



 OCTOBER 8 & 9  DOWNEY, CA

# ET Summit Fall 2018

COMMERCIAL + RESIDENTIAL BUILDINGS

Residential Codes & Standards: The Future of New Construction in California

# Title 24-2019 “ZNE” Homes

Unicorns & Everyone Else

Ann V. Edminster  
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# Stockton ZNE Homes

*A story  
of inner  
beauty*

A California Energy Commission research project



## Team lead: Gas Technology Institute

- Rob Kamisky, GTI project manager
- George Koertzen, Habitat for Humanity
- Bill Dakin, Frontier Energy
- Rick Chitwood, Chitwood Energy Mgmt
- Lew Harriman, Mason Grant Consulting
- Steve Easley, Steve Easley & Associates
- Bruce King, PE, structural engineer
- Ann Edminster, Design AVEnues LLC

# Project Goals & Principles

Design, build, & **compare** two *affordable* homes:



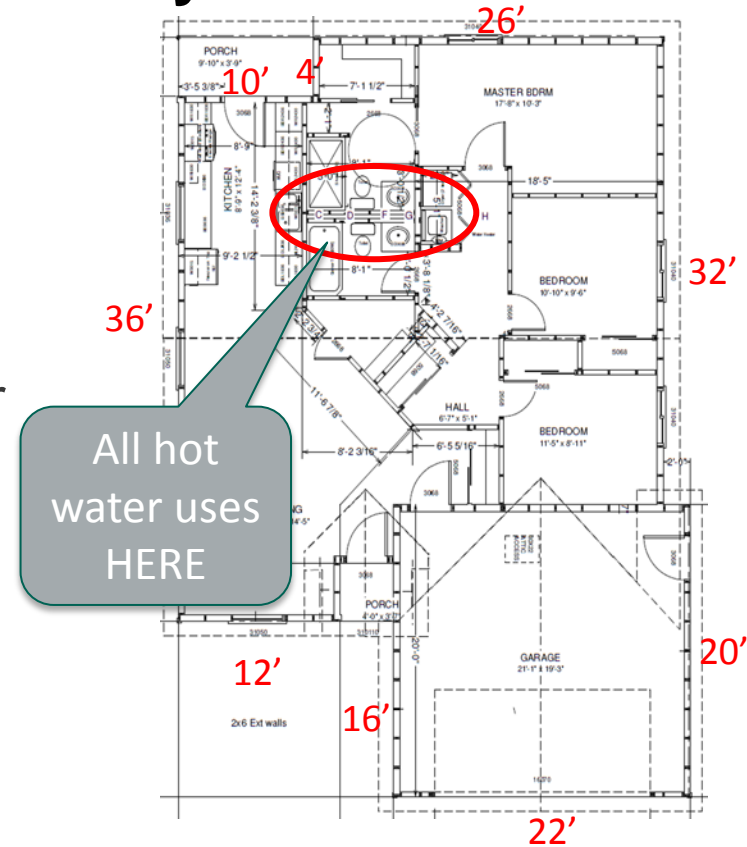
- Advanced framing
- Tight, well-sealed enclosure
- Compact, right-sized HVAC & water heating in conditioned space
- LED lighting & high-efficiency appliances and equipment
- Quality installation, measured in progress

# George's motto:

There *has* to be a **better way!**



1. Think holistically.
2. Don't use your back when you can use a machine.
3. Never do on a ladder what you can do on the ground.
4. Always think of the next guy ... and never trust the last guy.



# Phase 2 Technologies

## Emerging & otherwise

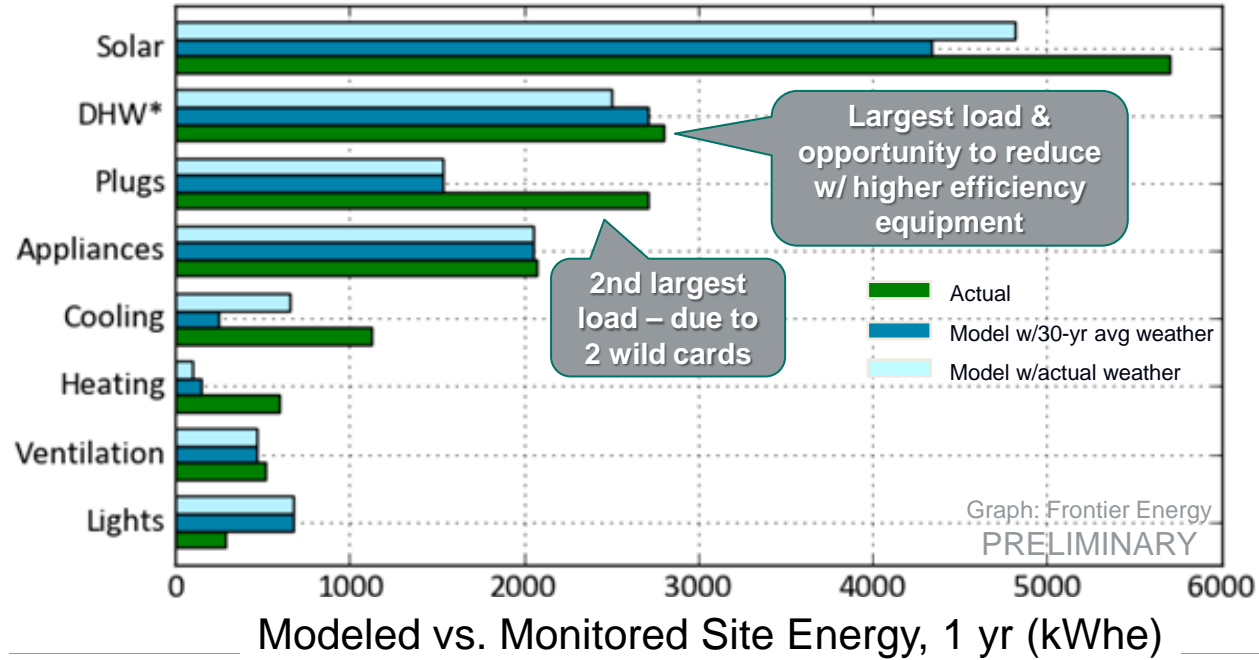


<p>Fujitsu ducted mini-split: ¾-ton (09RLF)*            *Watching Chiltrix heat pump field demo; may use for HVAC + DHW</p>	<p><b>Heating &amp; Cooling</b></p>	<p>First Company combined hydronic system: 2.5-ton air handler (30CDXQ), 1-ton* condensing unit            *1.5-ton if 1-ton unavailable</p>
<p>VKIN split system heat pump with 50-gallon storage tank*</p>	<p><b>Water Heater</b></p>	<p>Condensing tankless, 0.96 EF</p>
<p>Panasonic ducted energy recovery ventilator, 50-100 cfm (FV-10VEC1)</p>	<p><b>Ventilation</b></p>	<p>Panasonic ducted energy recovery ventilator, 50-100 cfm (FV-10VEC1)</p>
<p>Heat pump dryer &amp; induction range</p>	<p><b>Appliances</b></p>	<p>Gas dryer &amp; gas range</p>



# Phase 1 Outcomes

1. EUI 21.8 kBtu/sf-yr
2. Near-ZNE operation
3. Infiltration reduced 2/3
4. 50% lumber savings
5. **~\$3,000 cost reduction**
6. All future Habitat San Joaquin projects will include ZNE features package



\*DHW = energy in kWh from both electricity and gas

# ***BUT ...* George is a Unicorn and a Rock Star!**



Source: By Pearson Scott Foresman, donated to the Wikimedia Foundation



Source: Dmitry Abramov, Pixabay



# *Meanwhile,* in the **REAL** world ...



Source: Brett Thornton, <https://www.sleuthsayers.org/2018/07/herding-cats.html>

# So many challenges... *what can tech fix?*

**1**

The RACE to the BOTTOM (LOW BID syndrome)

- a. Not enough training
- b. Not enough time
- c. No validation of performance/commissioning

## SOLUTIONS?

- a. Education **NOT** provided by MANUFACTURERS
- b. Goof-proof installation
- c. Make meeting spec **necessary**

HOW? BE CLEVER!



Source: Miguel Guerra,  
<http://www.ideaeconomics.org/guerracartoons/>

# So many challenges... *what can tech fix?*

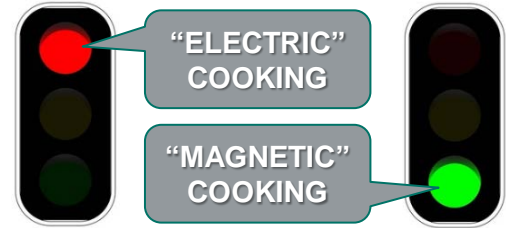
## 2

### ALL-ELECTRIC HOMES

- a. Electric ranges: fear of the KNOWN
- b. HPWH: space/ventilation needs in retrofits, DUCK CURVE effects
- c. Electric panel capacity

### SOLUTIONS?

- a. Smarter marketing: **benefits**, terminology
- b. New models, demand controls (homeowner/grid-responsive)
- c. Lower-amperage equipment, load balancing technology



# So many challenges... *what can tech fix?*

## 3

### MIXED-FUEL HOMES

- a. Regulatory & rate structures disincentivize ZNE because
- b. Natural gas use can't be offset by solar; and therefore,
- c. Decarbonization of mixed-fuel homes is all VERY PROBLEMATIC

### SOLUTIONS?

- a. Net energy metering reform
- b. Rate reform
- c. New accounting & offset schemes



ARE THERE  
TECH  
SOLUTIONS?  
*hmmm...*

# So many challenges... *what can tech fix?*

**4** State goals mean we need more RENEWABLES, but ...

- a. There's the DUCK CURVE!
- b. There's an EQUITY issue
- c. Denser cities don't have enough ROOF SPACE

## SOLUTIONS?

- a. BATTERIES & DEMAND CONTROLS at all scales
- b. COMMUNITY solar & ACCOUNTING systems (e.g., Blockchain?)
- c. Higher PV efficiencies, more vertical PV product development



*Thank you!*

# QUESTIONS?

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