



***Zero Net Energy – 3 DEFINITIONS...  
... and an opinion***

**Rob Hammon, Ph.D.**

**President**

October 17, 2012

# Agenda

- *WHAT IS ZNE?*
- *THREE COMMON DEFINITIONS*
- *TDV GRAPHS*
- *COMPARISONS: SOURCE → TDV ZNE → SITE ZNE*
- *QUESTIONS*

# What is Zero Net Energy (ZNE) ??

- **CPUC 2008 : California Energy Efficiency Strategic Plan**

*All new residential construction in California will be zero net energy by 2020*

*Zero Net Energy is herein defined as the implementation of a combination of building **energy efficiency design features and on-site clean distributed generation** that result in no net purchases from the electricity or gas grid, at the level of a single "project" seeking development entitlements and building code permits. Definition of zero net energy at this scale enables a wider range of technologies to be considered and deployed, **including district heating and cooling systems and/or small-scale renewable energy projects** that serve more than one home or business (CPUC 2010 Section 4).*

- **ZNE: Energy Consumed = Renewable Energy Generated**  
**(Annually)**

# Comparison of ZNE Source, Site and TDV

## ZNE Energy Definitions

### 1. ZNE – Site Energy: Net kWh at the Site

- Simple to understand
- Most difficult to achieve – “most stringent”
- Does not account for displaced fuel type

### 2. ZNE – Source Energy: Net kBtu at the Source

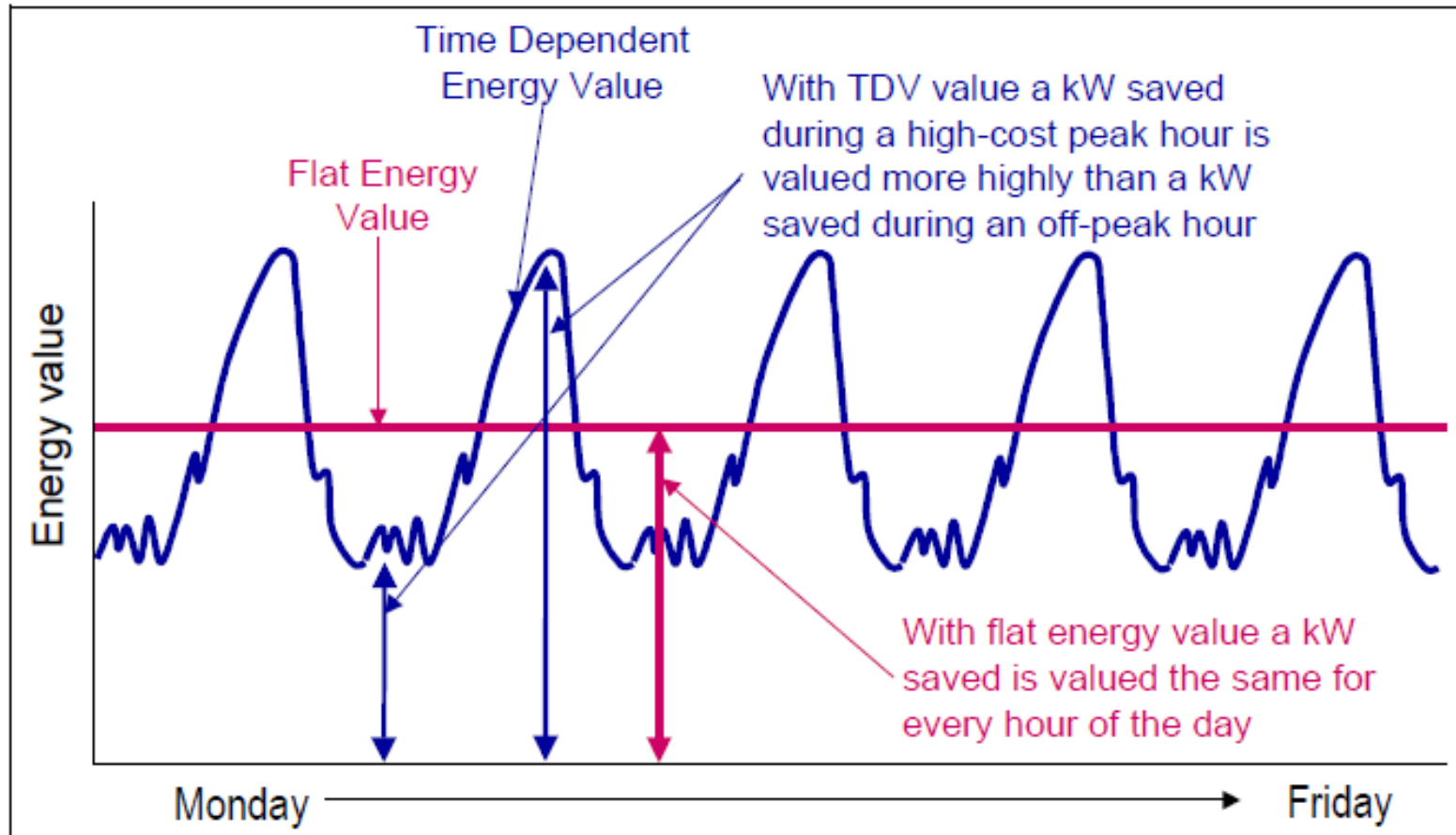
- Equating fuel types at source
- Does account for avoided losses
  - Generation and Distribution losses (Electricity x3, Natural gas x1)
- Do not account for ‘peak’ loads - regional and daily variation in generation

### 3. ZNE – Time Dependent Valuation (TDV): Net Source TDV

- Time Dependent Valuation: Energy use weighted by historical demands
- TDV multipliers for each hour of the year and for each energy type (electricity, natural gas, propane)
- Used in Title 24 and HERS “energy” calculations

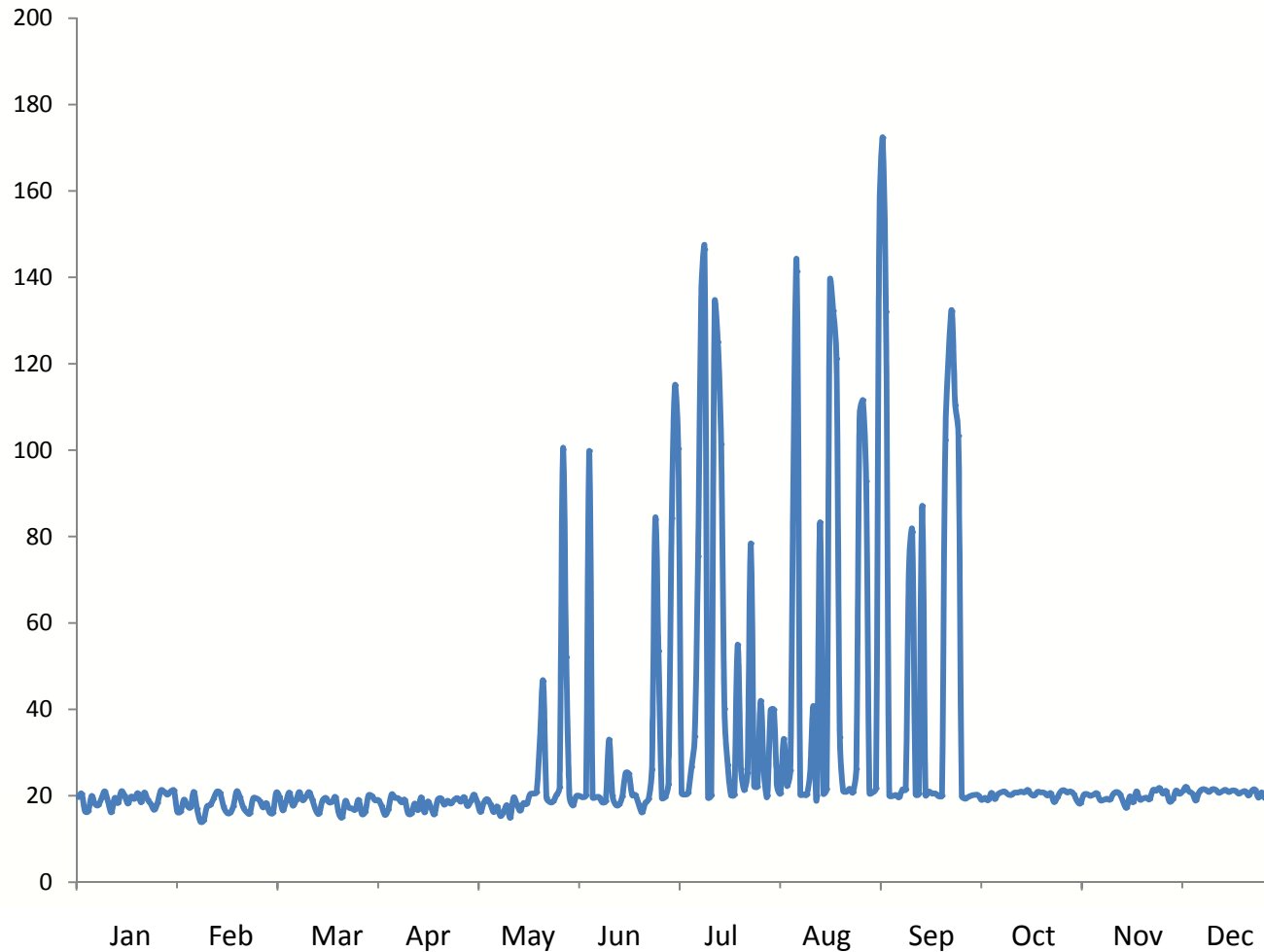
# TDV Costing Compared to Flat Costing - Summer Weekday

(PG&E TDV Study, 2002)



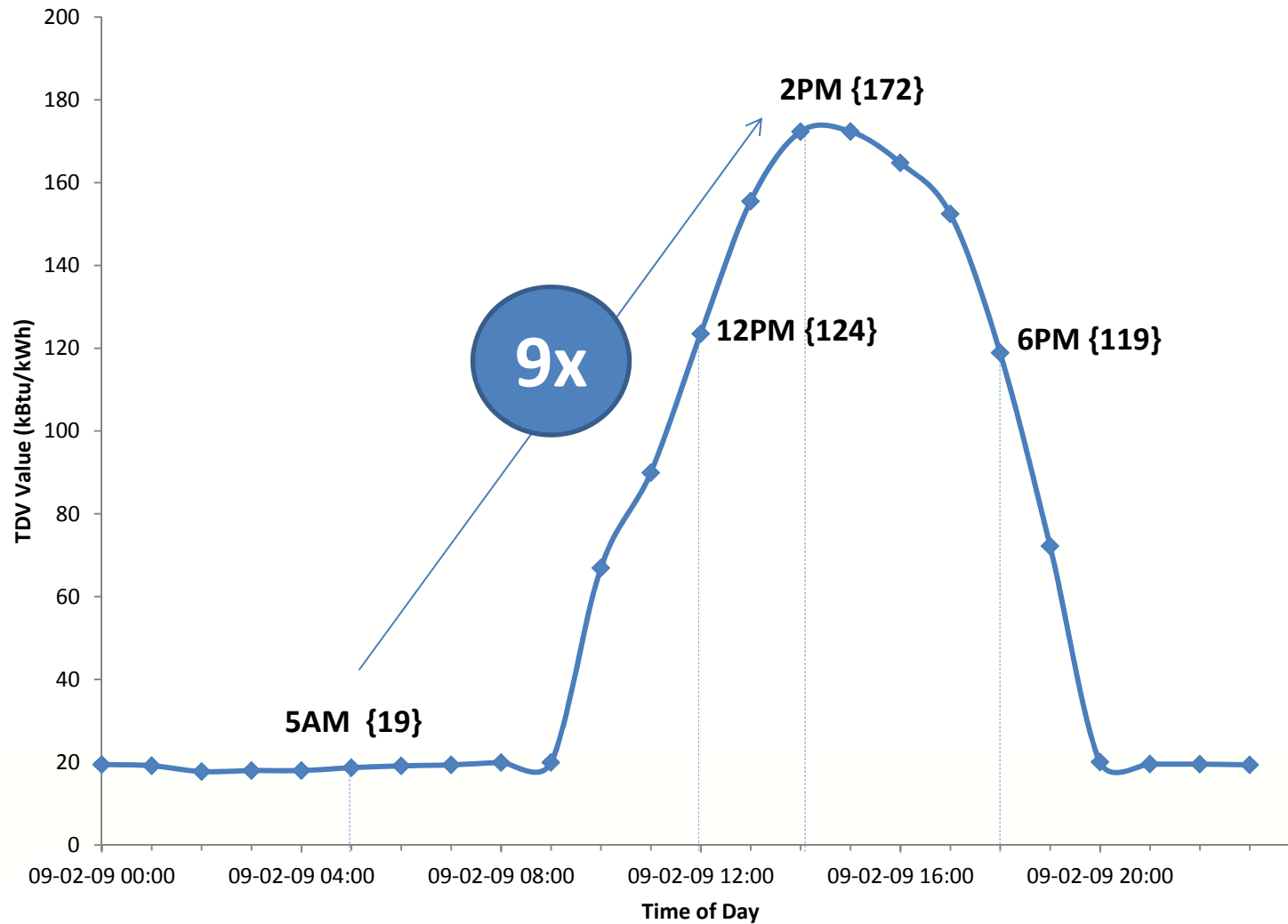
# Annual Electricity TDV -- Example

Annual Electricity TDV Values (kBtu/kWh) for CZ13 in 2009



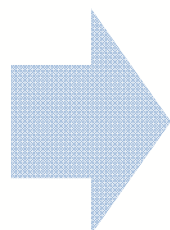
# Extreme Example of TDV – Based on Historical Demand

## Highest Average TDV Values for CZ13 in 2009 - September 2nd



# Comprisons Source → TDV ZNE → Site ZNE

Exterior Walls	R-19
Garage Walls	R-19
Roof/Attic	R-30 Ceiling Concrete Tile
Radiant Barrier	Yes
Attic	Vented
Floor	Slab on Grade Uninsulated
Windows (U/SHGC)	0.32/0.25
HVAC	14 SEER , 80% AFUE
Ducts	Tight R-6
Water Heater	Gas , 0.82 EF
Distribution	Uninsulated
<b>PV</b>	<b>4.0 kW</b>
Drywall	1/2"
Ventilation	Exhaust 100% A62.2
Refrigerator	ENERGYSTAR
Cooking Range	Gas
Dishwasher	ENERGYSTAR
Clothes Washer	ENERGYSTAR
Clothes Dryer	Gas
Solar DHW	None
Lights	85% LED
Infiltration	1.8 SLA
<b>% Source ZNE</b>	<b>95%</b>
<b>% TDV</b>	<b>100%+</b>



Exterior Walls	R-19
Garage Walls	R-19
<b>Roof/Attic</b>	<b>R-49 Ceiling Concrete Tile</b>
Radiant Barrier	Yes
Attic	Vented
Floor	Slab on Grade Uninsulated
<b>Windows (U/SHGC)</b>	<b>0.31/0.21</b>
HVAC	14 SEER , <b>92% AFUE</b>
Ducts	Tight R-6
Water Heater	Gas , 0.82 EF
Distribution	Uninsulated
<b>PV (South)</b>	<b>5.5 kW</b>
Drywall	1/2"
Ventilation	Exhaust 100% A62.2
Refrigerator	ENERGYSTAR
Cooking Range	Gas
Dishwasher	ENERGYSTAR
Clothes Washer	ENERGYSTAR
Clothes Dryer	Electric
<b>Solar DHW</b>	<b>40 sqft Closed Loop</b>
Lights	85% LED
Infiltration	1.8 SLA
<b>% Site ZNE</b>	<b>94%</b>



## My Opinion: TDV

### PLUSES:

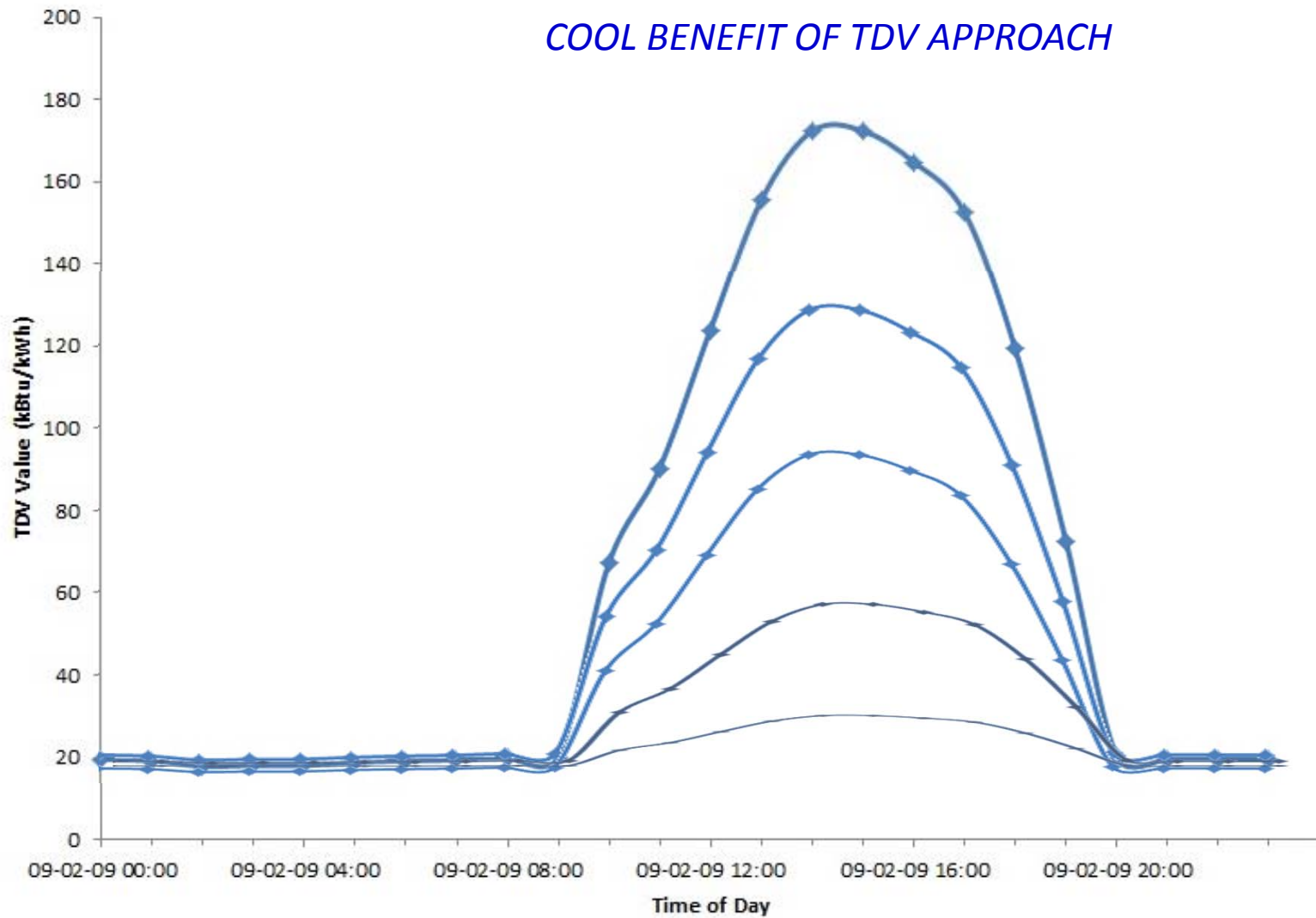
- Impacts Peak: **More important than Zero**
- Easier to Reach.... **More likely in near term**
- Strategy for Long Term .... (wait for it...)

### MINUSES:

- Smaller impact on energy
  - Harder to explain
- (Need new tariffs anyway!)*

# Over Time: TDV Site

**TDV VALUES REDUCE WITH INCREASED MARKET PENETRATION OF TDV ZNE**



# WHILE I'VE GOT THE FLOOR...

**Whatever approach ...**

**Messaging is *CRITICAL***

ZEH, ZNE, T24, TDV ... ??

***For Example:***

**Pretend you are a consumer...**

Zero Energy Home

**or**

Zero Net Energy

**Thank You !!**

**Dr. Rob Hammon**  
**rob@biraenergy.com**  
**www.biraenergy.com**