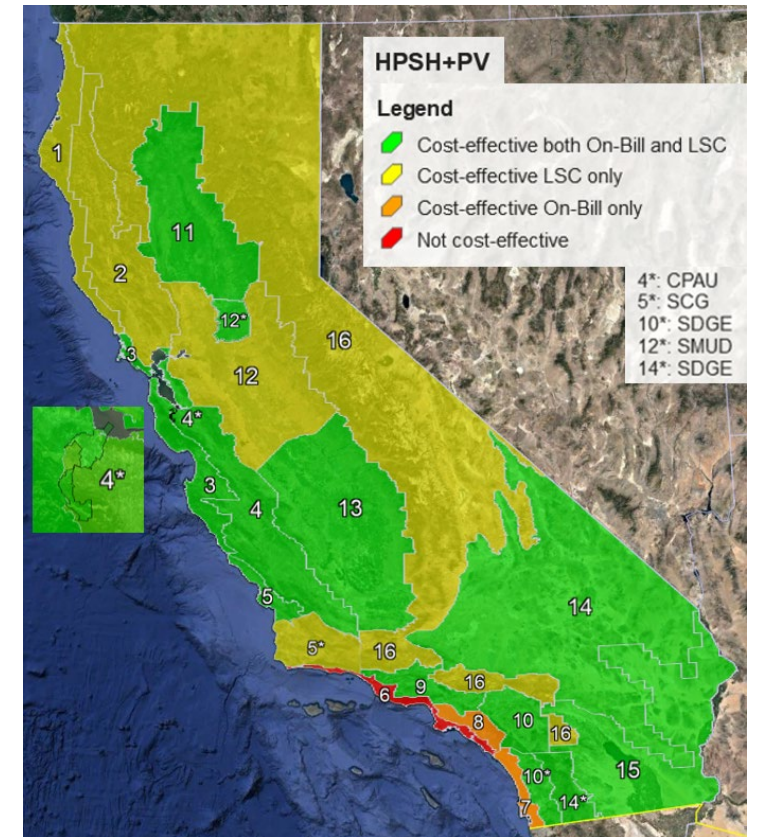
Results: Space Heating



DFHP with Existing Furnace
[1992-2010]

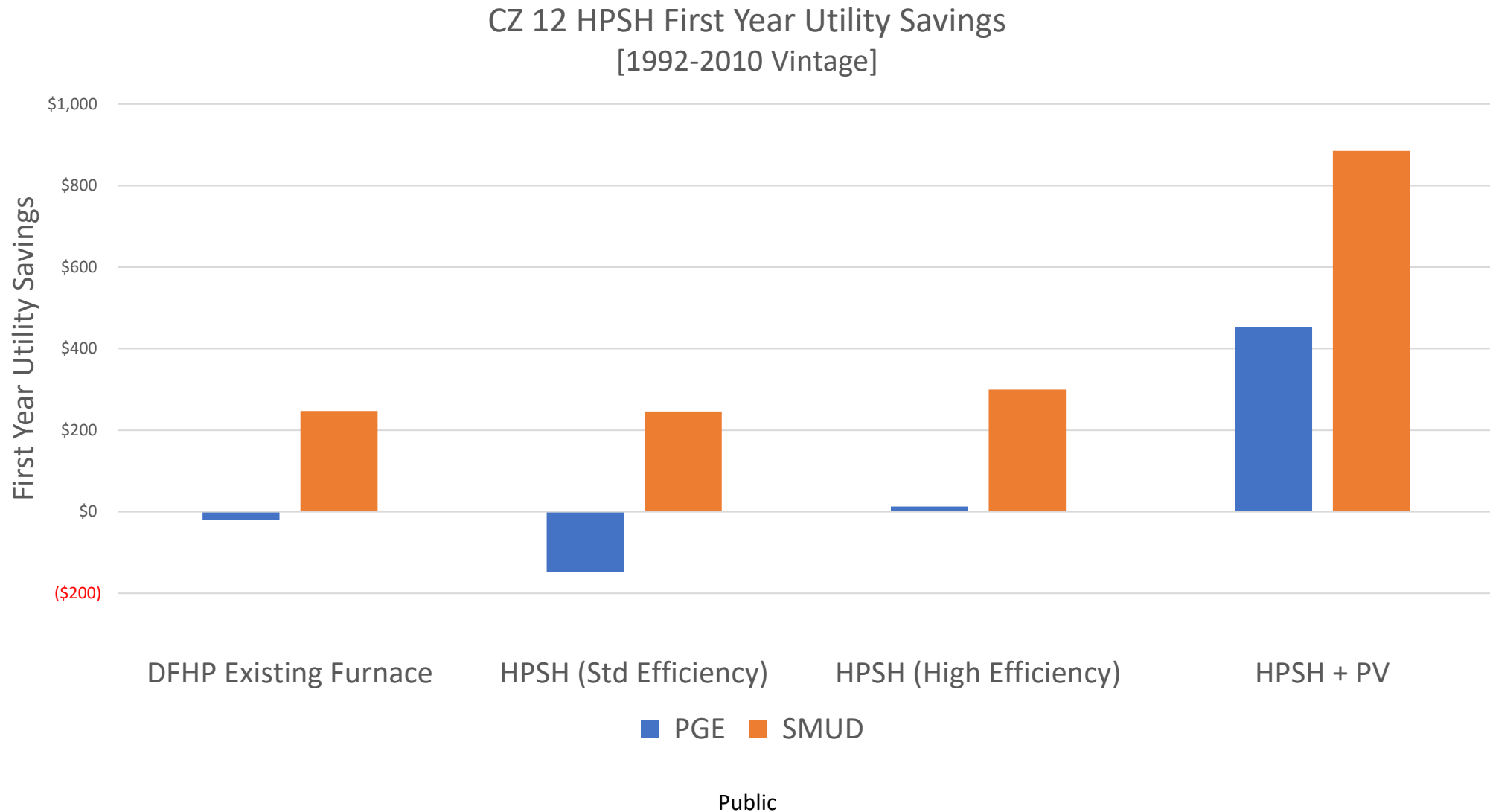


HPSH
[1992-2010]



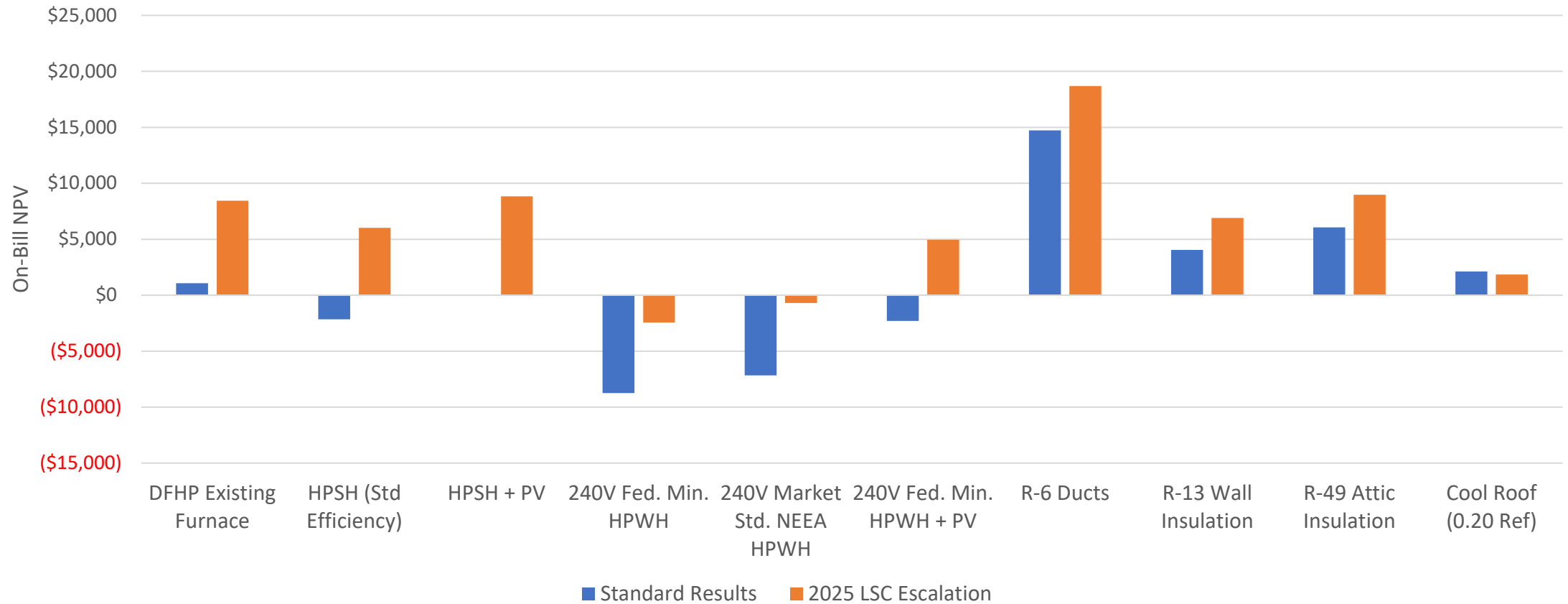
HPSH + 3kW PV
[1992-2010]

Results: First Year Utility Impacts



Escalation Sensitivity Analysis

Utility Rate Escalation Sensitivity
CZ 12 PG&E



Electric Panel Sensitivity Analysis

Measure	Standard Results		Electric Panel Upgrade	
	On-Bill NPV	LSC NPV	On-Bill NPV	LSC NPV
HPSH (Std Efficiency)	(\$2,151)	\$6,990	(\$4,931)	\$4,210
240V Fed. Min. HPWH	(\$8,738)	\$3,536	(\$11,624)	\$756

Summary

- **Envelope:** Improving envelope performance is very cost-effective in many older homes
- **Duct measures:** many older homes have leaky duct systems that should be replaced at end of life (20-30 yrs).
- **HPSH:** LSC cost-effective in most climate zones.
- **HPWH:** LSC cost-effective in all climate zones.
- **PV:** Less utility cost savings under NBT. Favor on site utilization of PV generation.
- **Next steps:** AC to HP replacement



Building A Policy in the Explorer



Questions?



Wrap-Up

Flexible Policy Options

Tailor Requirements to Meet Local Needs

- Vintages
- Measures/Structure
- Triggers

Assistance and Resources Available

- Custom technical support upon request
- Model ordinance language
- Study source data
- Implementation materials

[Local Energy Codes: Flexible Compliance Resources](#)



Thank You!



Ada Shen
ashen@frontierenergy.com

Jasmine Krause
jasmine@policystudio.co

Misti Bruceri
mistib@mbaenergy.com



LocalEnergyCodes.com



Contact info@localenergycodes.com
for no-charge assistance