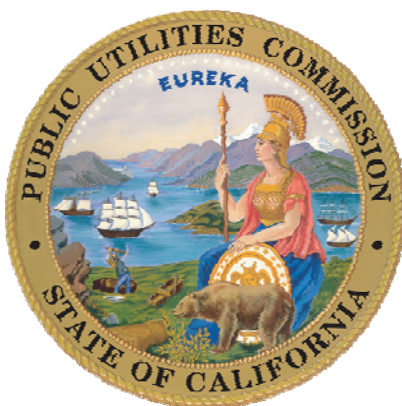




Defining ZNE Buildings and ZNE Building Goals in California



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CPUC Adopted ZNE Goals in CA Strategic Plan (2007-2008)

- All new residential construction in California will be zero net energy by 2020.
- All new commercial construction in California will be zero net energy by 2030.
- Policy goal also articulated by CARB, Energy Commission, the Gov. Clean Energy Jobs Plan and Futures Vision, the Energy Action Plan





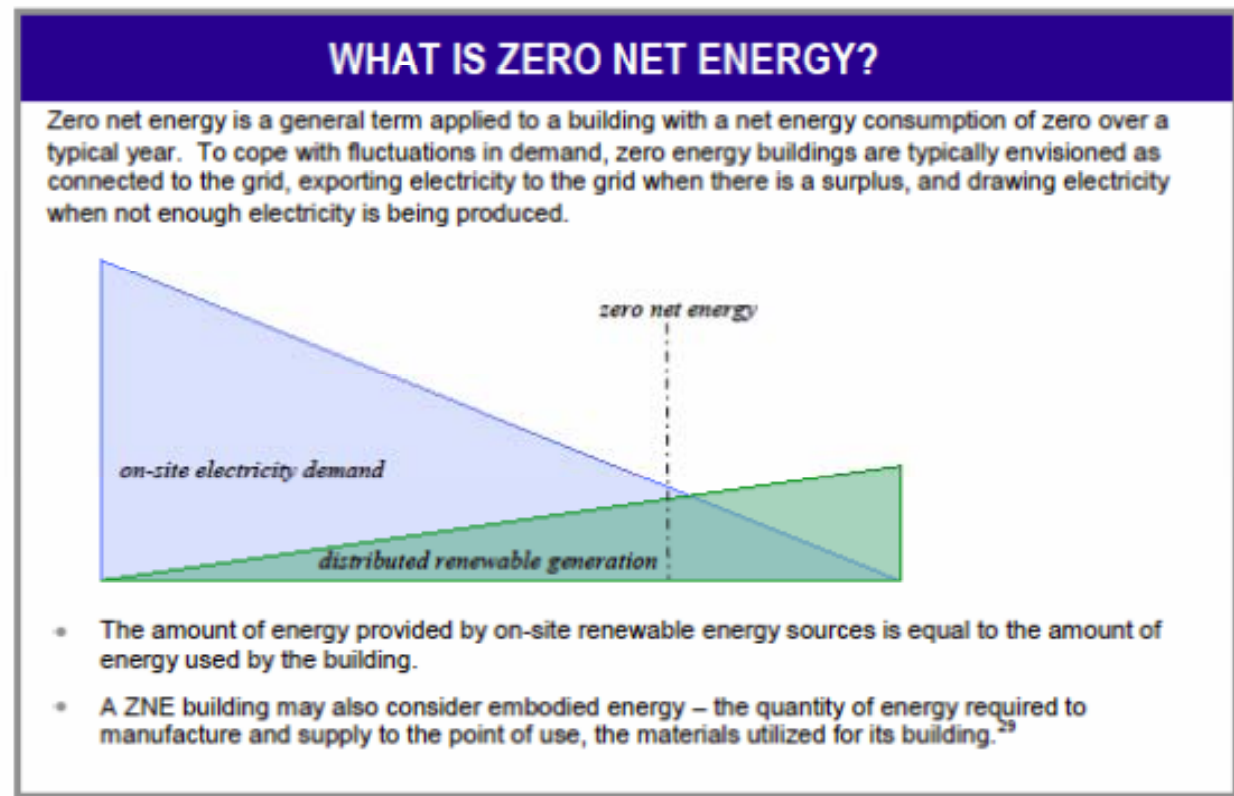
Defined ZNE as “the amount of energy provided by on-site renewable energy sources is equal to the amount of energy used by the building,” but...

Metric to measure
“energy” not specified

Some ambiguity:

- zero bill?
- embedded energy?

Was clearly intended
at level of “project
seeking entitlements
and permits”





Informal “ZNE Definitions Group” (2011)— From Commercial ZNE Action Plan process

- ***Key intent:*** Simple and short definition of ZNE where the policy complexity is captured
- ***Key challenge:*** Keep common sense definition of ZNE intact and meaningful while being applicable to all buildings in the near future
- ***Key finding:*** Definition of ZNE and policy goals had to be addressed together
- ***Proposed revised definition:*** “The *societal value of energy* consumed by the *building* over the course of a typical year is less than or equal to the societal value of the *on-site renewable energy* generated.”



Pressing need to formally approve a ZNE definition –

- 2016 Standards
 - Development activities already underway
 - Need to establish a ZNE level of energy performance in 2016 Green Building Standards
 - ZNE definition will be published in 2016 CA Building Code
- 2014 IOU New Construction Programs
 - Planning underway to build strong, explicit path to ZNE
 - Restructured incentives need to be support ZNE as will be defined in CA Building Code



Joint Energy Commission/CPUC Staff Proposed ZNE Buildings Definition (2012)

*“A Zero Net Energy (ZNE) Code Building is one where the societal value of the amount of energy provided by on-site renewable energy sources is equal to the value of the energy consumed by the building at the level of a single “project” seeking development entitlements and building code permits, measured using the California Energy Commission’s Time Dependent Valuation (TDV) metric. A ZNE Code Building meets Energy Use Intensity (EUIs) by building type and climate zone that reflect best practices for highly efficient buildings.**

Reference to EUIs necessary to ensure that *EE remains the foundation* of ZNE Buildings

** Updates from Strategic Plan in italics*



Time Dependent Valuation of Energy...

- Accounts for the avoided costs of future energy generation, transmission, distribution and delivery and GHG emissions expected over the 30 year life of buildings
- Includes the existing infrastructure costs paid by the “average consumer”
- Values both energy generation and efficiency more on peak than off peak, consistent with CA system costs
- Reduces the size of PV systems needed to meet ZNE compared to other energy metrics
- The energy valuation that is used in the Building Energy Efficiency Standards



CPUC/CEC Staff also suggest that there are other useful ZNE *TERMS* - but these should NOT be communicated as alternate DEFINITIONS for ZNE

- “ZNE Ready Building”
 - Buildings that meet the same high efficiency EUIs as ZNE Buildings, but that lack on-site renewables
- “Zero Net Electric Building”
 - A building where the amount of *electricity* provided by **on-site renewable energy sources** is equal to the amount of *electricity* consumed by the building (at the level of a single “project” seeking development entitlements and building code permits.) A Zero Electric Building meets Energy Use Intensities (EUIs)* by building type and climate zone that reflect best practices for highly efficient buildings. These EUIs will include both the electric and natural gas used at the building, such that best practice energy efficiency addresses all the energy used at the building, not just the electricity expected to be offset by a renewable energy source.



Key Findings from IOUs 2010-2012 ZNE Studies*

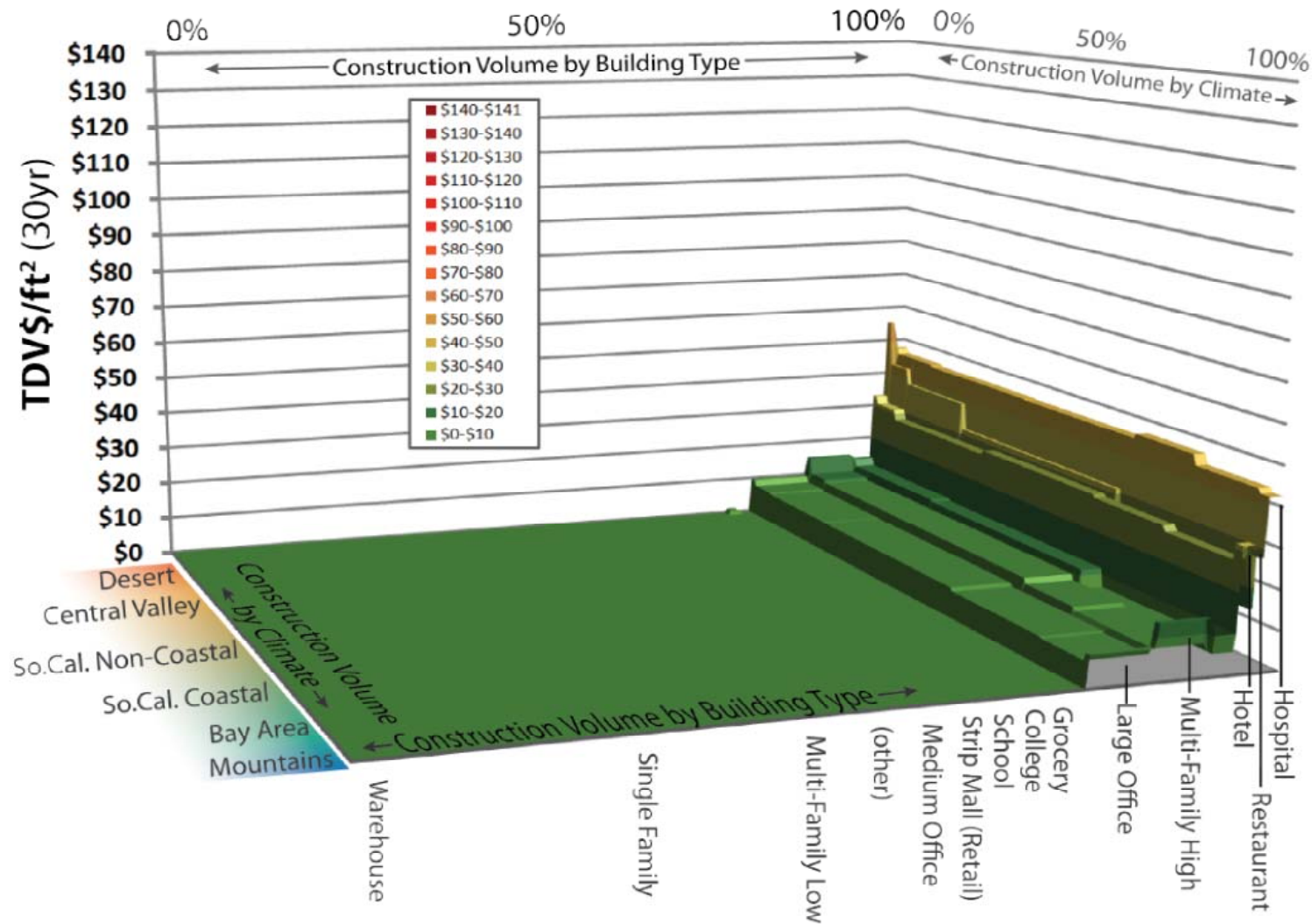
- ZNE buildings are technically feasible for all but a few building types, by 2020*
 - Hospitals, restaurants, large hotels, MF high rise, and large office excluded
 - Using parking lot space supports ZNE for MF high rise, large office, restaurants
 - Assumes rooftop PV systems, significant plug load improvements, etc.
 - Did not evaluate cost effectiveness (underway for 2013-14)
- Updates to TDV to reflect peak shift and value of energy exports needed

The Technical Feasibility of ZNE Buildings in California (Arup et al, 2012)

The Road to ZNE: Mapping Pathways to ZNE Buildings in California (HMG et al, 2012)

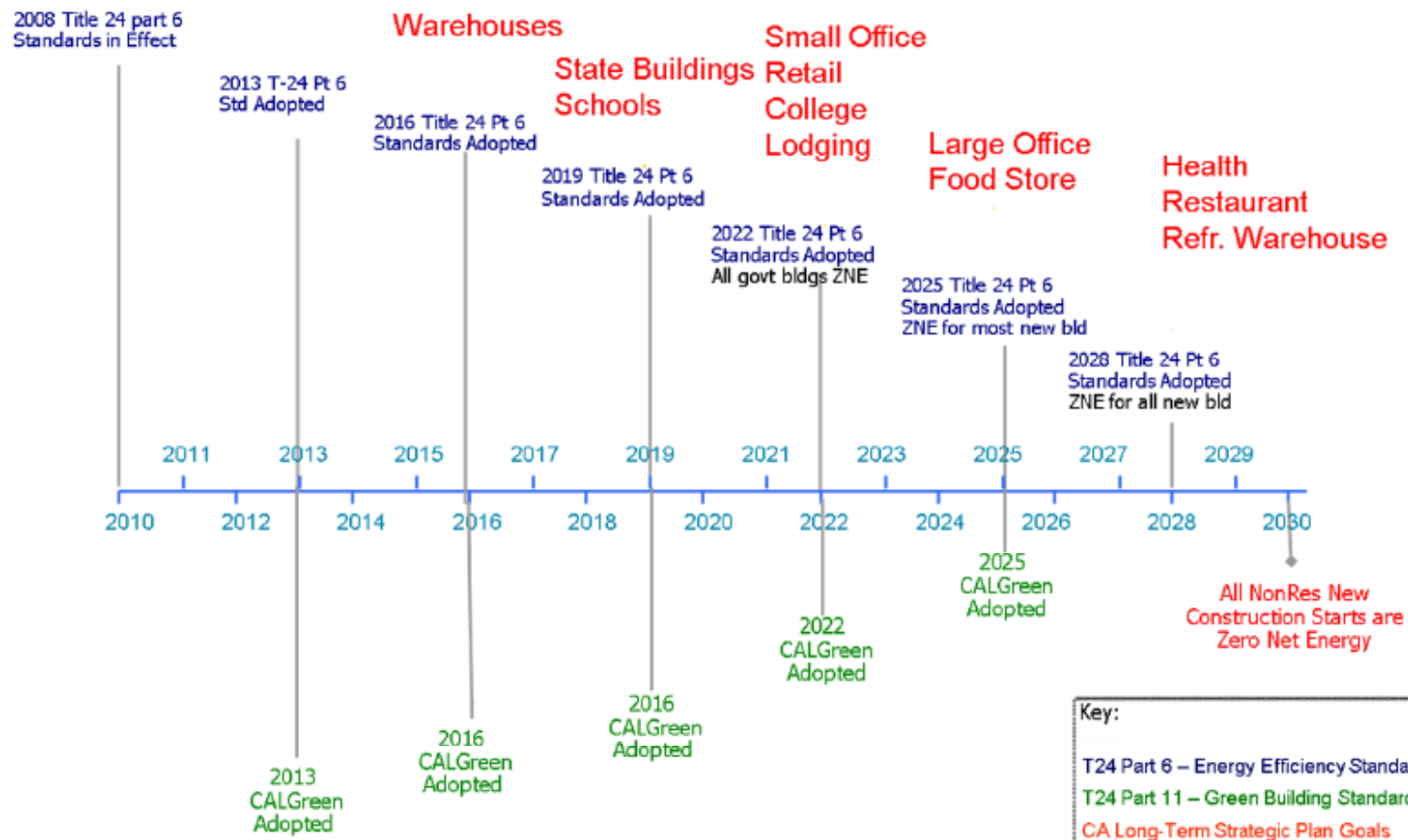


The Technical Feasibility of ZNE Buildings in California, in 2020





The Road to ZNE – Phase in ZNE Non-Res Bldgs in Title 24





(Some) Recommendations from *The Road to ZNE* –

- Deep EE as foundation of ZNE buildings
- Investigate and manage the grid impacts of distributed generation as DG requirements will be significant
 - Up to 530 MW rooftop PV / year for res in 2020
 - o PV not the only option
 - Up to 5000 MW PV by 2030, res goals alone
- Consider defining “ZNE Equivalent Buildings”
 - Could meet renewables generation off-site, and/or consider locational efficiency and/or water efficiency
- Internalize ZNE goals in IOU portfolios
 - Support and learn from Early Adopters
 - Take long term view of cost effectiveness



Concluding Thoughts

- CPUC/CEC supports TDV /societal value definition for “ZNE Code Buildings” for use in Title 24
 - “ZNE Ready” could be used as an EUI target or a home energy performance rating score
 - IOUs to link res new construction incentives to EUI targets starting in 2014
 - HERs score (30-40) would provide clarity for consumers
 - Builders can differentiate with respect to branding
 - “Zero Electric” could also be shown on a home energy performance rating scale
 - “ZNE Equivalent” will be hard to regulate via Title 24 and may be best kept separate
 - Many possible variables (location, water, off-site renewables) – will take time and diligence to build consensus on which are included, and how
 - More appropriate for “as occupied” rather than “as built” ?
- 13– Ongoing oversight of renewables ?



Thank you!

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To review IOU ZNE studies, search for
“zero net energy” at www.calmac.org

