CALIFORNIA ENERGY CODES & STANDARDS
A STATEWIDE UTILITY PROGRAM

Statewide Codes and Standards

2025 Single Family New Construction Cost-Effectiveness Analysis

March 12, 2026

Pacific Gas and Electric Company
Southern California Edison — Energy for What's Ahead
SDGE

Agenda

- Study Background
- Prototypes and Measures
- Results
- Q&A and Discussion
- Wrap Up

2025 Code Metrics

- Four Compliance Metrics (for new single family)
  - Long-term System Cost (LSC) efficiency
  - LSC total
  - Source Energy
  - Peak Cooling

2025 Base Code

- Heat Pump Baseline
  - Space Heat
  - Water Heat
- Compliance-Neutral Equipment
  - Stoves, Clothes Dryers
- Outdoor Equipment

Energy Related Ordinances: Cost-Effectiveness

Why do we need cost-effectiveness studies?

- Document compliance with CEC requirements
- Inform ordinance development
- Understand and communicate impacts
- Identify local and regional opportunities

CALIFORNIA ENERGY CODES & STANDARDS
A STATEWIDE UTILITY PROGRAM

2025 Code Cycle Single Family New Construction

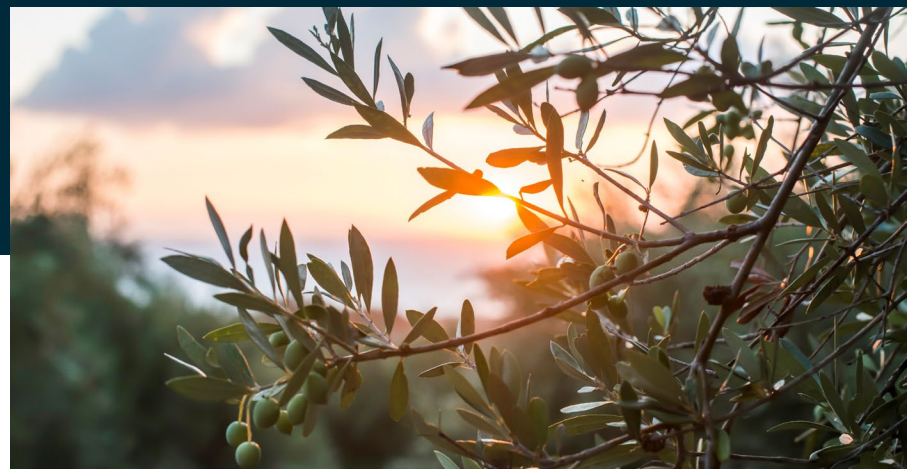
Reach Codes Results Report

March 12, 2026

Pacific Gas and Electric Company

Southern California Edison
Energy for What's Ahead

SDGE



Agenda

- Energy Code Background
- Prototypes
- Efficiency Measures
- Results

Reach Code Basics

Goal: **Exceed** the Energy Code

Requirements:

- Demonstrated statewide **cost-effectiveness**
  - Using approved formulas and tools
- Obtain approval from the **CEC**
- File ordinance with **BSC**

The **Statewide Reach Codes Team**

- Facilitates adoption and implementation
- Provides resources

https://explorer.localenergycodes.com/

CALIFORNIA ENERGY CODES & STANDARDS
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SDGE
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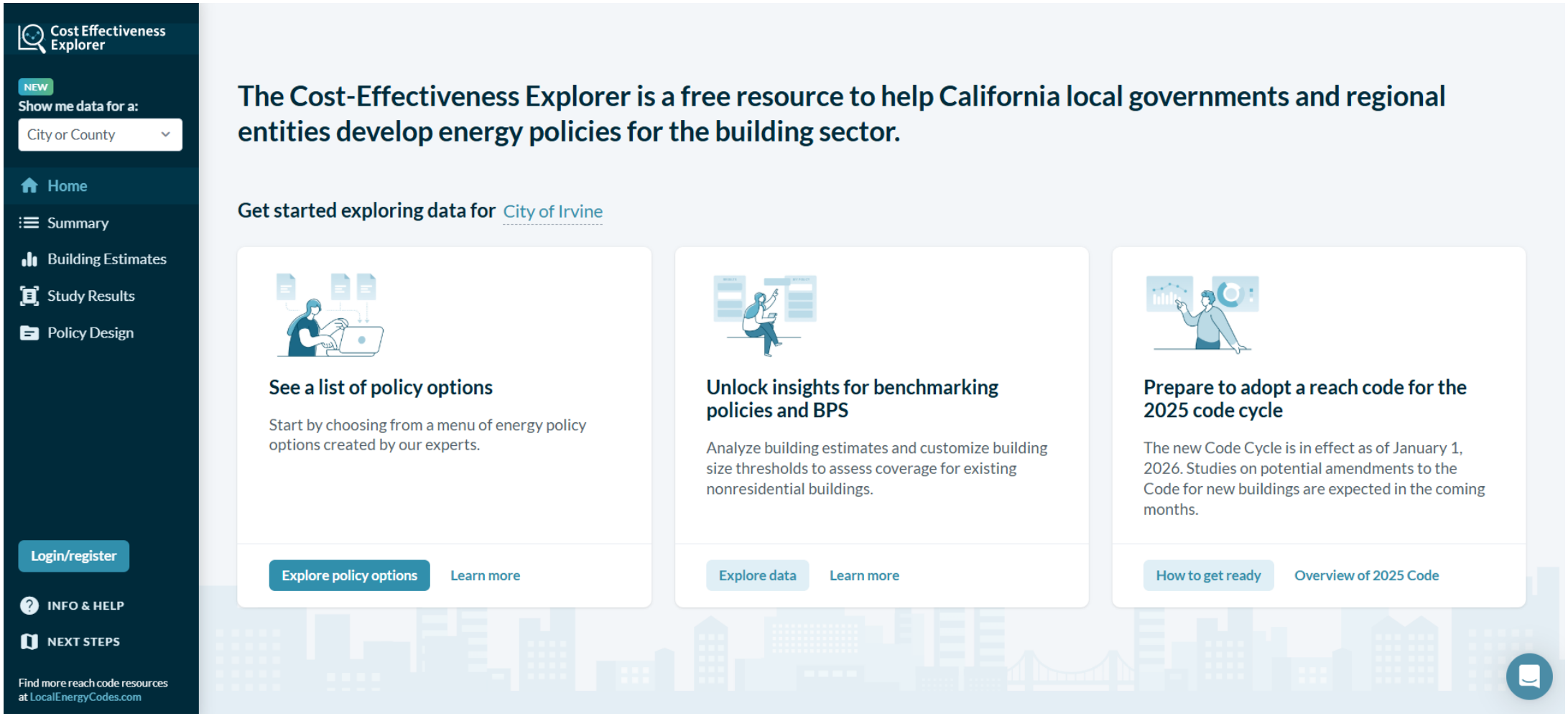
Energy for What's Ahead
Pacific Gas and Electric Company

STATE OF CALIFORNIA
ENERGY COMMISSION

CALIFORNIA BUILDING STANDARDS COMMISSION
CBSC

Reach Code Cost-Effectiveness Explorer



Results Report

- **Final report** expected April 30th, 2026

- **Preliminary results report** (limited analysis) posted

- Single Family
- New Construction
- Compliance Analysis

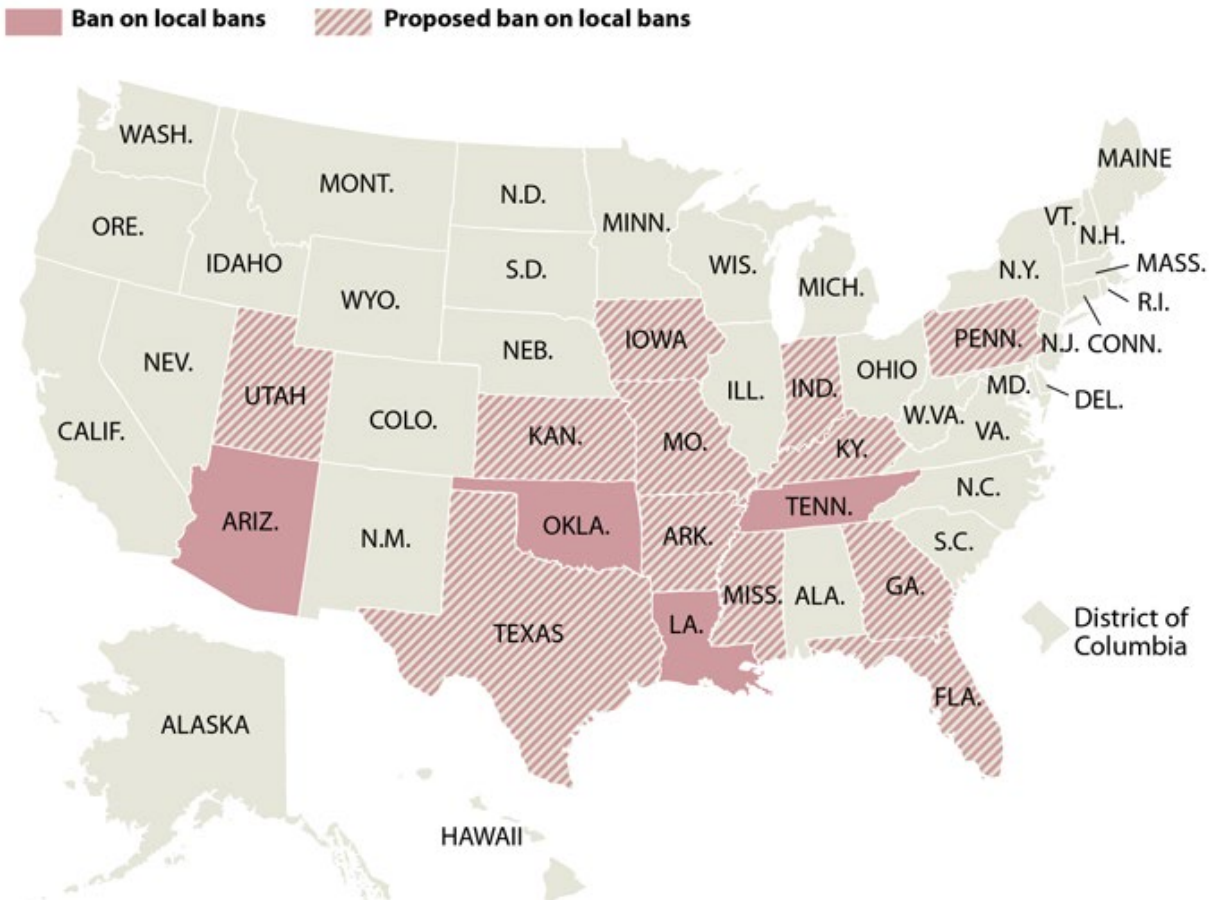
Legal Considerations

Energy efficiency requirements for some **appliances** are regulated at the federal level; states cannot require higher efficiencies—that is, requiring more is **preempted**.

Includes **HVAC** and **DHW**.

Legal Considerations

Gas Ban Repeal



PAUL HORN / Inside Climate News, SOURCES: ICN research; RMI; Climate Investigations Center

Assembly Bill 130

California Legislative Action Committee

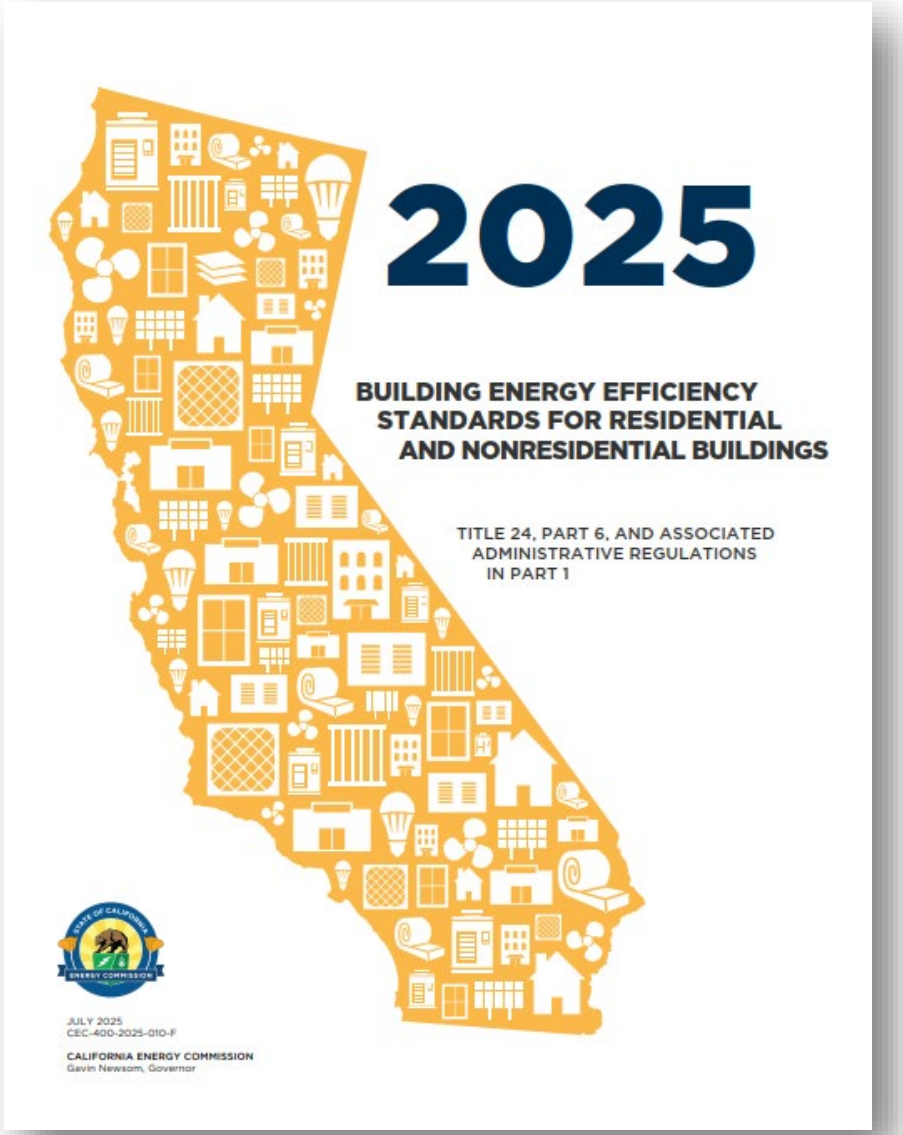
Energy Code Background

Basics

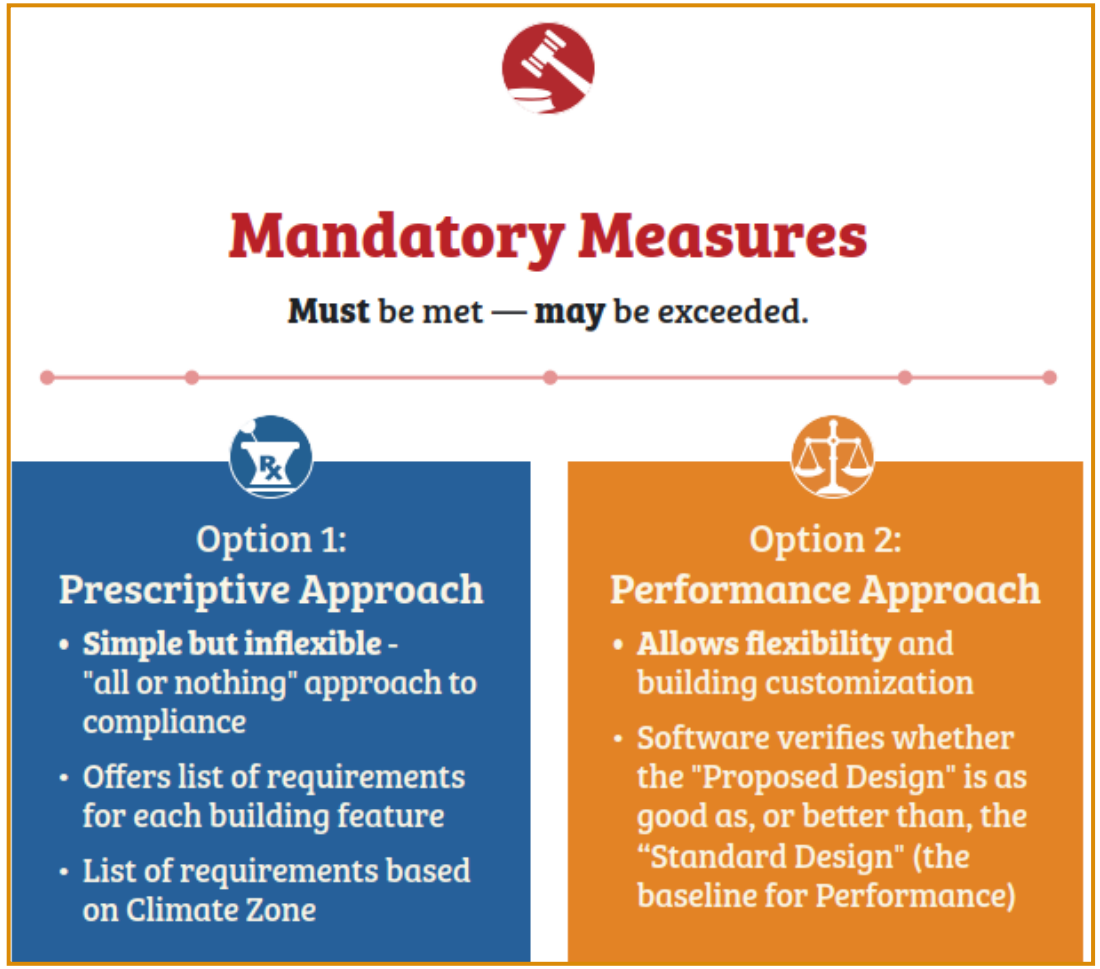
“Energy Code”
“Part 6”
“Title 24”
“Standards”

Updated every 3 years – “code cycles”

2022 → 2025
Effective January 1st, 2026



Energy Code Basics

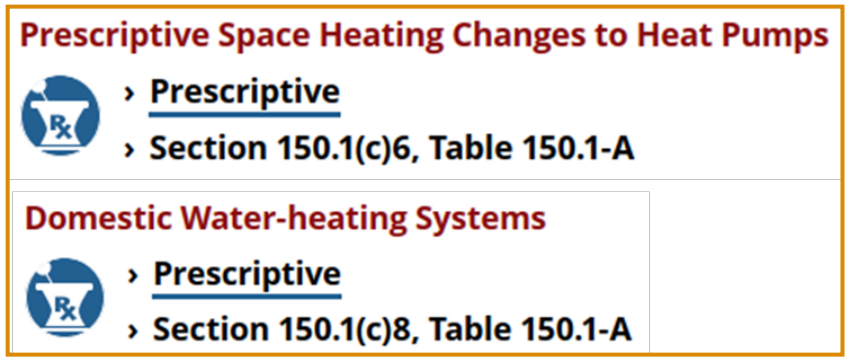


Mandatory vs Performance vs Prescriptive

Prescriptive = baseline or base case of compliance and analysis

2025 Code Cycle Updates

“Dual Heat Pump Baseline”
Heat pumps for space heating and water heating prescriptively required for all climate zones



Vs. heat pumps in 2022 cycle:
Space heating: climate zones 3, 4, 13, 14
Water heating: all other climate zones

Compliance Metrics
LSC (Long-term System Cost, $/ft^2) for efficiency and total; Source
(+ Peak Cooling)

Energy Code	New Construction	Additions	Alterations
2022	EDRs, EDRe, EDRt	TDV	TDV
2025	Source, LSCe, LSCt	LSCe	LSCe

2022: EDRs = Source EDR; **EDRe** = Efficiency EDR; **EDRt** = Total EDR; **TDV** = Time Dependent Valuation

2025: Source = Total Annual Source Energy; **LSCe** = Efficiency LSC; **LSCt** = Total LSC

Vs. metrics in 2022 cycle:
EDR (Energy Design Rating) for all 3
TDV-based

2025 Compliance Metrics

Source Energy (Source)	Efficiency Long-Term System Costs (LSCe)	Total Long-term System Costs (LSCt)
A score representing the building **long run source energy use due to fossil fuel combustion expressed as an hourly source-carbon metric**. Source Energy includes: + Envelope + Indoor fans + HVAC + DHW + PV + Batteries + Other loads	A score representing the **building energy efficiency expressed as long-term system costs**. Efficiency LSC includes: + Envelope + Indoor fans + HVAC + DHW + Other loads, including self-utilization credit when applicable	A score representing the building **long-term system costs for energy efficiency while also factoring in photovoltaics (PV) and flexibility**. Total LSC includes: + Efficiency measures + PV + Batteries + Precooling

PV = Solar photovoltaics, **HVAC** = Heating, ventilation, and air conditioning, **DHW** = Domestic hot water

Important Note: For New Construction, a building complies with the Performance Approach ONLY if **all three** compliance scores are met, which means that each Proposed Design score is **lower than or equal to** the Standard Design score.

The 3 components used to calculate compliance have similar goals and end uses.

Selected Pathway: Efficiency LSC (LSCe)

Efficiency Long-Term System Costs (LSCe)

A score representing the **building energy efficiency expressed as long-term system costs**.

Efficiency LSC includes:

- Envelope
- Indoor fans
- HVAC
- DHW
- Other loads, including self-utilization credit when applicable

This is the Reach Code pathway utilized for this report.

LSCe pathway = prescriptive baseline (mixed fuel) + measure(s) to reach X% LSCe

Why we're using it:

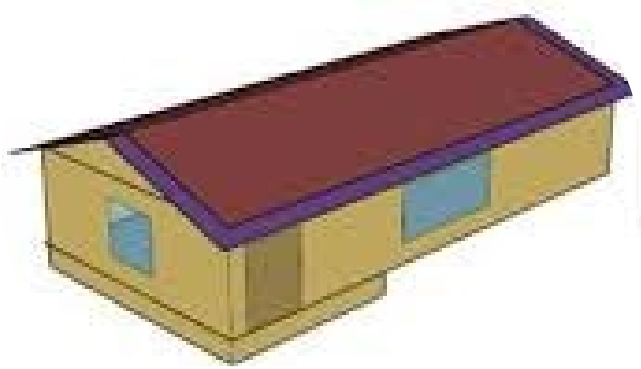
- Due to the new dual heat pump baseline, most non-electric end uses are address by prescriptive standards.
  - Range and clothes dryer fuel sources do not impact compliance.
- Source metric has also changed in 2025.
- So, LSCe is now more impactful than Source in driving electrification.
  - LSCe is efficiency-based, and electric equipment is generally higher efficiency than natural gas.
- Added benefit: addresses the importance of envelope in long-term energy savings.

Prototypes

Single Family Prototype

	One-Story
Conditioned Floor Area	2,100 ft^2
Stories	1
Bedrooms	3
Window-to-Floor Area Ratio	20%

	Two-Story
Conditioned Floor Area	2,700 ft^2
Stories	2
Bedrooms	4
Window-to-Floor Area Ratio	20%



43%

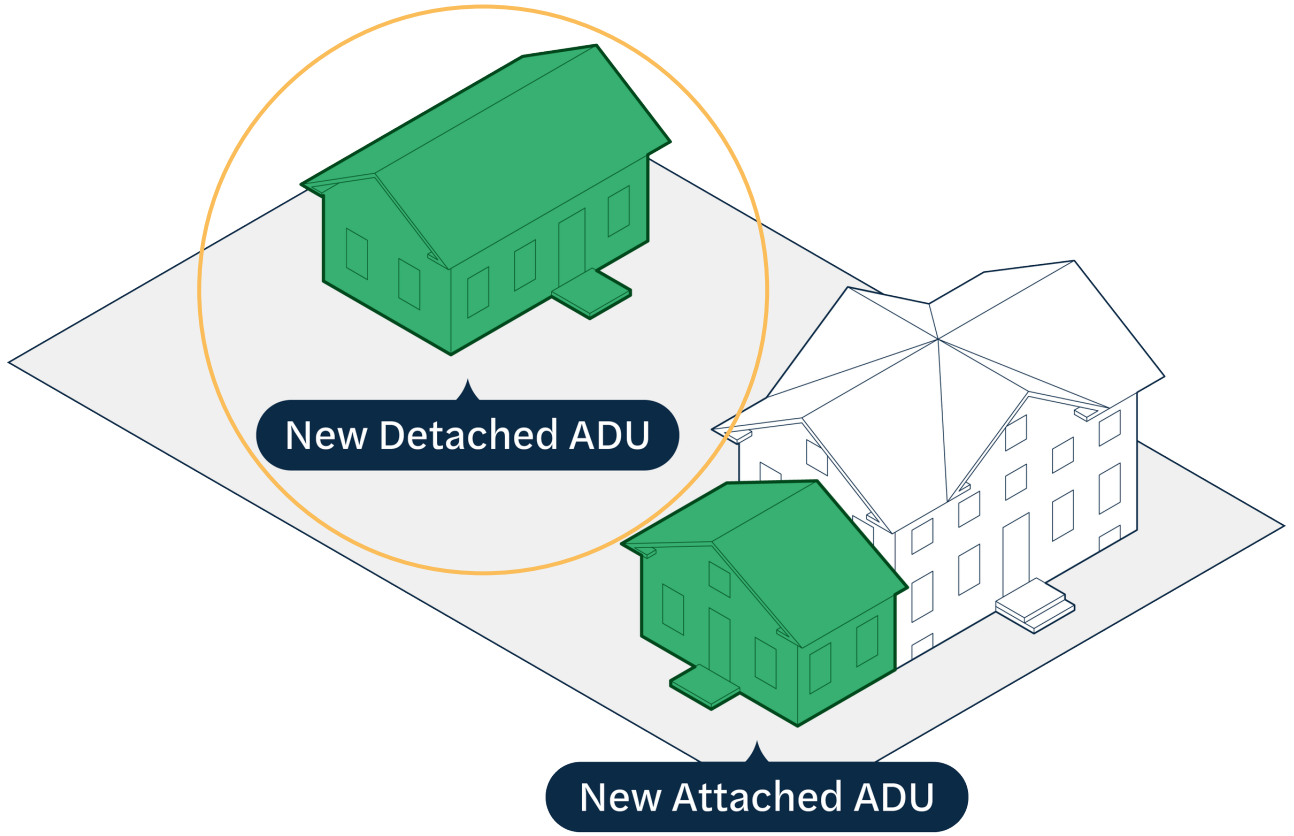
57%

2,400 ft^2 Prototype

ADU Prototype

	CEC
Conditioned Floor Area	500 ft^2
Stories	1
Bedrooms	1
Window-to-Floor Area Ratio	19.2%

	Reach Codes
Conditioned Floor Area	625 ft^2
Stories	1
Bedrooms	1
Window-to-Floor Area Ratio	19.2%



https://www.newhavenadu.com/

Prototype Characteristics

Characteristic	Single Family
HVAC	Split heat pump – 7.5 HSPF2, 14.3 SEER2, 11.7 EER2
Air Distribution	Ductwork located in vented attic
Water Heater	Heat pump water heater (HPWH) UEF = 2.0 located in the garage
DHW Distribution	CZs 1, 16: Basic compact distribution credit
Cooking	Natural Gas
Clothes Drying	Natural Gas
PV System	Sized to meet the prescriptive requirements by climate zone, which is designed to offset 100% of electricity. Sizes = 2.49 to 5.28 kW. When prescriptive calculation is <1.8 kW, PV is not required – this is the case in Climate Zones 1-9, 12, 14, and 16. For others, sizes = 1.80 to 2.45 kW.
Foundation	Slab-on-grade

Efficiency Measures

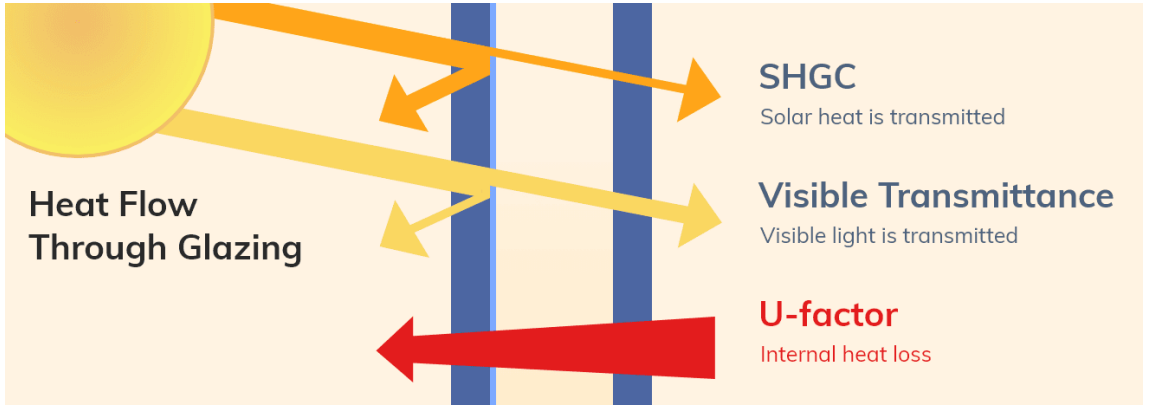
Efficiency Measures Analyzed

1. **High Efficiency Windows**: Decrease U-Factor, increase SHGC.

Climate Zone		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
U-Factor	Presc.	0.27	0.27	0.27	0.27	0.27	0.3					0.27				0.3	0.27
	Proposed	0.24															
SHGC	Presc.	0.35	0.23	0.35	0.23	0.35	0.23									0.2	0.35
	Proposed	0.5															

Higher **SHGC** = more heat from the sun passes through the window **into the home**

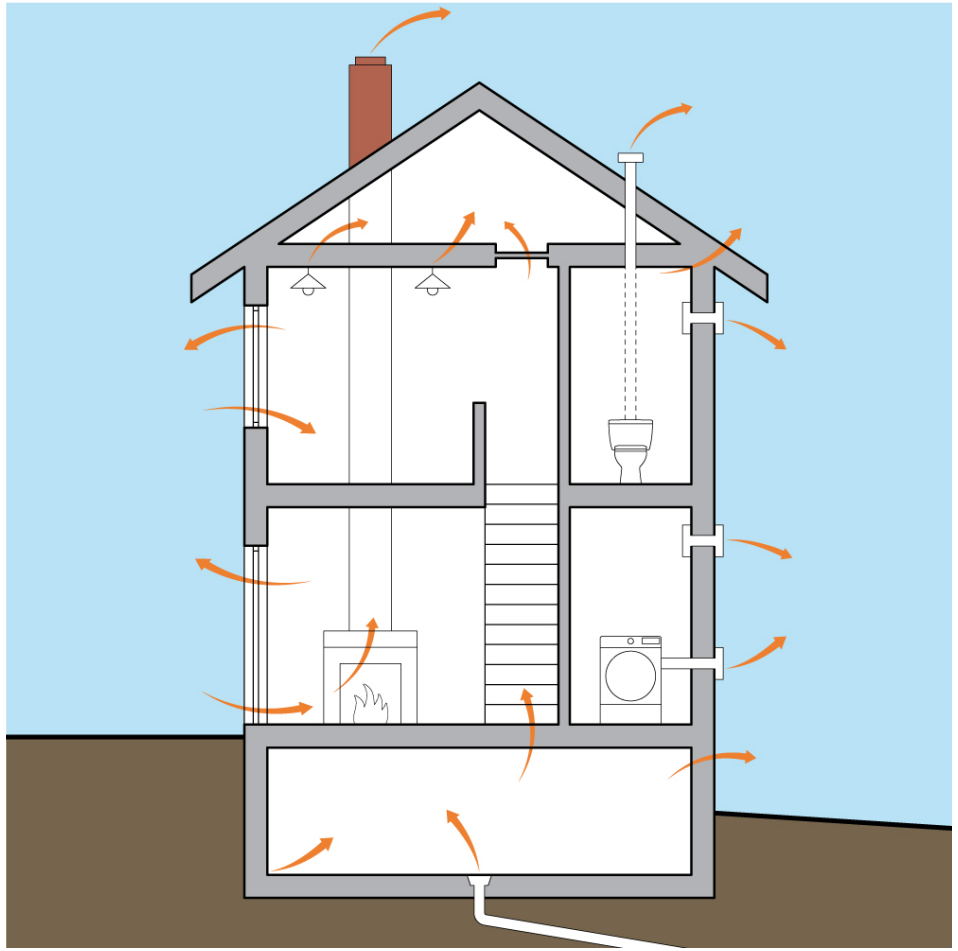
Higher **U-factor** = more heat from the home passes through the window **to the outside**
Similar concept as insulation



Efficiency Measures Analyzed

2. **Reduced Infiltration**: Decrease from 5 ACH50 → 3 ACH50 (40%).

ECC verification required.

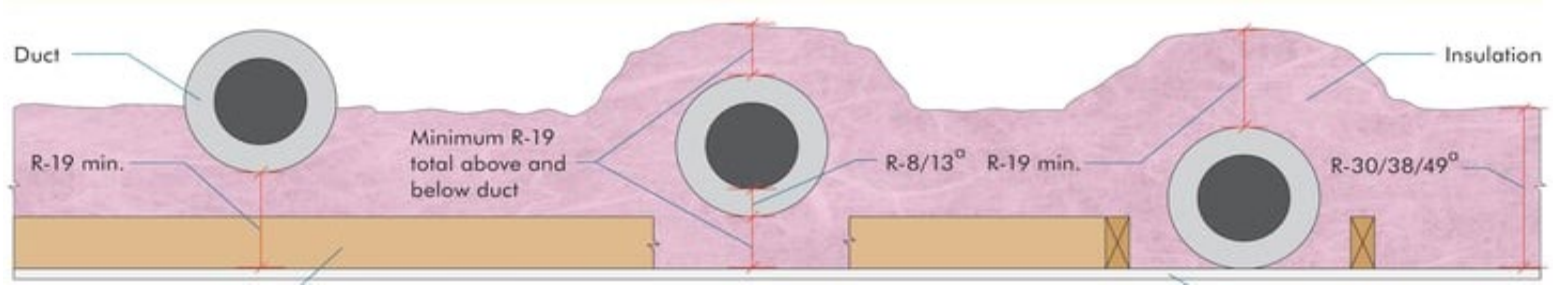


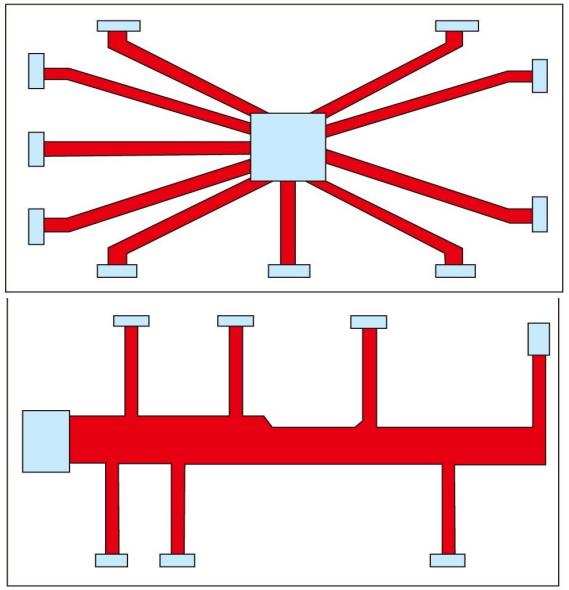
Christie Architecture

- Infiltration is the opposite of air leakage.
- ACH50 = air changes per hour at 50 pascals pressure
- ECC = Energy Code Compliance program, replaces HERS

Efficiency Measures Analyzed

3. **Buried Radial Ducts**: Radial duct design, with R-8 duct insulation (where not already prescriptive), buried in insulation. ECC verification required.





Radial

Trunk-and-branch

4. **Ceiling Insulation**: Increase from prescriptive.

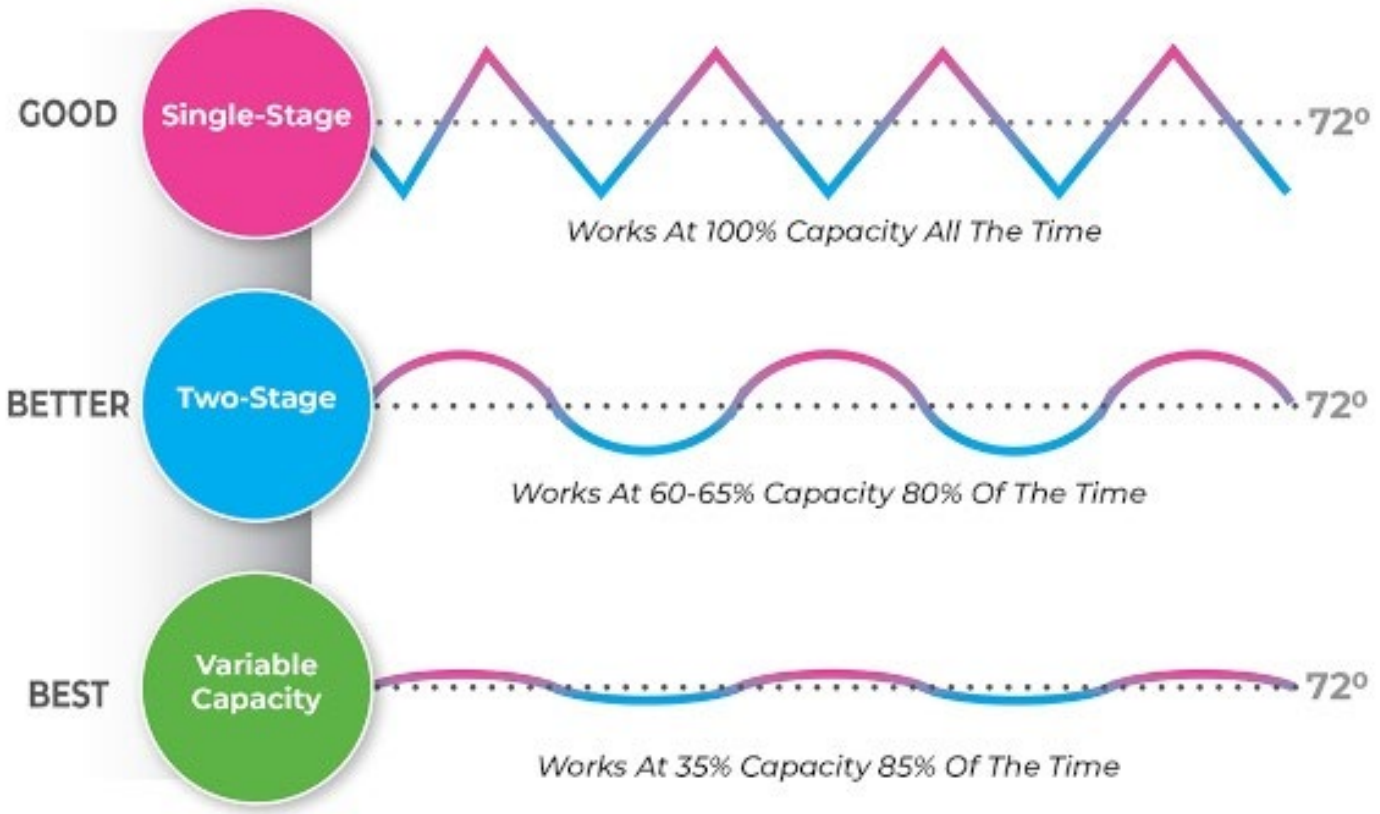
Climate Zone		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
R-Value	Presc.	38		30	38	30			38								
	Proposed	60		49	60	49			60								

Efficiency Measures Analyzed

5. **Compact Hot Water Distribution**: Design to meet basic credit, except where prescriptively required.

Efficiency Measures Analyzed

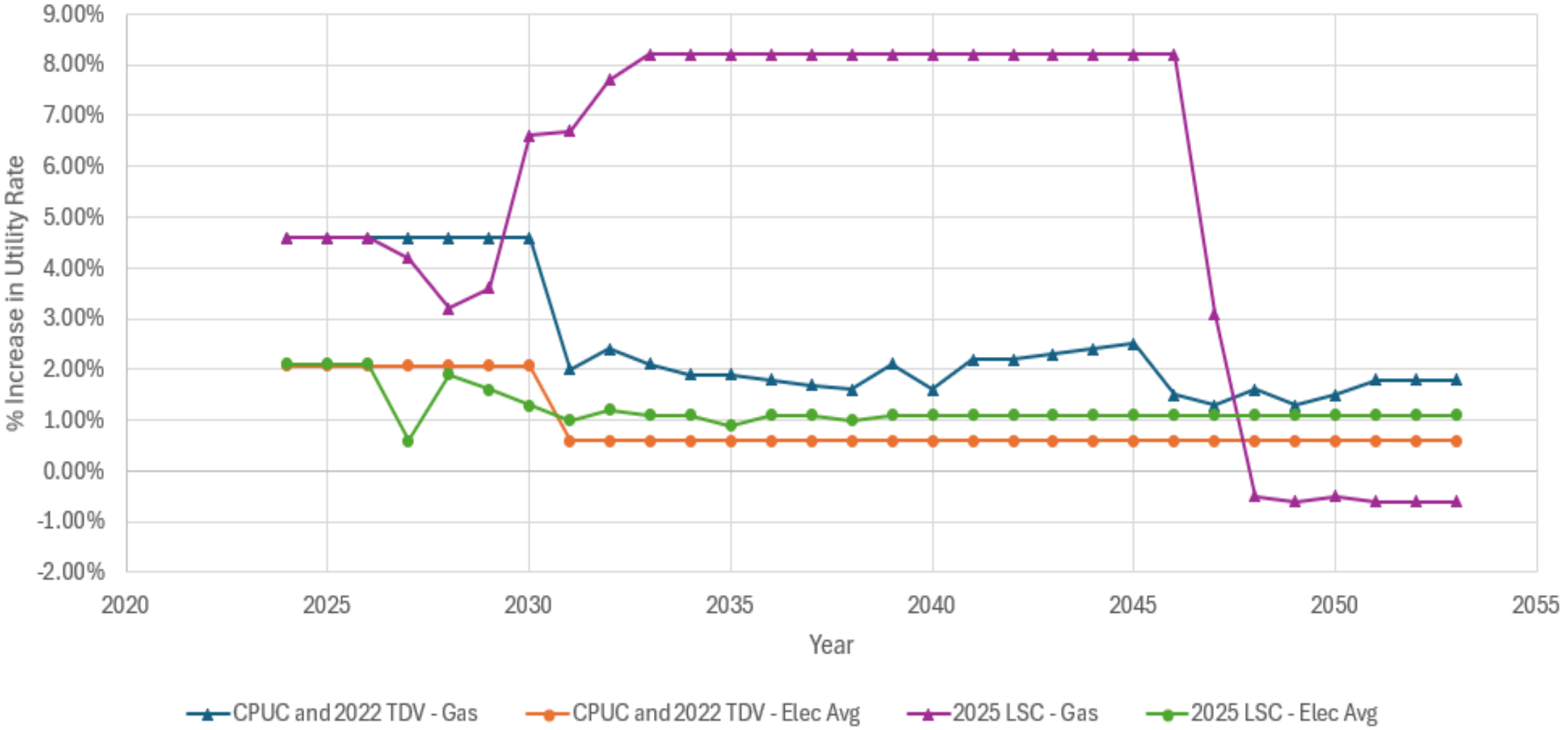
6. Ductless VCHP: ADU prototype only.



Incremental Costs (2,400 ft^2 Prototype)

Measure		Performance Level	First	Lifetime (2026$)
High Efficiency Windows	U-Factor	0.24 vs. 0.27	$630	$873
		0.24 vs. 0.30	$1,060	$1,469
	SHGC	0.50 vs. 0.35	$0	$0
Reduced Infiltration	--	3 vs. 5 ACH50	$615	$860
Buried Radial Ducts	Duct Design	Radial vs Trunk and Branch	$615	$860
	Duct Insulation/ECC	R-8 vs. R-6	$300	$423
Ceiling Insulation	--	R-49 vs. R-30	$911	$1,318
		R-49 vs. R-38	$493	$714
		R-60 vs. R-30	$1,404	$2,032
		R-60 vs. R-38	$987	$1,428
Compact Distribution		Basic credit	-$131	-$185
Variable Capacity Heat Pump		9 kBtu with R-6 ducts	-$5,256	-$9,427
		9 kBtu with R-8 ducts	-$5,274	-$9,448
18 kBtu base case vs:		12 kBtu with R-8 ducts	-$5,144	-$9,160
		18 kBtu with R-8 ducts	-$4,693	-$8,237

Escalation rates



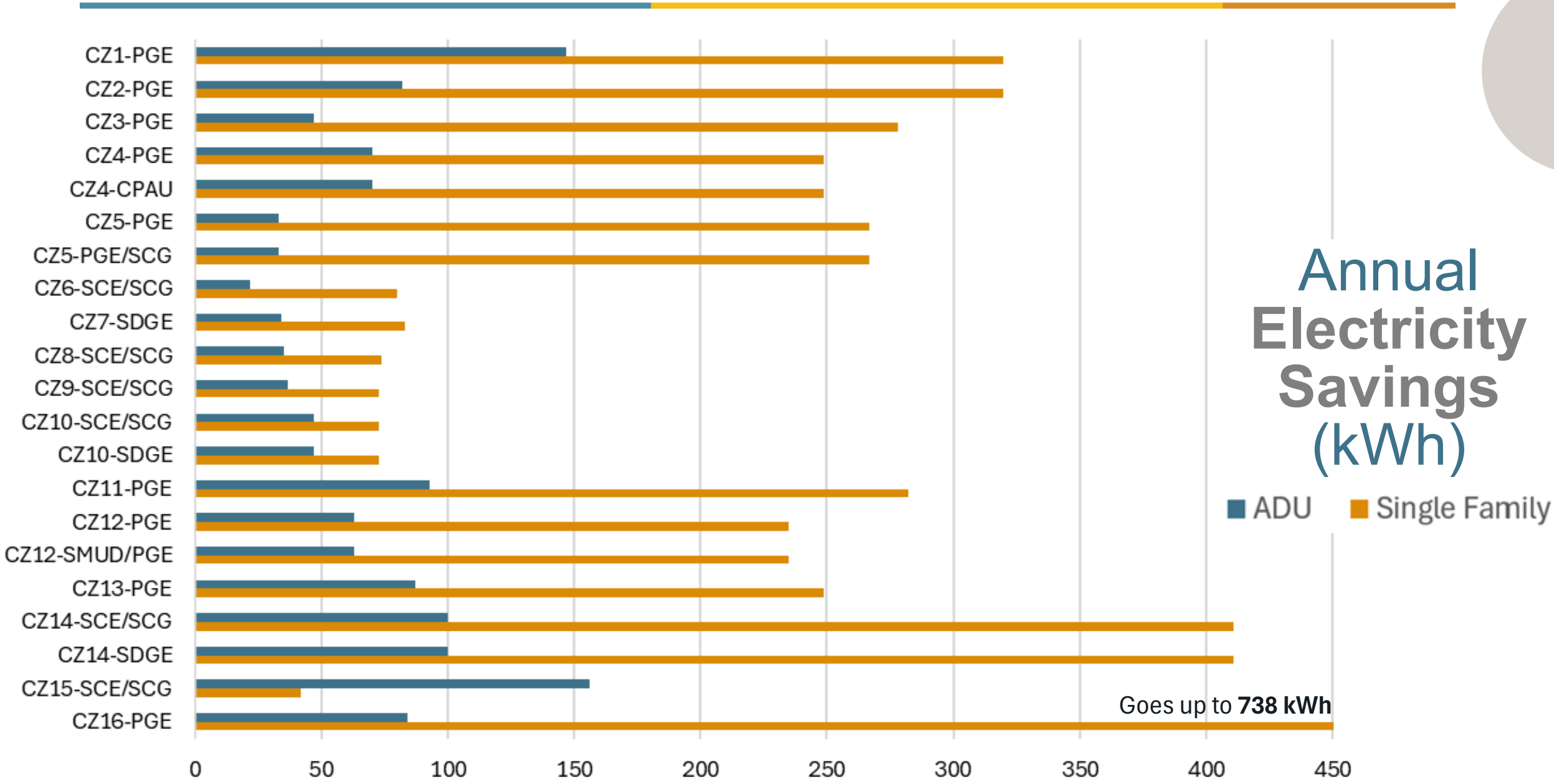
Results

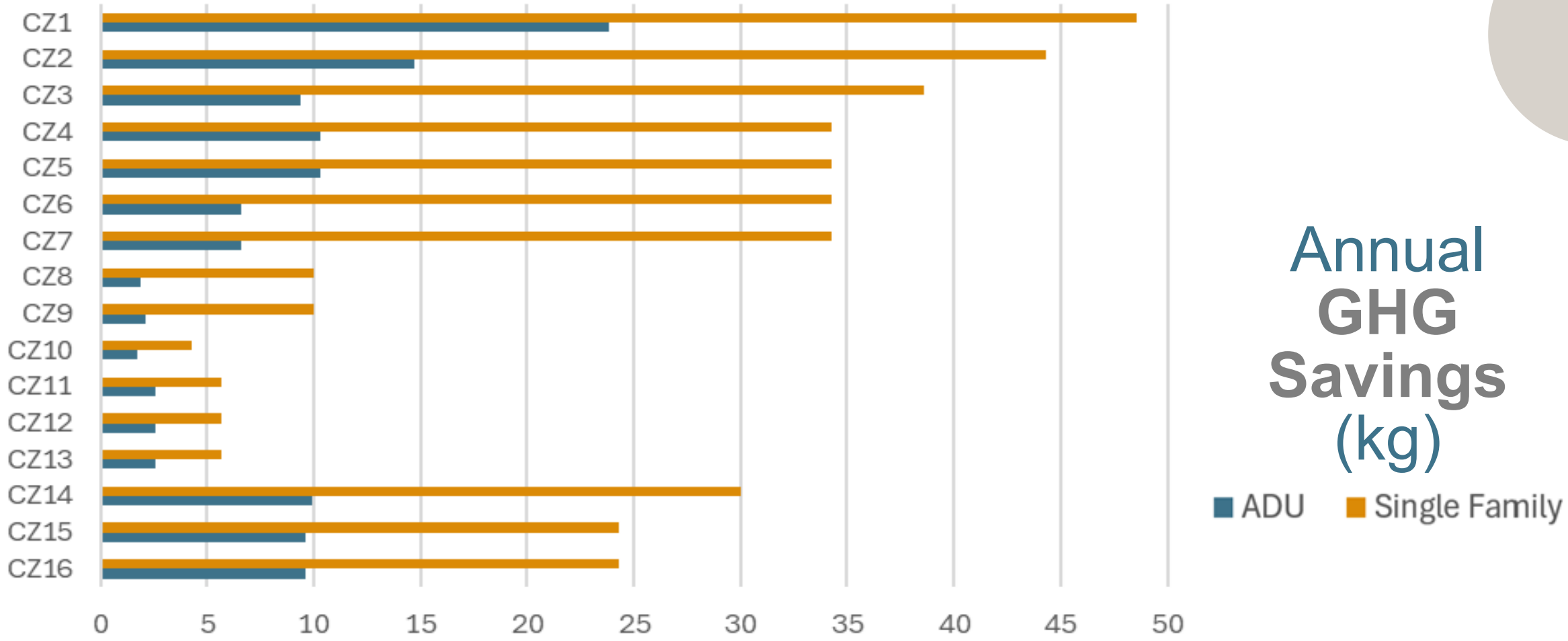
Results: Overview of Measure(s)

Single Family:

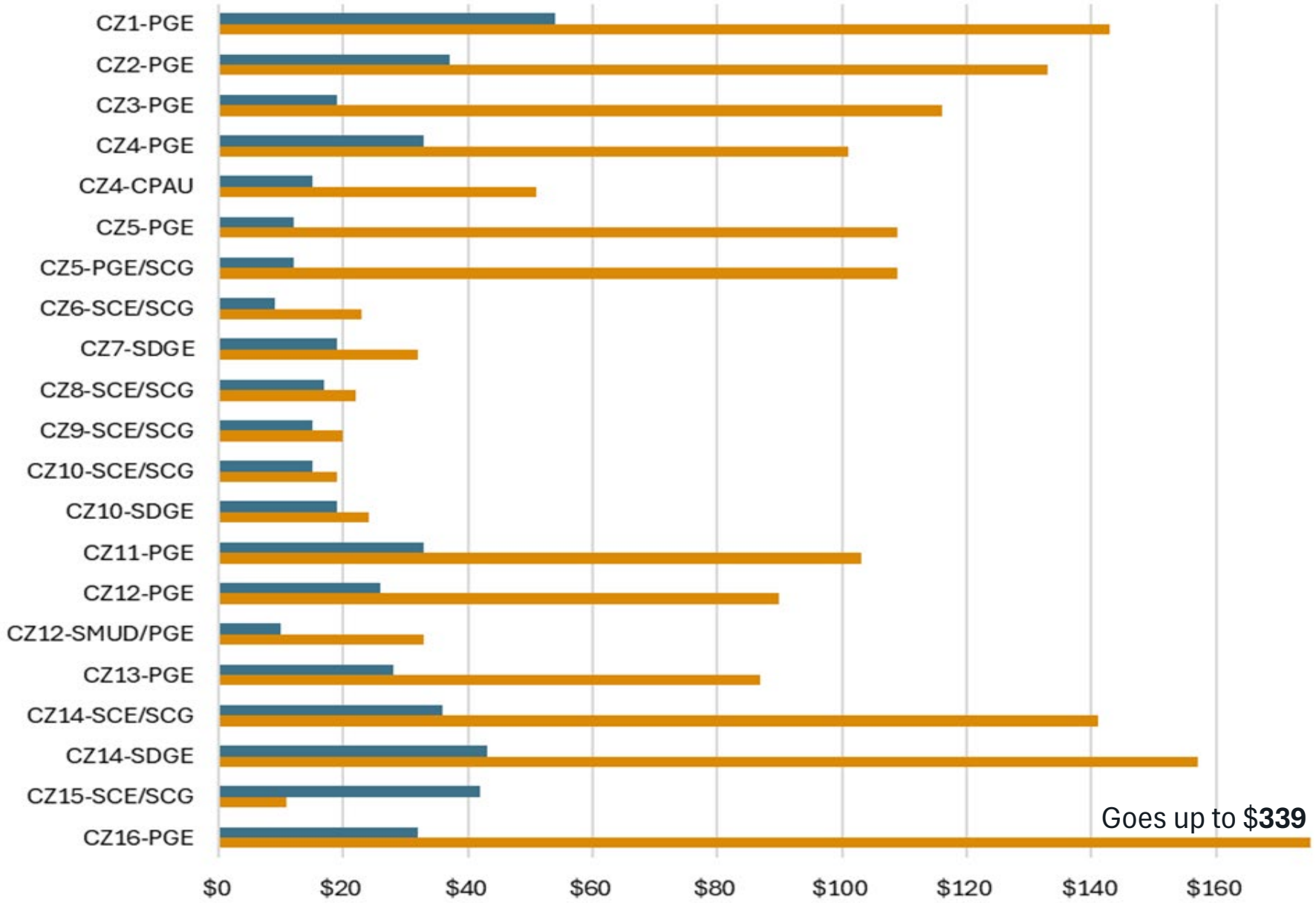
Climate Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
High Efficiency Windows																✓
Reduced Infiltration														✓		
Buried Radial Ducts	✓	✓	✓	✓	✓						✓	✓	✓	✓		✓
Increased Ceiling Insulation	R-60	R-60	R-49	R-60	R-49						R-60	R-60	R-60	R-60		R-60
Compact Hot Water Distribution		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	

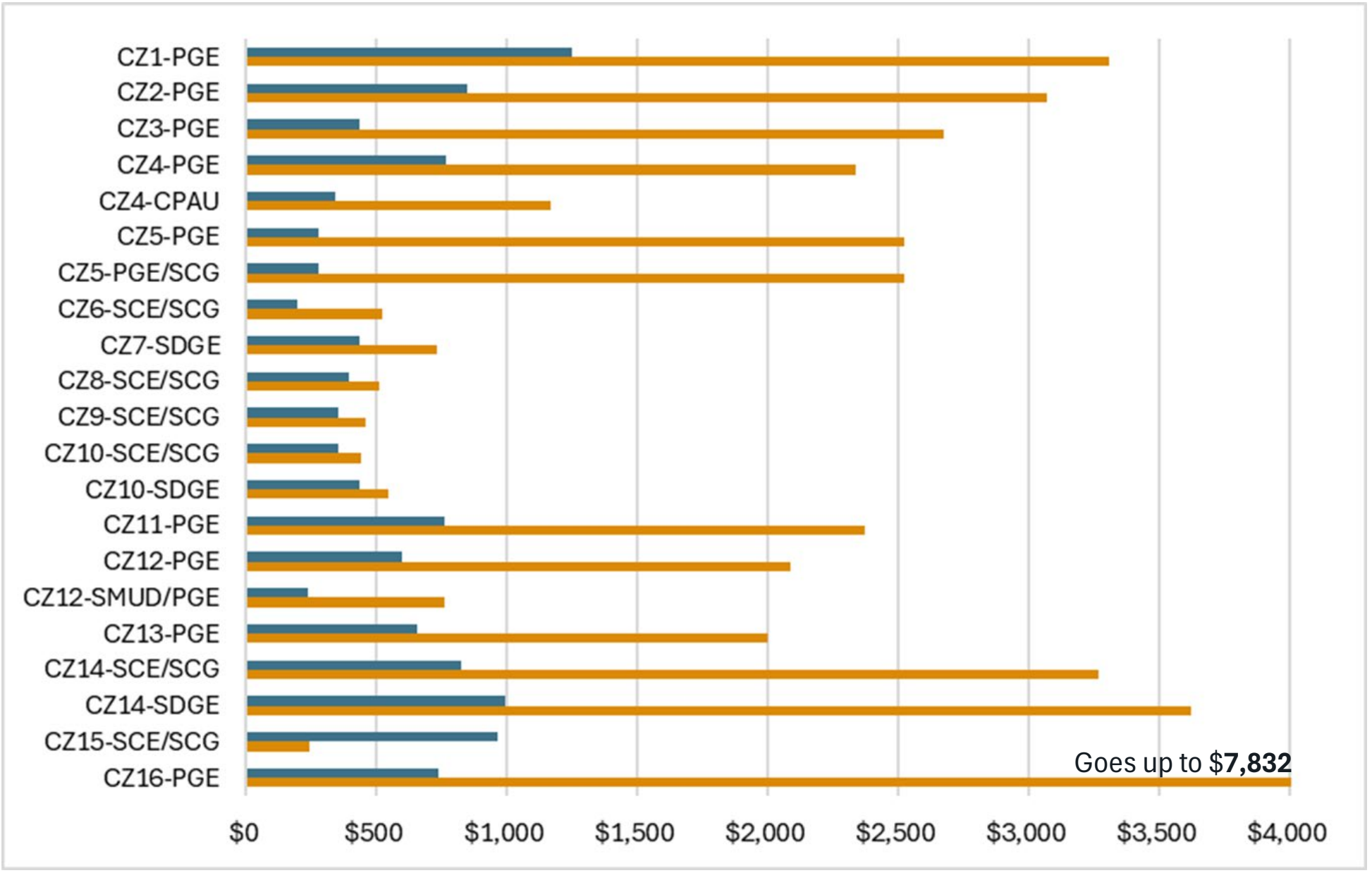
ADU: VCHP only, all climate zones


CZ1-PGE
CZ2-PGE
CZ3-PGE
CZ4-PGE
CZ4-CPAU
CZ5-PGE
CZ5-PGE/SCG
CZ6-SCE/SCG
CZ7-SDGE
CZ8-SCE/SCG
CZ9-SCE/SCG
CZ10-SCE/SCG
CZ10-SDGE
CZ11-PGE
CZ12-PGE
CZ12-SMUD/PGE
CZ13-PGE
CZ14-SCE/SCG
CZ14-SDGE
CZ15-SCE/SCG
CZ16-PGE
0
50
100
150
200
250
300
350
400
450
Annual Electricity Savings (kWh)
ADU
Single Family
Goes up to **738 kWh**


CZ1
CZ2
CZ3
CZ4
CZ5
CZ6
CZ7
CZ8
CZ9
CZ10
CZ11
CZ12
CZ13
CZ14
CZ15
CZ16
0
5
10
15
20
25
30
35
40
45
50
Annual GHG Savings (kg)
ADU
Single Family

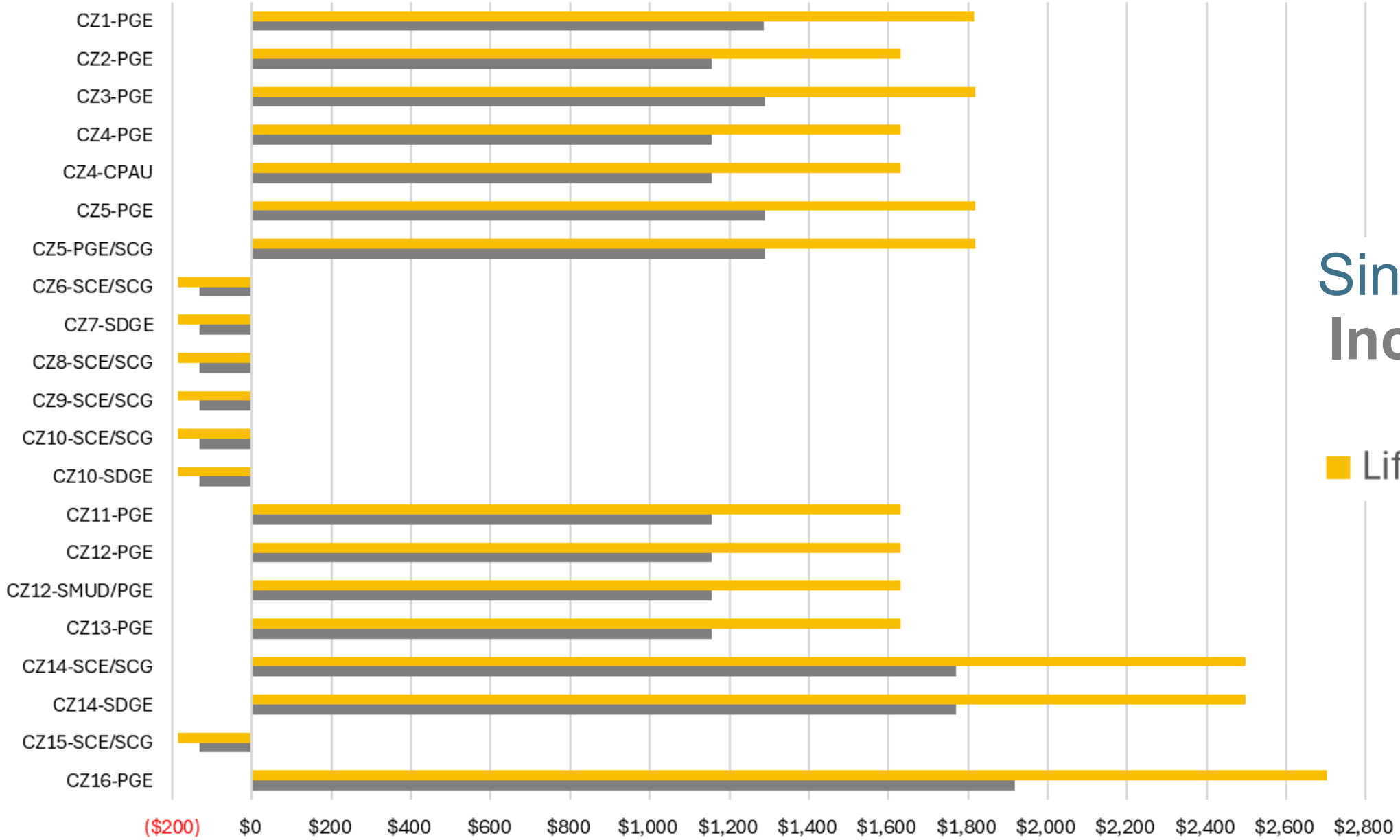
First-Year Utility Cost Savings





Lifetime **Utility Cost Savings** (2026$)

ADU Single Family

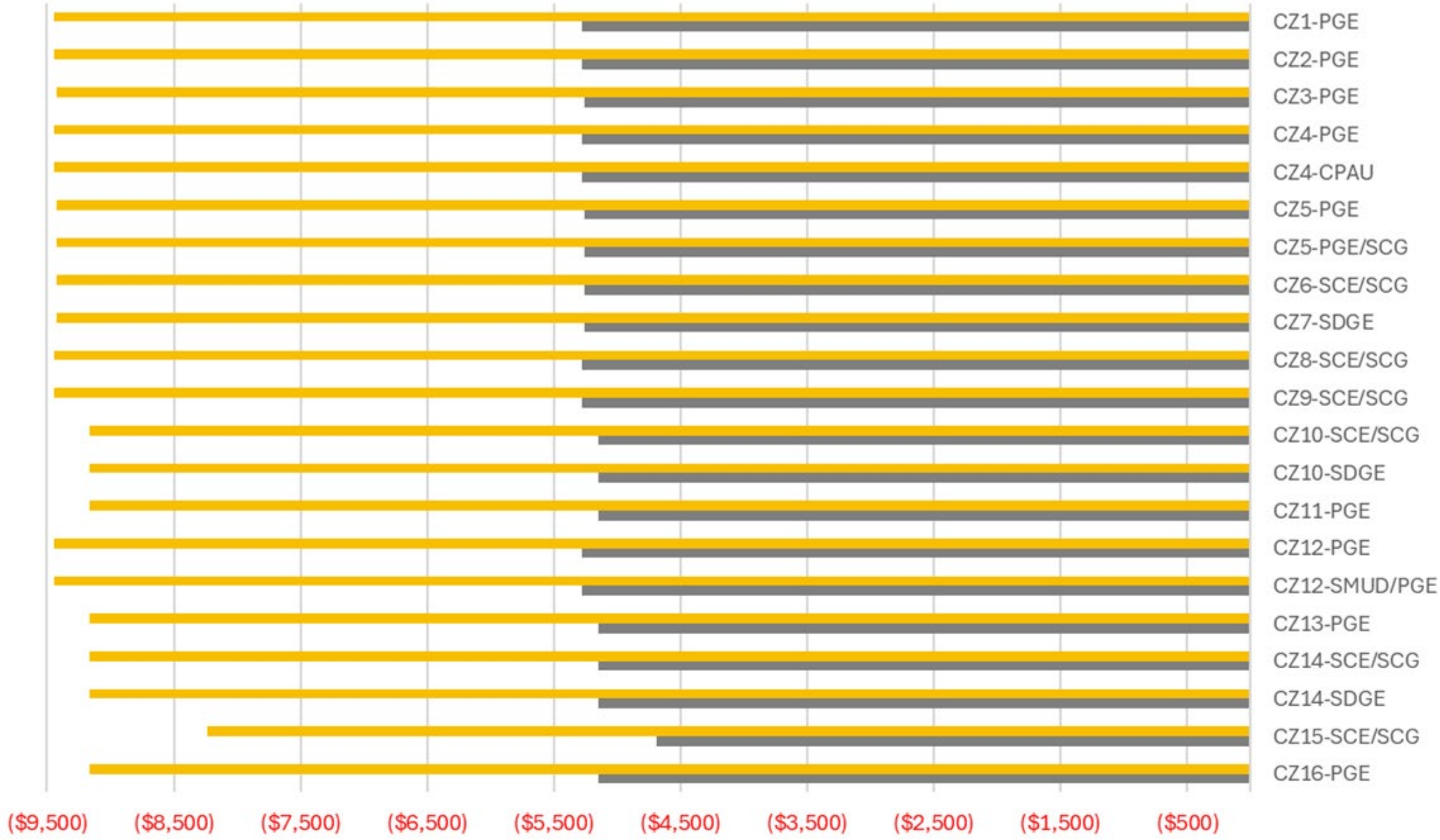


Single Family **Incremental Costs**

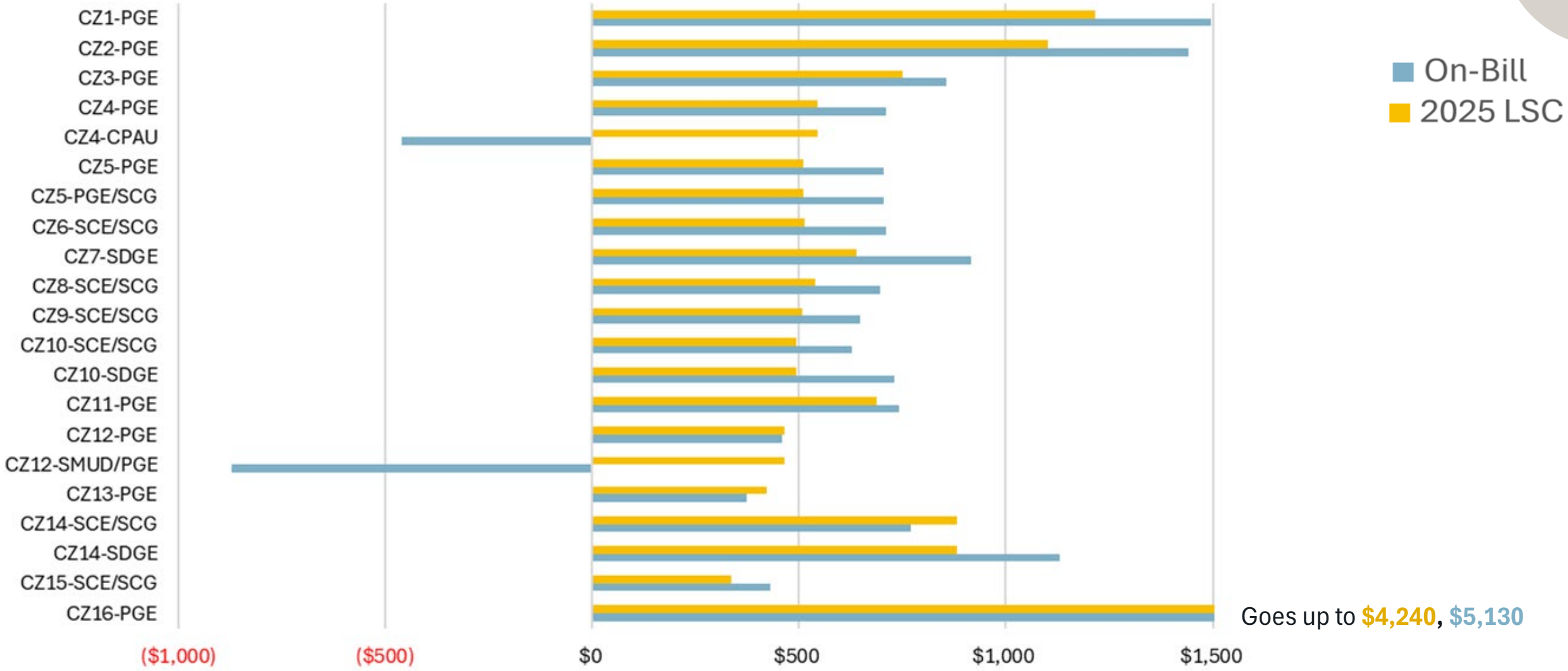
Lifetime (30-Year)

First

ADU Incremental Costs

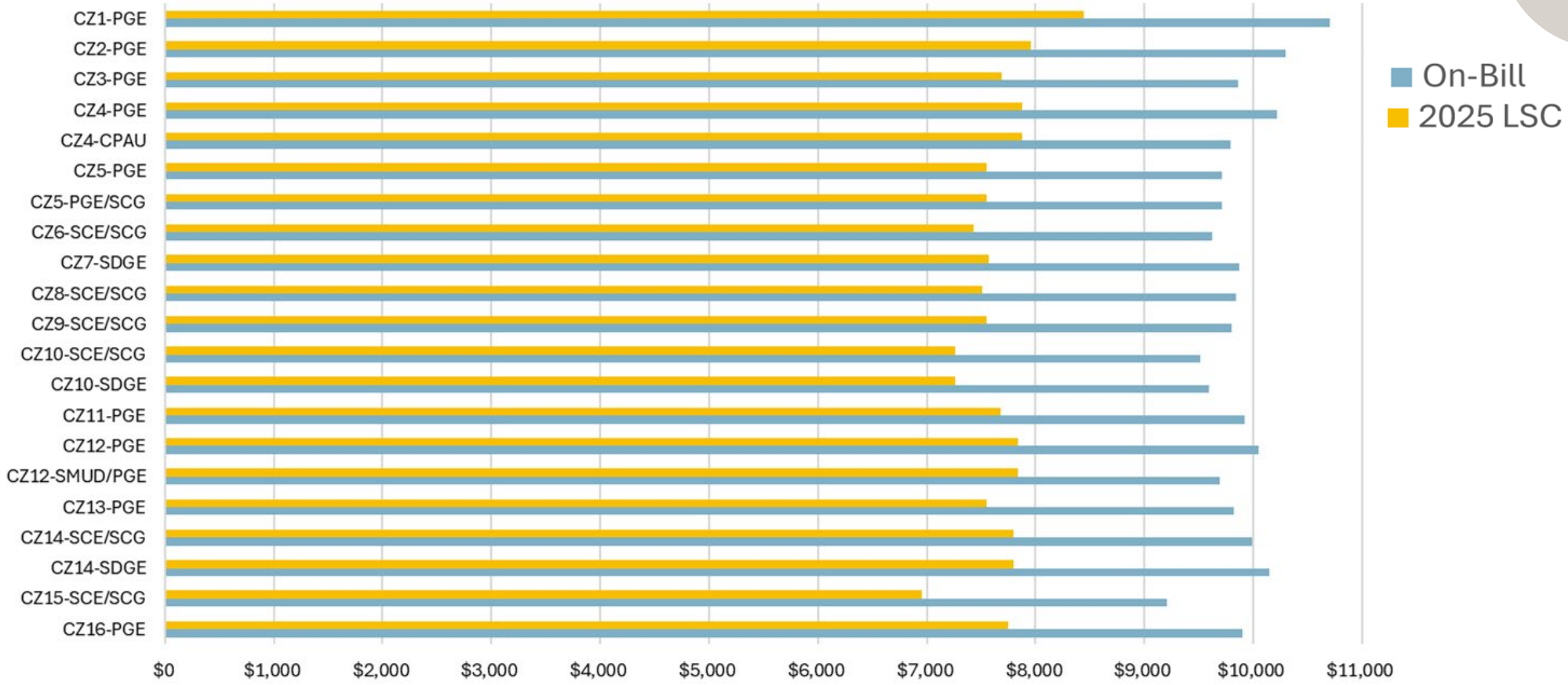


Cost-Effectiveness: NPV Single Family

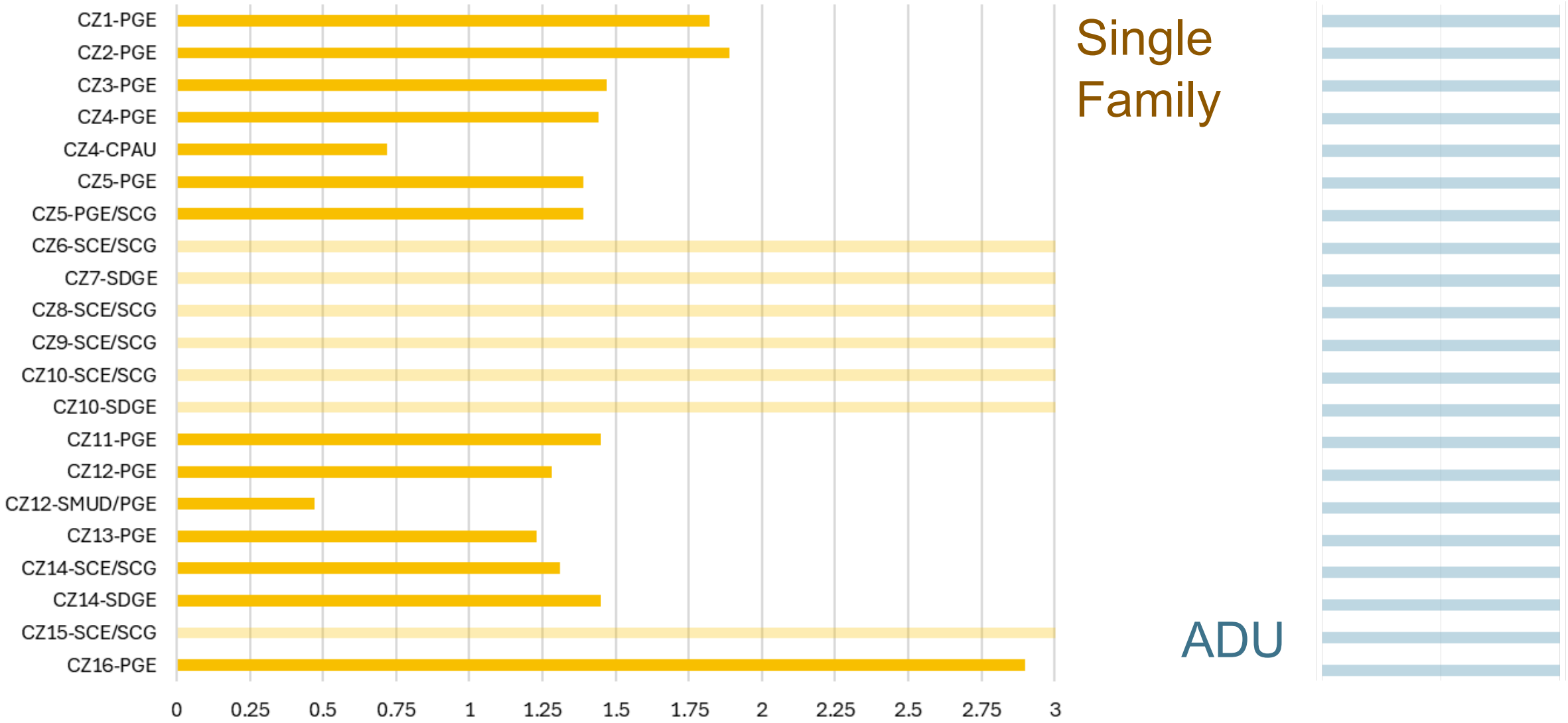


Goes up to **$4,240**, **$5,130**

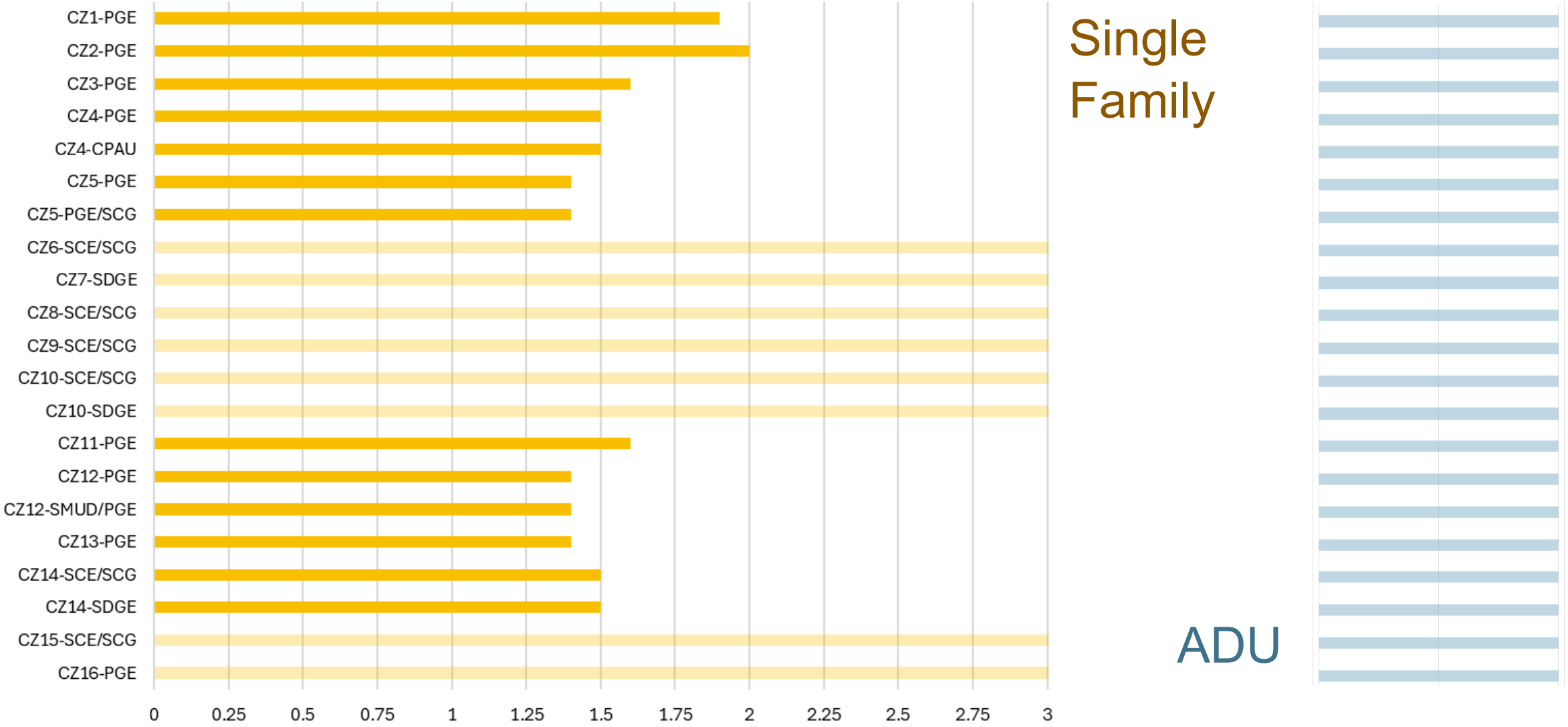
Cost-Effectiveness: NPV ADU



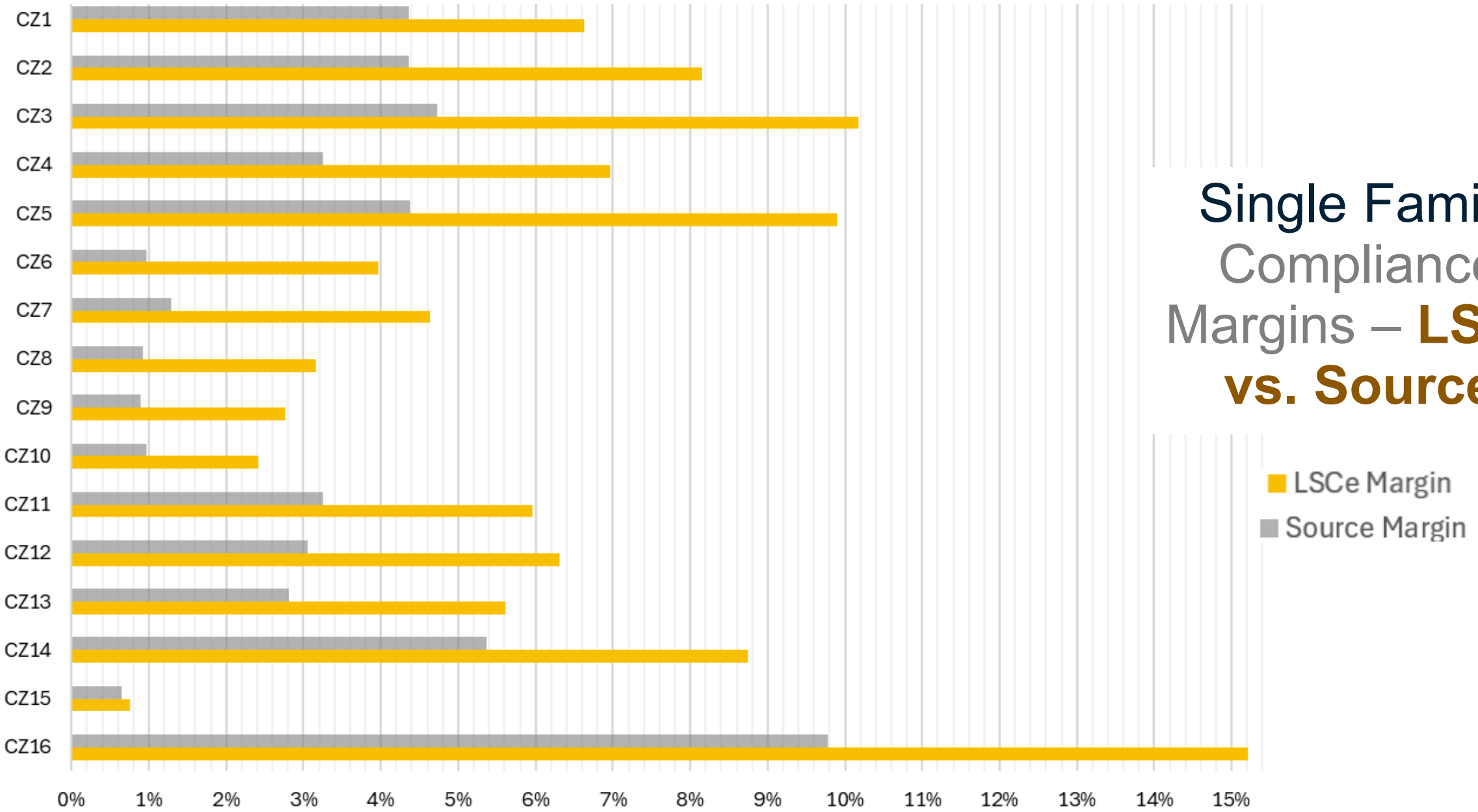
Cost-Effectiveness: On-Bill B:C Ratio



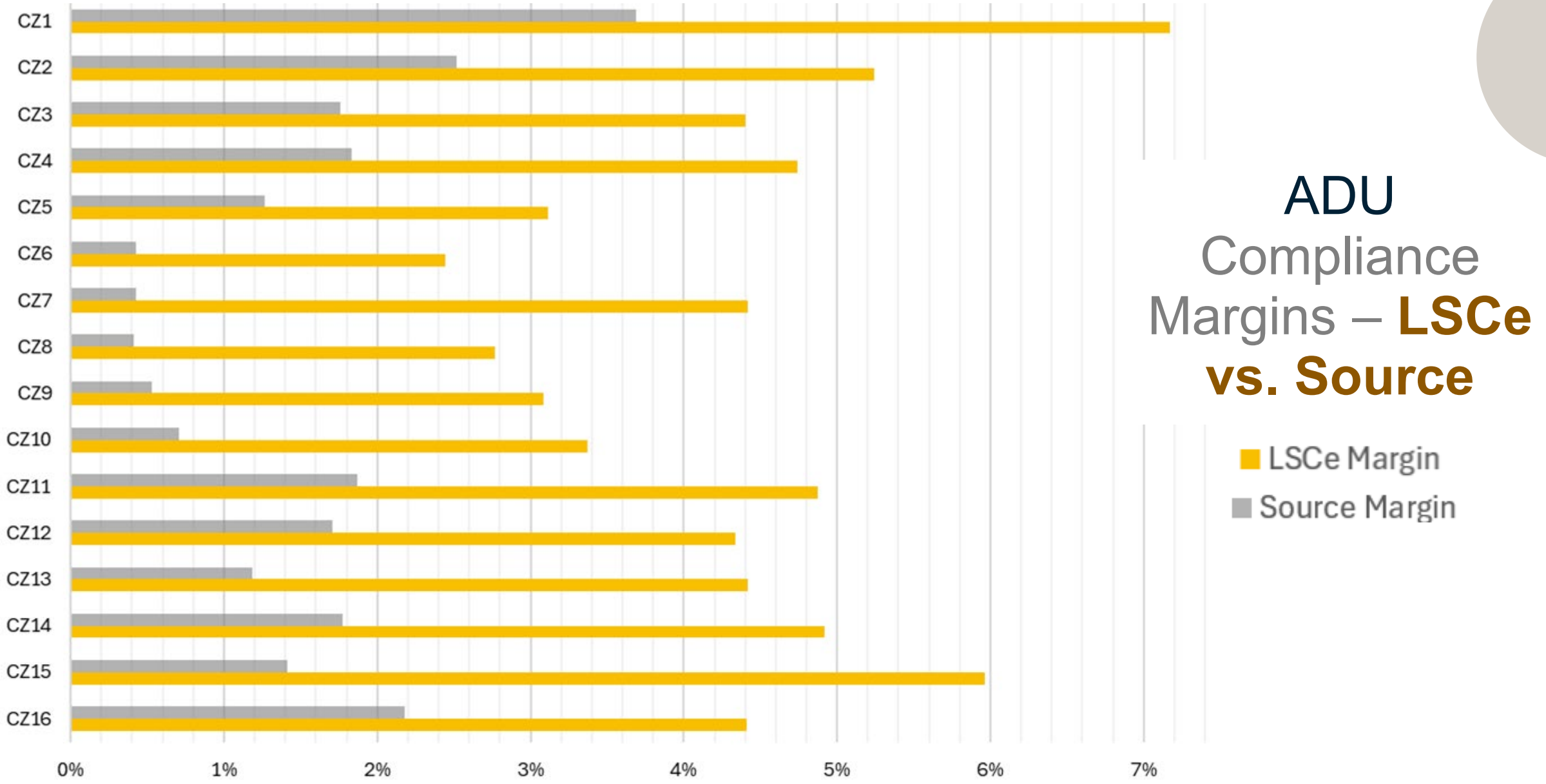
Cost-Effectiveness: 2025 LSC B:C Ratio



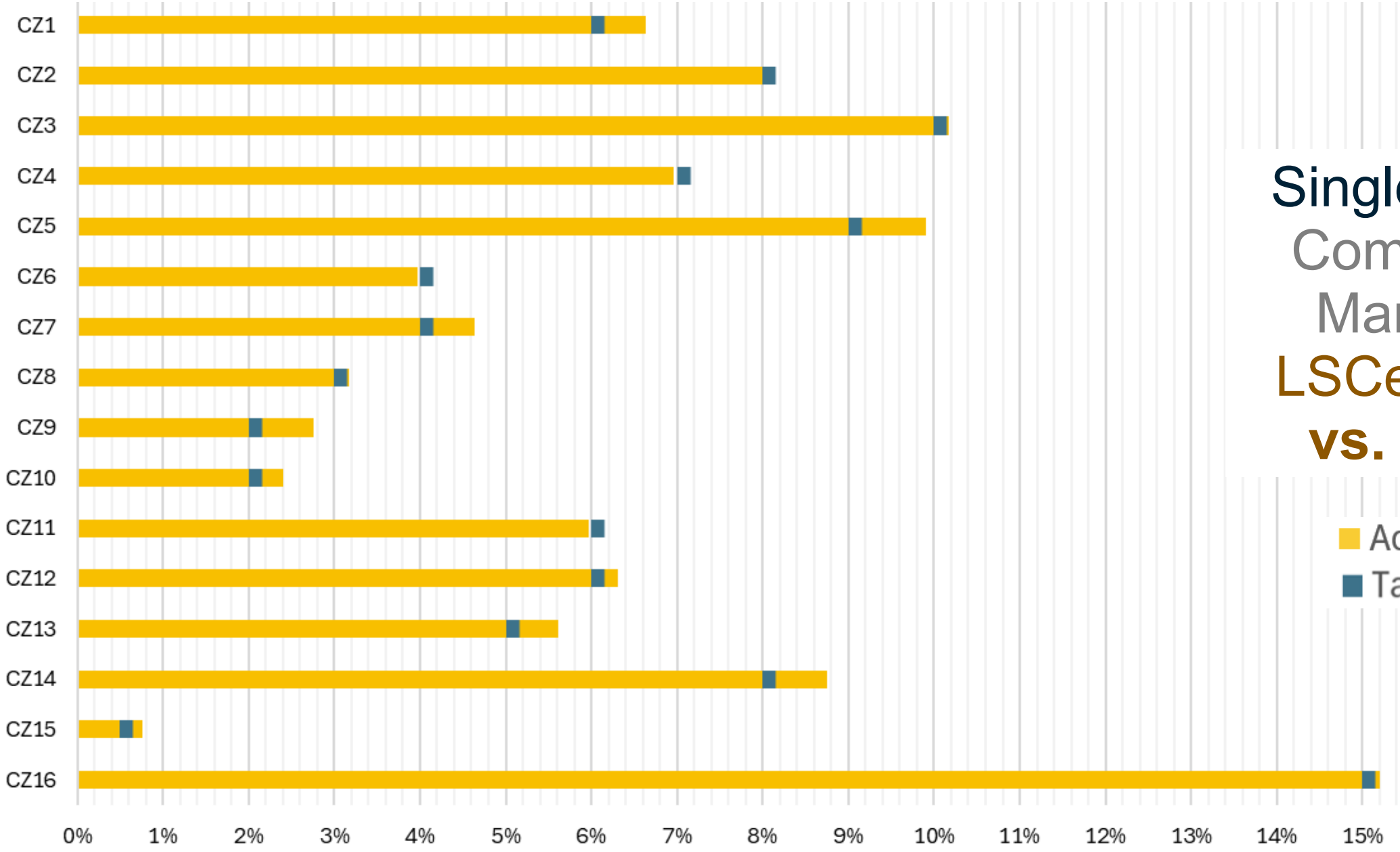
Single Family Compliance Margins – **LSCe vs. Source**



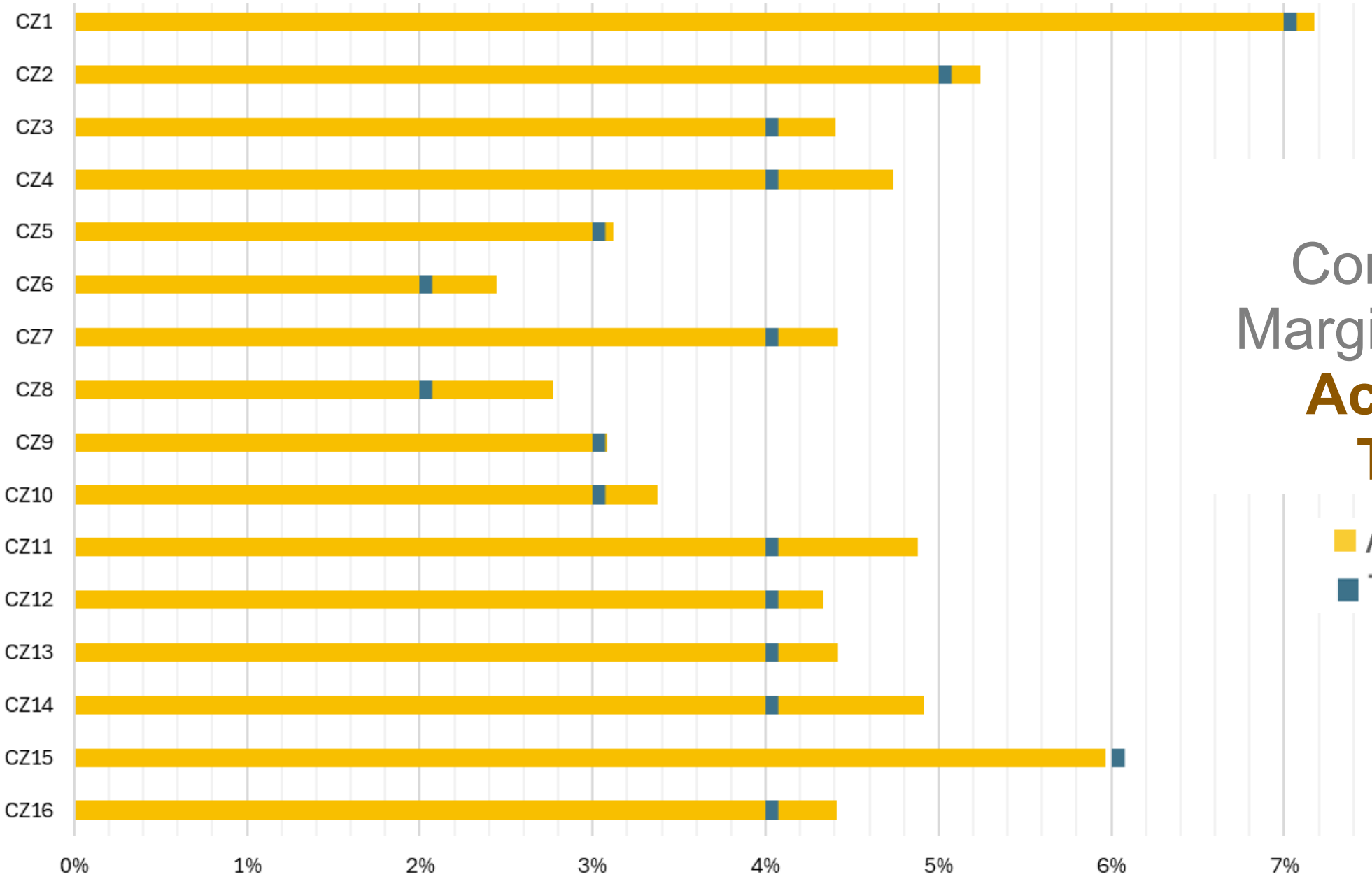
ADU Compliance Margins – **LSCe vs. Source**



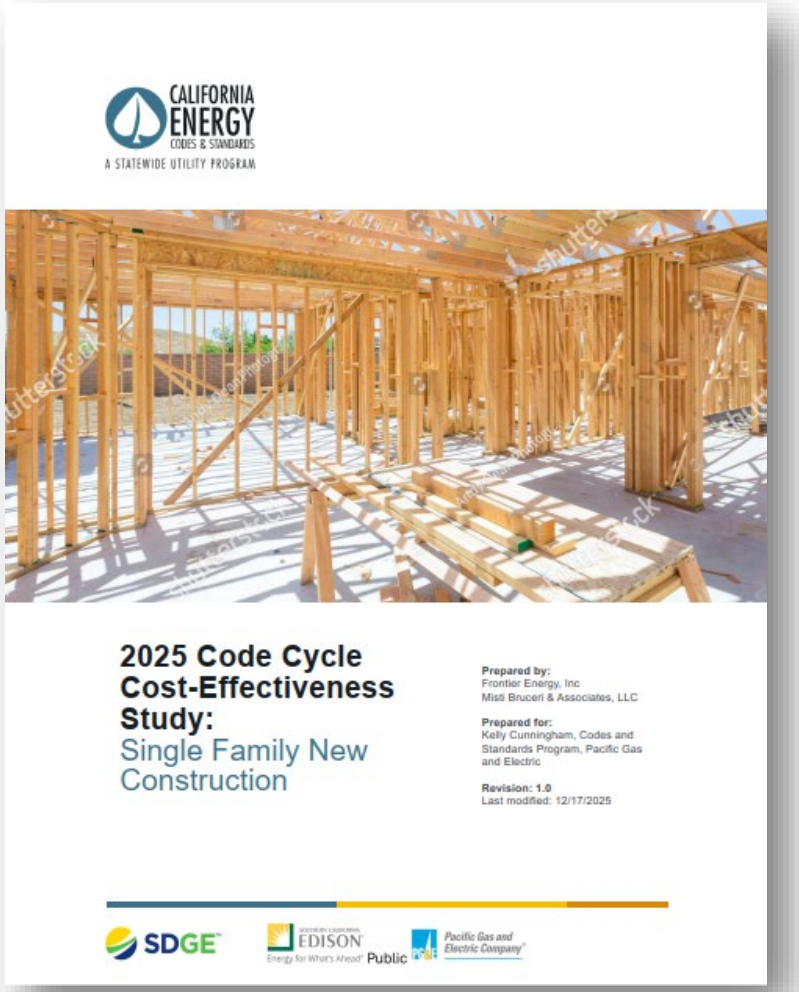
Single Family Compliance Margins – LSCe **Actual vs. Target**



ADU Compliance Margins – LSCe **Actual vs. Target**



Next Steps



Document details in final report, make data available in Cost-Effectiveness Explorer tool.

Thank you!

We appreciate your time

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Questions?

Wrap-Up

In Summary

There are cost-effective opportunities to exceed minimum single family new construction requirements.

- 2,400 sf home
  - On-Bill: All climate zones except CZ 4 in CPAU and CZ 12 in SMUD territories
  - LSC: All Climate Zones.
- ADUs
  - On-Bill and LSC: All climate zones

Some Ways to Begin Preparing

Research	Review CAP and other guiding documents for related policy goals and objectives
Consult	Consult with your attorney to determine AB130 impacts and eligibility for exceptions
Review	Review new housing development plans
Reach Out	Reach out to begin dialog with stakeholders

Additional Resources

Available Now

- Cost Effectiveness Explorer
- Model Ordinance Language

Coming Soon!

- Staff Report
- Presentation
- Checklist
- Policy Summary

Current Study Publication Schedule

Study Name	Scope	Initial Results
Single Family NC Memo	SF (excluding ADUs)	Published
Multifamily NC Memo	Low and Midrise	3/31/2026
Nonresidential NC	Hotels, Cond. Warehouses	4/15/2026
Existing Multifamily	2025 Update	4/15/2026
Cool Roofs	SF, MF, NR (New and Exist)	TBD

Thank you!

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