

# **RESNET 2018**

### The Dog that Caught the Car: A Case Study in the Unexpected Hazards of Achieving ZNE

Matthew Christie TRC Energy Services February 28, 2018



### **TRC Energy Efficiency Services**

- Residential program design and implementation
- Codes and standards
- Market characterization and program evaluation
- Zero Net Energy and emerging technology





### Agenda

- Disclaimer
- Status of ZNE
- ZNE Driving forces
  - Regulatory
  - Market Driven
- Regulatory Deep Dive
- New Metrics
- New Markets & Drivers
- Questions





### **Disclaimer**



#### • I'm sorry

- I work in California I know we're not special and you're sick of hearing about us
- I also work in Oregon and Washington. We're a little bit special





#### **Good News! Residential ZNE is:**

### Technically Feasible

For simple single family building types

## Financially Cost Effective

 With integrated design efforts and an experienced design-build team



Up to a point with natural-gas complications galore





#### What drives **ZNE**





### **California Res Codes 1975 to Today**

#### Impact of building standards on home energy use





### **The Asymptote of ZNE Achievement**



- Decoupling IOUs profit
  from savings
- Abundance of cost effective measures (low hanging fruit)
- CPUC, CEC & IOU backing
- Preemption
- Society's profit-promise to regulated utilities
- Grid harmonization and time of use
- Incrementalism



#### **Reduction in savings potential**



What do you think happened to cost-effective savings?





#### As Code Approaches ZNE – The Drivers Stall





#### Grid Harmonization – Aggressive ZNE Can Create New Problems





#### Load shifting through battery storage





#### **Proxy Metrics to New Metrics**







#### **Advanced Metrics**

### Not all BTUs are created equal



- Time Dependent Valuation (TDV) Energy (CA)
  - Energy type (electric vs. gas)
  - Date and hour
  - Climate zone





#### **New Metrics – Time Dependent Valuation**



Any peak-related metric will inevitably change over time





#### Efficiency and PV are finally getting hitched!





### Mandatory PV in CA for ZNE (2019 Res Code)



"PV array sized to displace the annual site kWh"



 End uses covered by PV: cooling, lighting, plug loads, ventilation, appliances



 End uses covered by PV: cooling, lighting, plug loads, ventilation, appliances, DHW, heating, cooking





### All-electric 2

 End uses covered by PV: cooling, lighting, plug loads, ventilation, appliances, DHW, heating, cooking





#### **New Metrics – Energy Efficiency Dovetail**



#### NEW JERSEY'S CLEAN ENERGY PROGRAM





#### **New Market Drivers – Green Appraisal and Listing**







#### **Open the Boundary Box**





#### **Open the Boundary Box**





#### When is Good Enough Good Enough?



Depends on your definition of ZNE, your metrics, and the policy goals



### **THANK YOU**



#### **TRC Energy Services**

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