



California Energy Commission

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# Defining ZNE Buildings - Additional Slides -

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## **State Buildings ZNE goals- Adopted by Ex Order B-18-12 2012**

- All new state buildings and major renovations beginning design after 2025 shall be constructed as ZNE facilities
- 50% of new state facilities beginning design after 2020 shall be ZNE
- State agencies shall take measures towards achieving ZNE for 50% of the square footage of existing state-owned building area by 2025.
- State agencies shall continue measures to reduce grid-based energy purchases for State-owned buildings by at least 20% by 2018 as compared to a 2003 baseline.

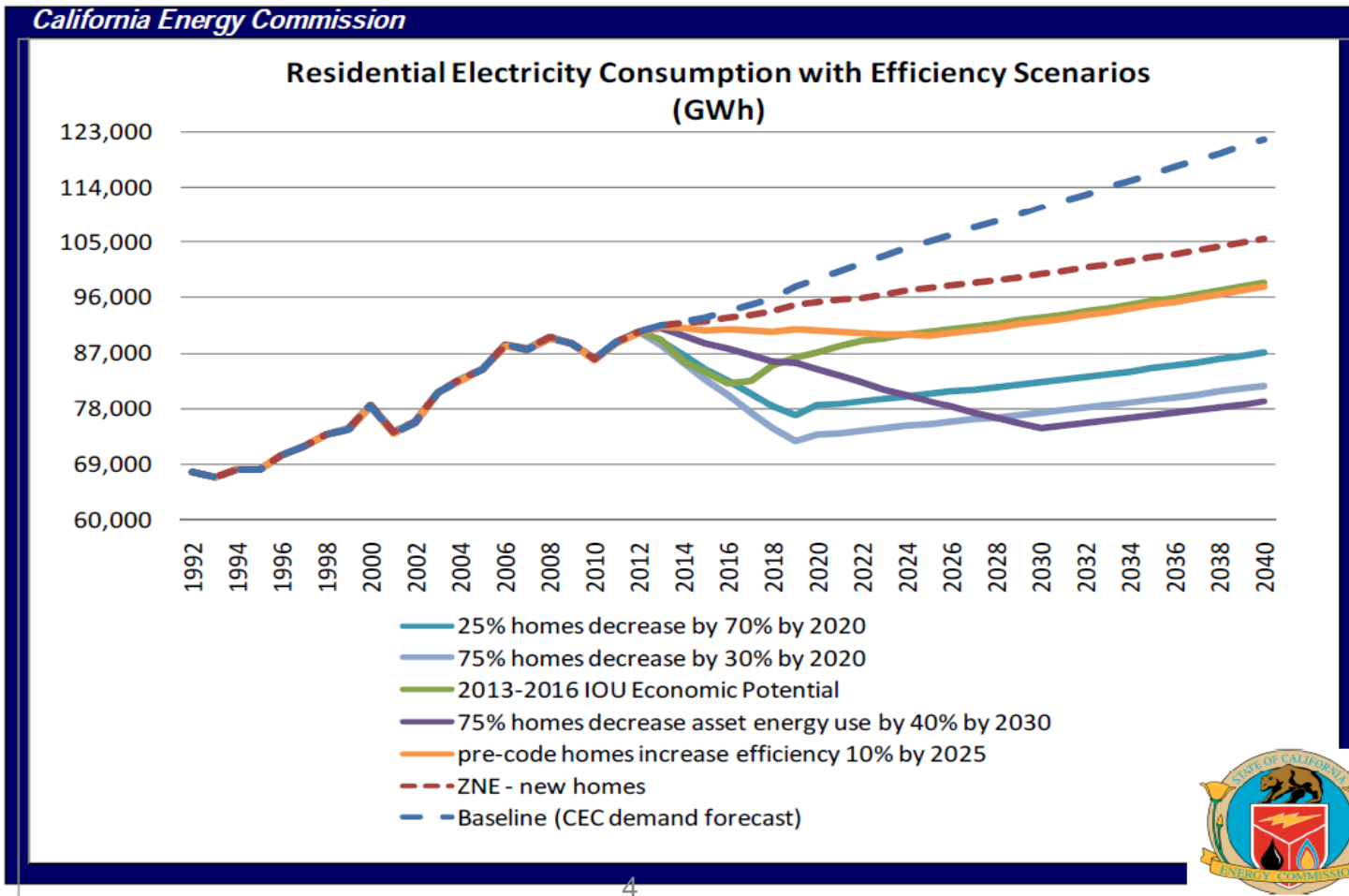


## Zero Net Energy as CPUC/ CEC Policy Goal

- Supported by Governor's Clean Energy Jobs Plan
  - Clean Energy Futures Vision, AB 32 Scoping Plan, Energy Action Plan, IEPRs
- ZNE buildings are “Aspirational”/ “Administration” goal -- not legislative mandate
- CEC/CPUC can advance ZNE building goals within the limits of agencies current statutory authority
  - ZNE buildings included in Title 24 if found to pass cost-effectiveness tests
  - IOU programs support advancing ZNE building goals within cost-effective portfolio
- CPUC mandated IOUs to support ZNE goals in 2010-12
  - \$136 million total expenditures, \$12.9 million of this in **new** programs/pilots and studies (will be similar in 2013-14)

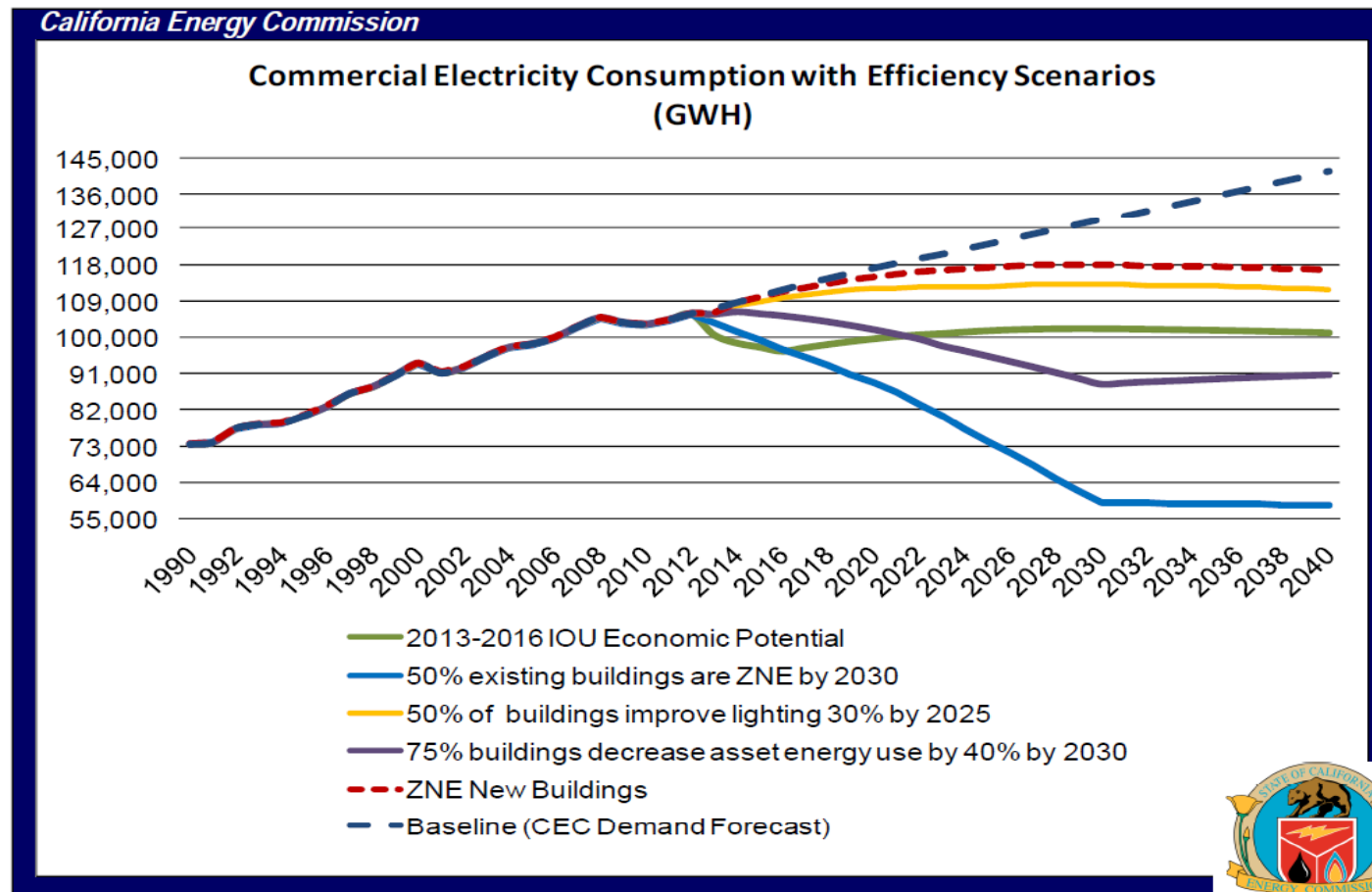


# ZNE Building Goals Offer Substantial Residential Demand Reductions





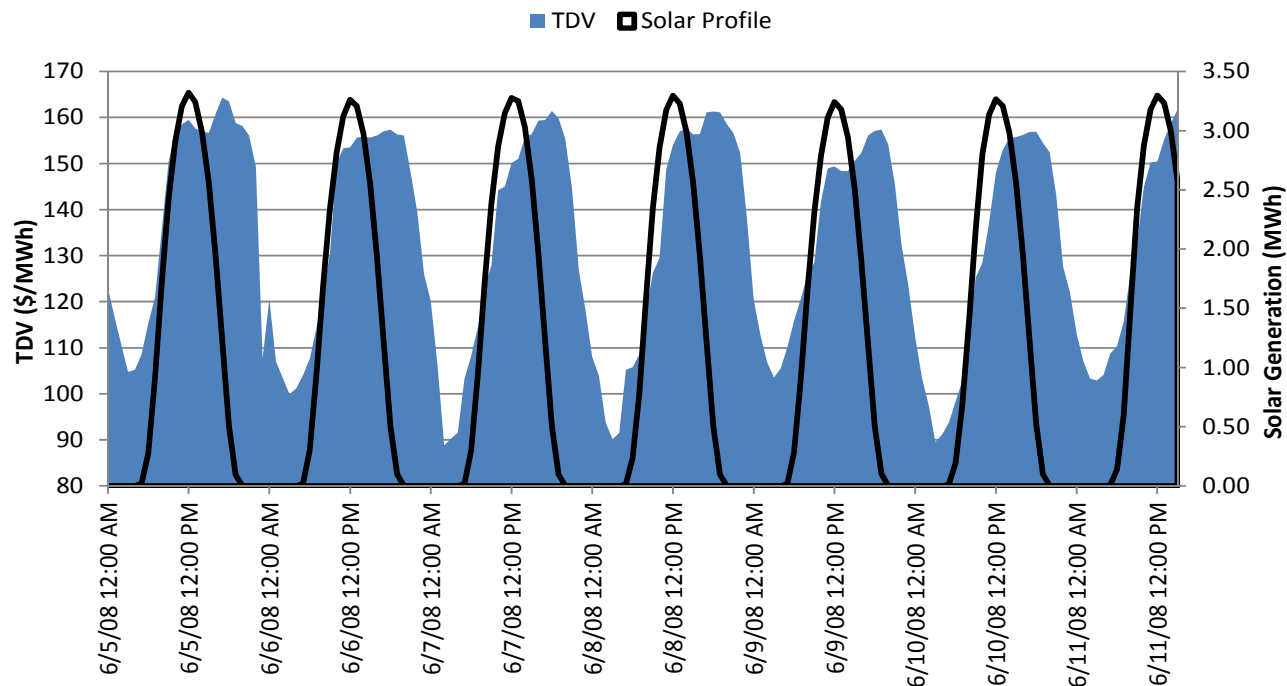
# ZNE Building Goals offer Substantial Commercial Demand Reductions





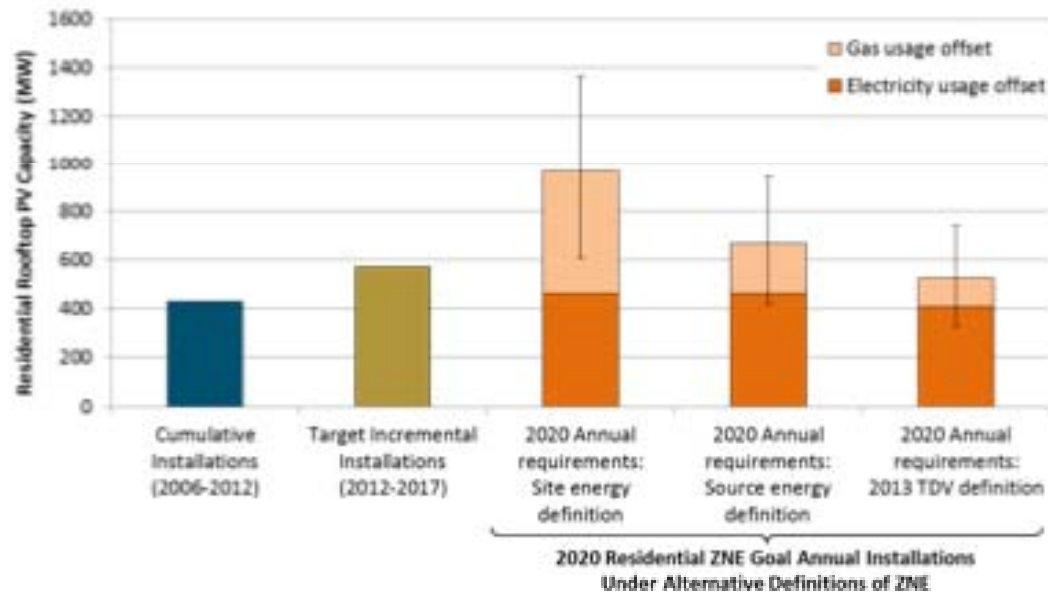
## Shape of TDV Metric Aligns well with Shape of Solar PV

- Solar PV generation profile is similar to the shape of the TDVs – **this increases the cost-effectiveness of solar:**
  - Example of Climate Zone 10





# ZNE Definition and Metric Impacts Projected Annual Residential ZNE Solar Requirements



*Figure 35. Cumulative historical residential PV installations associated with the California Solar Initiative (CSI) and New Solar Homes Partnership (NSHP) (2006 – 2012) (CEC, CPUC 2012); the additional residential PV installations required to meet a statewide target of 3,000 MW of rooftop PV's in California (assuming that 33% of these are built on residential rooftops) (2012 – 2017); and the annual PV installations needed for all new residential construction to achieve ZNE in 2020 under the site energy, source energy, and TDV-based definitions of ZNE.*





## PV Cost Implications of different ZNE definitions

### Low PV price estimate (\$4.50/W)

Current new buildings	PV kWh	PV kW	PV Cost \$/house	First Cost \$ Million/yr
Site energy ZNE	17,501	11.7	\$52,502	\$5,250
Source energy ZNE	10,264	6.8	\$30,791	\$3,079
Societal Energy ZNE	8,056	5.4	\$24,168	\$2,417
(Elec) Grid neutral	6,645	4.4	\$19,935	\$1,994

48% reduction T-24 (4 cycles 15% reduction)	PV kWh	PV kW	PV Cost \$/house	First Cost \$ Million/yr
Site energy ZNE	11,581	7.7	\$34,744	\$3,474
Source energy ZNE	7,324	4.9	\$21,972	\$2,197
Societal Energy ZNE	5,835	3.9	\$17,505	\$1,750
(Elec) Grid neutral	5,195	3.5	\$15,586	\$1,559

66% reduction all end-uses	PV kWh	PV kW	PV Cost \$/house	First Cost \$ Million/yr
Site energy ZNE	5,834	3.9	\$17,501	\$1,750
Source energy ZNE	3,421	2.3	\$10,264	\$1,026
Societal Energy ZNE	2,685	1.8	\$8,056	\$806
(Elec) Grid neutral	2,215	1.5	\$6,645	\$665

Elec vehicle extra	3750	2.5	\$11,250	\$1,125
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Source: 7,000 kWh to Zero in 8 Years Flat: A Strategy for Net Zero Energy Residential Buildings by 2020 (McHugh, 2012)





# ZNE Technical Feasibility Study

***“ZNE buildings will be technically feasible for much of California’s new construction market in 2020...”***

*Most buildings that were able to reach a ZNE goal using the TDV metric were also able to reach the goal using the more challenging Site-kBtu metric. But a significant difference exists between the two metrics as to the amount of PV required to meet a ZNE goal. **The Site-kBtu metric requires 80% more photovoltaic solar capacity to reach ZNE on residential buildings** as compared to the TDV definition. The difference is **30% for commercial buildings...***

*The additional PV capacity required to reach ZNE using a Site-kBtu definition can **add a substantial first cost** in reaching a ZNE goal when compared to a TDV definition”*



# Comparison of CPUC and CEC Cost Effectiveness Tests

	CPUC EE Avoided Cost ('E3 Calculator')	Title 24 TDV Factors
Regions of analysis	Utility (PG&E, SDG&E, SCE, SGE) and climate zone combinations	16 climate zones
Purpose	Evaluate cost-effectiveness of IOU energy efficiency portfolios	Evaluate cost-effectiveness of new energy efficiency building codes
Cost test	Total Resource Cost test, based on wholesale electricity costs, requires no retail rate adjustment	Modified Participant Cost Test (hourly wholesale electricity costs grossed up to reach retail rate levels with a constant 'adder')
Discount rate	Each utility's WACC (e.g.: 7.66% nominal for PG&E)	Societal discount rate (3% real or ~5% nominal).
Measure life	Varies by measure Expected Useful Life (EUL)	15-years (non-res) and either 30-years or 15-years (res) depending on the measure (shell is 30 years)
Capacity costs	Calculated as the difference between the cost of a combustion turbine (CT) and the margins that CT could earn from the energy markets. Based on 2005 through 2010 historical market data.	Calculated as the difference between the cost of a combustion turbine (CT) and the margins that CT could earn from the energy markets. Based on market simulations for 2012 and 2020.
T&D capacity cost allocations	T&D costs allocated to hours based on CTZR/V2 TMY weather files.	T&D costs allocated to hours based on CTZ2010 TMY weather files.

Source: E3 Memo to Energy Division, 2012