ZNE AND CEC MODEL
SOLAR ORDINANCE

BayREN Forum
June 27, 2017
CALIFORNIA’S ZERO NET ENERGY
All new residential construction will be zero net energy by 2020.

All new commercial construction will be zero net energy by 2030.
Zero Net Energy – in 2008, seemed simple enough...generate as much as you use over a year

2016 Standards Definition
- Energy Design Rating = 0 (Efficiency measures plus renewables offset all TDV energy usage)
ENERGY DESIGN RATING

• Based on 2006 IECC
• Includes energy efficiency and renewables
• Regulated and Non-Regulated Loads
  • Space Heating, Cooling and Water Heating; plus
  • Lighting, Appliances, Plug Loads

• Implementation Challenge:
  • EDR = 0 requires offsetting all TDV-energy with renewables (including natural gas)
CAISO Net System Load
March 31, 2012-2020

- Renewables changing system demand shape
- Risk of over-generation (resulting in curtailment)
- Need grid interactivity and harmonization to maximize benefits

Source: Flexible Resources to Help Renewables
Teaching the Duck to Fly
An Example

- Targeted Efficiency
- Manage Water Pumping
- Control Electric Water Heaters
- Ice Storage for Commercial AC
- Rate Design
- Targeted Electric Storage
- Inter-Regional Power Exchange

1. Peak-Oriented Renewables
2. Manage Water Pumping
3. Control Electric Water Heaters
   - Ice Storage for Commercial AC
   - Inter-Regional Power Exchange

- Peak-Oriented Renewables
- Manage Water Pumping
- Control Electric Water Heaters
- Rate Design
- Targeted Electric Storage
- Inter-Regional Power Exchange

- Demand Response
- Targeted Efficiency
- Rate Design
- Targeted Electric Storage

http://www.raponline.org/document/download/id/7956
REFINING THE VISION FOR THE 2019 STANDARDS

- Revised Zero Net Energy to Zero Net Electricity
  - Compliance baselines fuel-neutral
- Offset site electricity use only, system sized for mixed-fuel home
- Two separate scores: Efficiency, Renewables
  - Must meet minimum level of efficiency before renewables
- EDR required score likely ~20
- Focus on ensuring PV systems deliver value to customer and grid
  - Credits for storage (basic and utility-controlled)
ACHIEVING THE GOAL

• 2016: approx. 10% of new homes installing PV
• CEC identified need to ramp up more quickly to reach 100% by 2020
• Proposed local ordinance requiring PV systems on new homes
• Worked with PG&E to develop cost-effectiveness study
CEC SOLAR ORDINANCE
C-E STUDY ASSUMPTIONS

• May not use PV credit to achieve compliance
• No efficiency measures beyond compliance required
• Ensure PV systems appropriately sized
  • Offsets approximately 80% of site electricity usage
  • Estimates based on total TDV energy
• Baseline is mixed-fuel home
• Cost-effectiveness based on customer utility savings (not TDV energy)
• Prescriptive (<4,500 sq.ft) and performance options

Table 1: Minimum Nameplate System Size (kW DC) Required [SAMPLE CZ12]

<table>
<thead>
<tr>
<th>Conditioned Space (ft²)</th>
<th>Minimum kW (DC) Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 1000</td>
<td>1.5</td>
</tr>
<tr>
<td>1000 - 1499</td>
<td>1.9</td>
</tr>
<tr>
<td>1500 - 1999</td>
<td>2.3</td>
</tr>
<tr>
<td>2000 - 2499</td>
<td>2.7</td>
</tr>
<tr>
<td>2500 - 2999</td>
<td>3.1</td>
</tr>
<tr>
<td>3000 - 3499</td>
<td>3.4</td>
</tr>
<tr>
<td>3500 - 3999</td>
<td>3.8</td>
</tr>
<tr>
<td>4000 - 4499</td>
<td>4.2</td>
</tr>
</tbody>
</table>
SINGLE FAMILY COST EFFECTIVENESS RESULTS

- Cost effective in all climate zones
- PV System Capacity: 2.2 – 4.6 kW
- Simple payback: 12.7 yrs in CZ5 – 17.1 yrs in CZ1
- CO2 emissions reduction: 25.7 – 64%
MULTIFAMILY COST EFFECTIVENESS RESULTS

- Cost effective in all climate zones
- PV System Capacity: 1.3 – 2.1kW (per dwelling unit)
- Simple payback: 12.3 yrs in CZ16 – 17.7 yrs in CZ6
- GHG emissions reduction: 31 – 55%
Resources for Local Jurisdictions

The following model ordinance is designed for local jurisdictions considering solar PV installations to reach beyond the mandatory requirements of the current standards, depending on climate zone. The model ordinance language is consistent with the statewide standards for solar installations currently under development by the Building Standards Office.

Available for adoption

Draft CEC Ordinance Template

CE Study

http://www.energy.ca.gov/title24/2016standards/ordinances/
ADDITIONAL ORDINANCE OPTIONS
GARNERING ADDITIONAL EFFICIENCY ("PV-PLUS")

- Performance-Based format requires achieving savings beyond compliance
- "PV-Plus" cost-effective compliance margins:
  - Single Family
    - 30% in most climates (1, 2, 4, 8-16)
    - 20% in milder climates (3, 5)
    - 10% in CZ 6 and 7 (no PV credit available)
  - Multifamily
    - 25% in most climates (4, 9-16)
    - 20% in some coastal climates (1, 2, 8)
    - 15% in parts of bay area (CZ 3)
    - 10% in very mild climates (5-7)
- Strongly encourages, but does not require PV systems
GARNERING ADDITIONAL EFFICIENCY ("PV-PLUS")

- PV-Plus (EE + PV) measure package results in incremental cost above PV-only cost equal to:
  - Single Family $300 – $1,800
  - Multifamily $0 - $300
- Decrease in simple payback time (SF and MF): 6 months to 1.5 years
- Increased GHG emissions reductions
  - Single Family: 39 - 72% (from 30 - 64%)
  - Multifamily: 41 - 62% (from 31 – 55%)
EFFICIENCY-ONLY ORDINANCE

• Performance-Based format
• “EE-Only” cost-effective compliance margins:
  • Single Family
    • 15% in most climates (1-3, 5, 9-16)
    • 10% in CZ 4
  • Multifamily
    • 15% in most climates (1, 11-16)
    • 10% in CZ 10
    • QII Only in CZ 2
• Does not allow using PV system credit in performance calculations
• Reduces incremental costs significantly
  • Single Family: $600 - $1,500
  • Multifamily: $150 - $1,100
PRESCRIPTIVE (SINGLE MEASURE) OPTIONS

Cost-Effectiveness Studies Available
• Cool Roofs (Res, Non Res)
• Non Res Outdoor Lighting
• Plug-in Electric Vehicle Infrastructure

Coming Soon: Prescriptive ordinance addressing substantial residential remodels
RESOURCES

• LocalEnergyCodes.com (coming soon)
• BayREN Codes and Standards website
• California Energy Commission
• California Building Standards Commission
• New Buildings Institute
SUMMARY

- Aggressive State goals can be met but can use support
- Local governments have options
- Ordinances can support market transformation and code readiness
THANK YOU

• Amy Dryden
• amy@builditgreen.org