CALGreen, Title 24 & the Net Zero Energy Standard
• Title 24, Part 6
• Title 24, Part 11
• ZNE – Why and How
Title 24, Part 6 – California Energy Code

http://www.energy.ca.gov/title24/

• Triennial rulemaking by CEC
  Ŷ 2013 code to be adopted by CEC late May 2012
  Ŷ effective on January 1, 2014

• Residential and nonresidential buildings
  Ŷ newly constructed
  Ŷ additions/alterations to existing buildings

• Applies to covered loads
  Ŷ heating, cooling, water heating, lighting
Title 24, Part 6 – California Energy Code

http://www.energy.ca.gov/title24/

• Covered loads
  - 45% of total energy for single family homes
  - federal preemption prohibits stricter state requirements (central AC, furnace, conventional WH)
  - does not include appliances, plugs loads

• Mandatory features + energy budget
  - prescriptive – checklist approach
  - performance – modeling approach
Title 24, Part 6 – California Energy Code

http://www.energy.ca.gov/title24/

- 40 + local jurisdictions have more stringent codes
- Proposed 2013 code
  - 25% savings single family homes
  - 30% savings nonresidential
  - envelope focus – windows and walls
  - lighting controls – daylighting, controllable ballasts
  - field verification – HVAC system testing
Title 24, Part 11 – California Green Building Standards Code (a.k.a. CALGreen)

http://www.bsc.ca.gov/Home/CALGreen.aspx

• Triennial rulemaking
  - HCD for residential
  - CBSC for nonresidential

• Mandatory and voluntary sections
  - planning, energy, water, materials, environmental
  - local jurisdictions may adopt voluntary
Title 24, Part 11 – California Green Building Standards Code (a.k.a. CALGreen)

http://www.bsc.ca.gov/Home/CALGreen.aspx

• 2010 voluntary energy efficiency Tier 1 +15% and Tier 2 +30%
  Ÿ efficiency program targets
  Ÿ eligibility criteria for solar incentives programs
  Ÿ basis of regional green building codes
• CEC will propose 2013 energy chapter
  Ÿ residential  +15% & +30%
  Ÿ nonresidential  +10% & +20%
  Ÿ communicate measures for migration to Part 6
Zero Net Energy – Why?

- AB32 (Global Warming Solutions Act of 2006)
- Long term EE strategic plan (http://tinyurl.com/5tkejy4)
- Other supporting policies (AB758, AB1103, AB1109)
- ZNE residential by 2020
- ZNE nonresidential by 2030
Zero Net Energy – Why?

CA GHG Emissions
484 MMT CO2e (2004)

- Buildings: 23% (114 MMT)
- Transportation: 38%
- Industrial: 20%
- Agriculture: 6%
- Electricity: 9%
- Other: 4%
Zero Net Energy – Why?

Building Greenhouse Gas Emissions
1990-2004 from the CARB GHG Emissions Inventory
future estimates based on CEC Electricity Demand Forecast

Million Metric Tonnes CO2e

40 Mtonne CO2e
Zero Net Energy – How?

• What is the correct metric?
  ᵉ site energy
  ᵉ source energy
  ᵉ annual utility costs
  ᵉ carbon/emissions
  ᵉ grid neutral (electricity only)
  ᵉ role of embodied energy & transportation energy
Zero Net Energy – How?

• Policy Questions
  - tradeoffs between fuel types
    - can a natural gas consuming building be ZNE?
  - what on-site renewable generation is allowed?
    - is any form of combustion allowed?
  - what is the boundary for the site?
  - difficult buildings types
    - high EUI buildings
    - urban infill
    - limited renewables access
Zero Net Energy – How?

• CEC working definition for ZNE
  - based on definition developed in CPUC working group
  - no consensus reached on definition

• ZNE = 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 renewable energy generated on-site
Zero Net Energy – How?

• Societal Value = Time-Dependent Valuation (TDV) Energy
  ŷ specialized version of source energy
  ŷ highly values energy coincident with peak demand
  ŷ allows tradeoff between fuel types

• On-site = property receiving development entitlements and building code permits
Zero Net Energy – How?

- Renewable energy generation
  - photovoltaics, solar thermal electric, micro-hydro, wind
  - ground source heat pump, solar thermal treated as energy efficiency measures
  - does not include off-site generation, renewable energy credits, biomass, biogas, etc.
Zero Net Energy – How?

• Revised Zero-Net Energy Goals
  Ÿ All new residential construction in California will be zero net energy or equivalent to zero net energy by 2020

  Ÿ All new commercial construction in California will be zero net energy or equivalent to zero net energy by 2030
Zero Net Energy – How?

- Possible concepts for “equivalent”
  - purchase of renewable energy credits (RECs)
  - averaging of multiple buildings under control of same owner (e.g. multiple schools in a school district, multiple buildings in a campus setting)
  - off-site renewables
  - reductions in embodied energy, water usage, transportation energy (location efficiency)
  - housing density credit
  - tracking and enforcement concerns
Zero Net Energy – How?

• Asset rating = calculated, rates the building not the occupants
• Operational rating = measured, actual energy usage
• Hybrid = operational rating adjusted for weather & operating variables
• Zero Net Energy is zero on chosen rating scale
Zero Net Energy – How?

- New paradigm for code development & compliance
- More & better collaboration with PIER, CPUC, ARB, utilities
- New partnerships with local governments
- Quicker migration from R&D and emerging tech
Zero Net Energy – How?

- Expanded scope for Appliance & Building Efficiency Standards
  - building standards on “whole building” metric
  - consumer electronics
  - residential general lighting
  - process loads (e.g. data centers, laboratories, refrigeration systems)
  - design phase code requirements
    - orientation
    - solar access
    - mass
    - glazing
    - daylighting
  - commissioning
  - energy monitoring & feedback
Zero Net Energy – How?

Percentage of buildings in NBI “Getting to 50” database utilizing technology

Daylighting: 95%
Controls: 90%
Increased Insulation: 60%
HVAC Efficiency: 50%
Natural Ventilation: 40%
Heat Recovery: 35%
Applied PV: 30%
Glazing Performance: 30%
Demonstration PV: 25%
UFAD/Displacement: 20%
GSHP: 15%
VFDs: 10%

Source: Dave Hewitt, New Buildings Institute
*Getting To Fifty* presentation, 2008 ACEEE Summer Study
Zero Net Energy – How?

- Conservation ethic
- Social marketing
- Education & outreach
- Medium term goals for single family homes
  - reduce loads so ZNE can be achieved with 3-4 kW of PV
  - 2019 Title 24, Part 6 requirement for residential buildings is ZNE or equivalent
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