

# What HVAC Technicians Need to Know to Realize Efficiency

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Heinemeier

# Focus: Zero Net Energy Housing

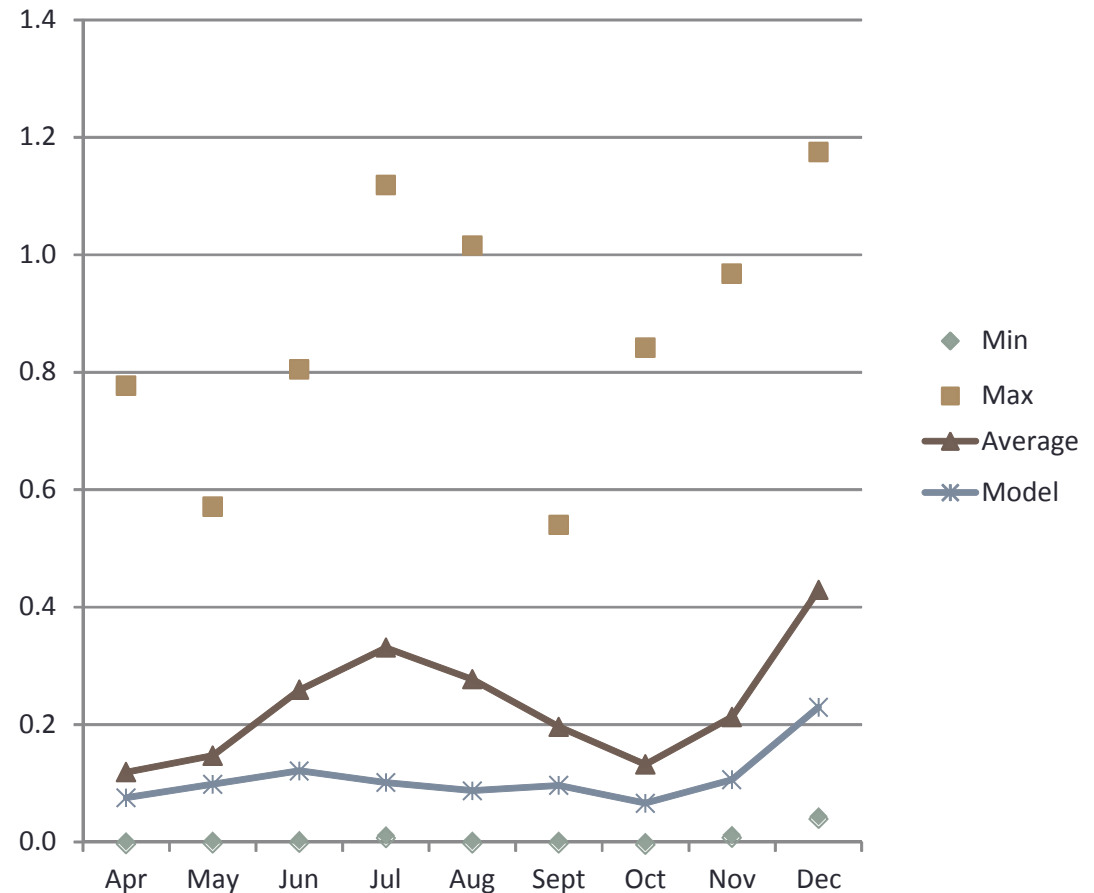
West Village,  
Davis, CA



E-Sogo,  
Yokohama

# West Village Efficiency – HVAC

- 🌀 HVAC consumption was modeled.
- 🌀 Actual HVAC consumption was 118% greater than the model.
- 🌀 Many units used little energy for HVAC.
- 🌀 Many units used A LOT of energy for HVAC.
- 🌀 Overall: West Village Consumption was 15% higher than generation.

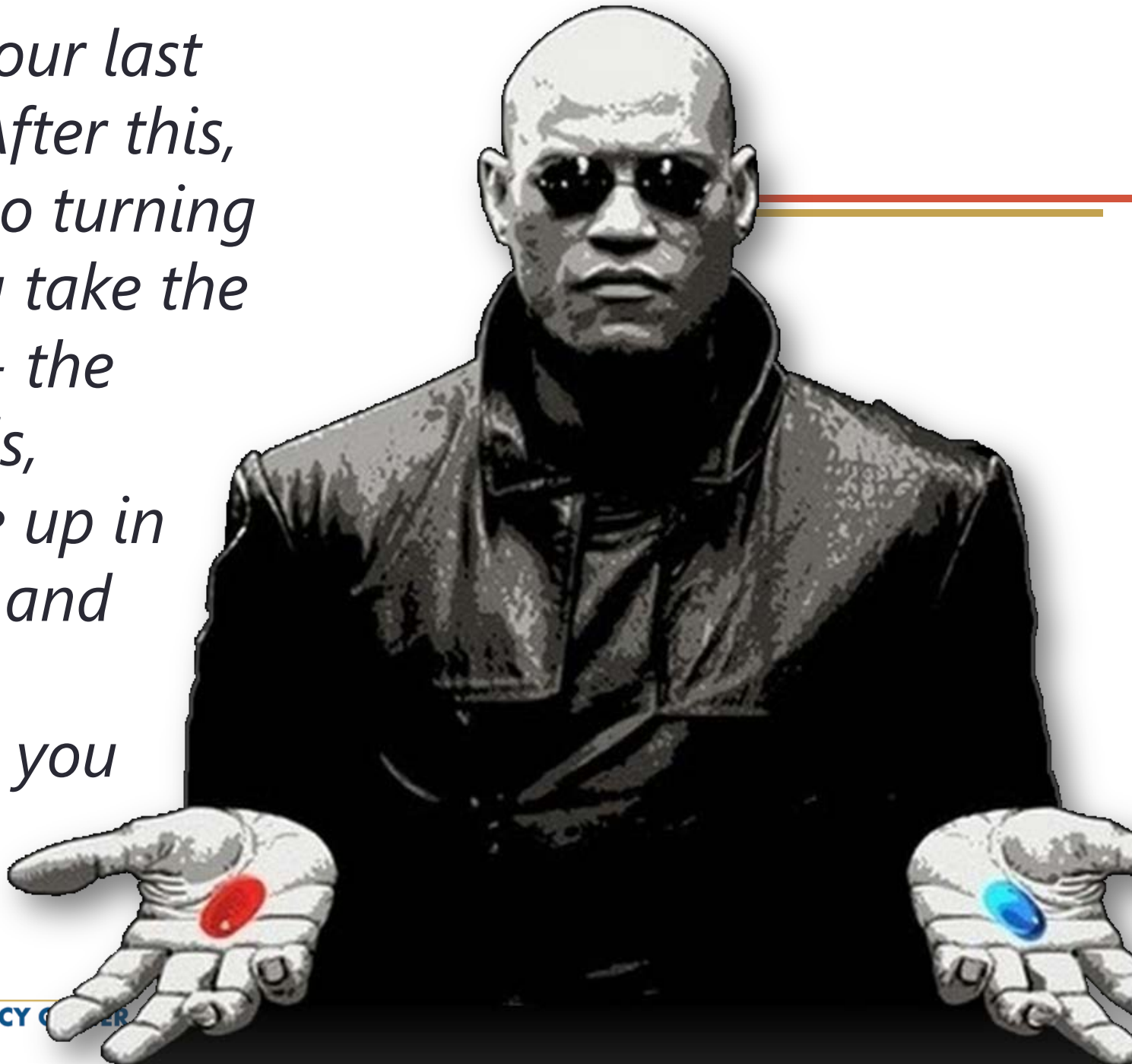


# Realized and Unrealized Efficiency

- There seems to be a gap between our expectations and the real world.
- Which do we want to work on?



*"This is your last chance. After this, there is no turning back. You take the blue pill - the story ends, you wake up in your bed and believe whatever you want to believe."*



*"You take the red pill -  
you stay in  
Wonderland and I  
show you how deep  
the rabbit-hole goes."*



# Down the rabbit hole...

- 🌀 Technologists like complex solutions
- 🌀 Policymakers encourage or mandate adoption of these solutions
- 🌀 Manufacturers have to keep costs to a minimum to be competitive, and dumb-down the solutions
- 🌀 Installers know that the customers don't know the difference and wouldn't pay for it anyway
- 🌀 End users like shiny objects (unless they're educated by contractors)



# ...what will we see?

## TAKE THE BLUE PILL ...

California has the tightest building code in the country, and will soon require Zero Net Energy buildings.

In California climates, the economizer is an essential measure that cools with free outside air.

Architects, engineers, and contractors have quality control processes, and deliver buildings that work.

## TAKE THE RED PILL ...

Nine in ten residential air-conditioner replacements choose to completely ignore the code.

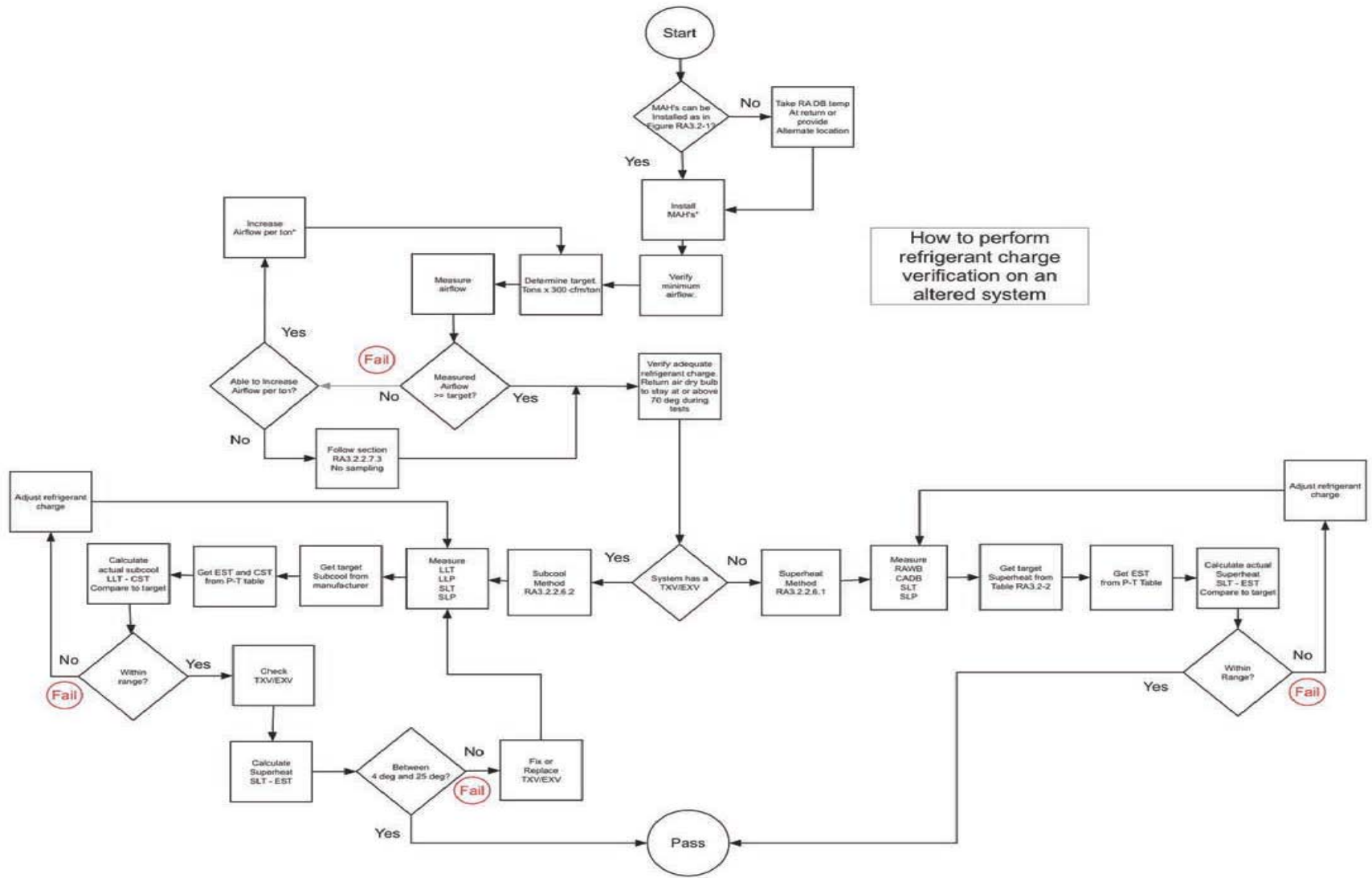
Two out of three economizers installed in California are not working.

Many building owners commission their new buildings, paying extra just to get a building that works.

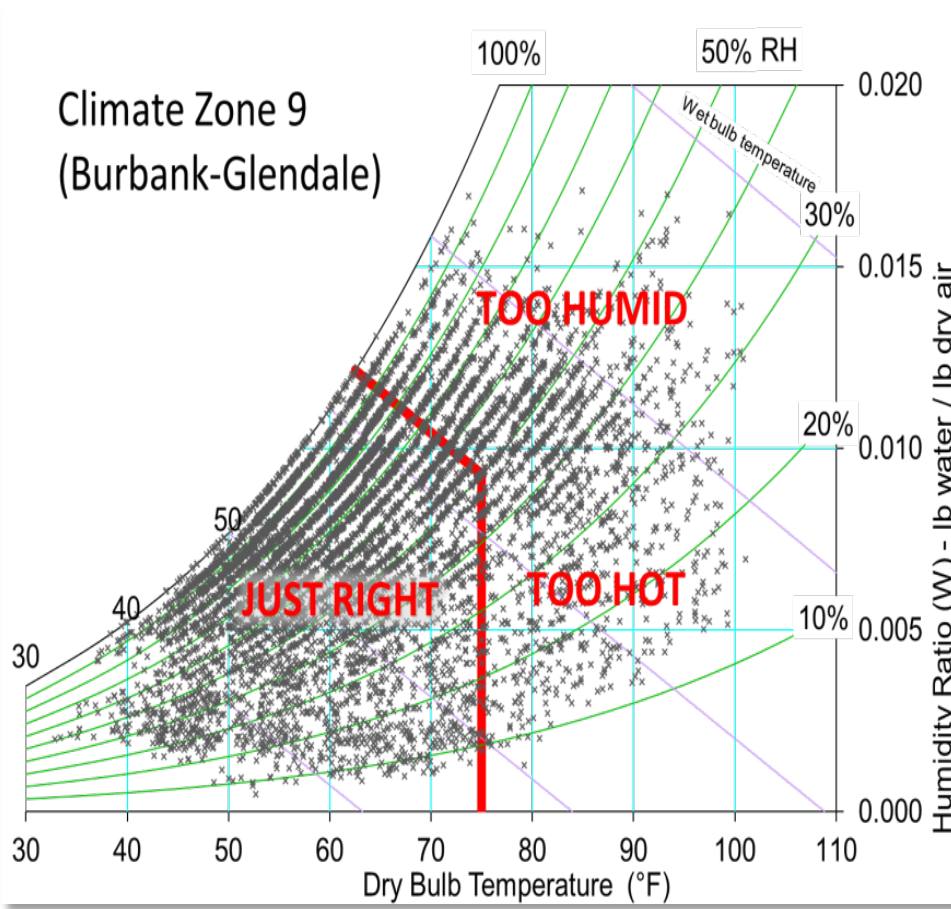




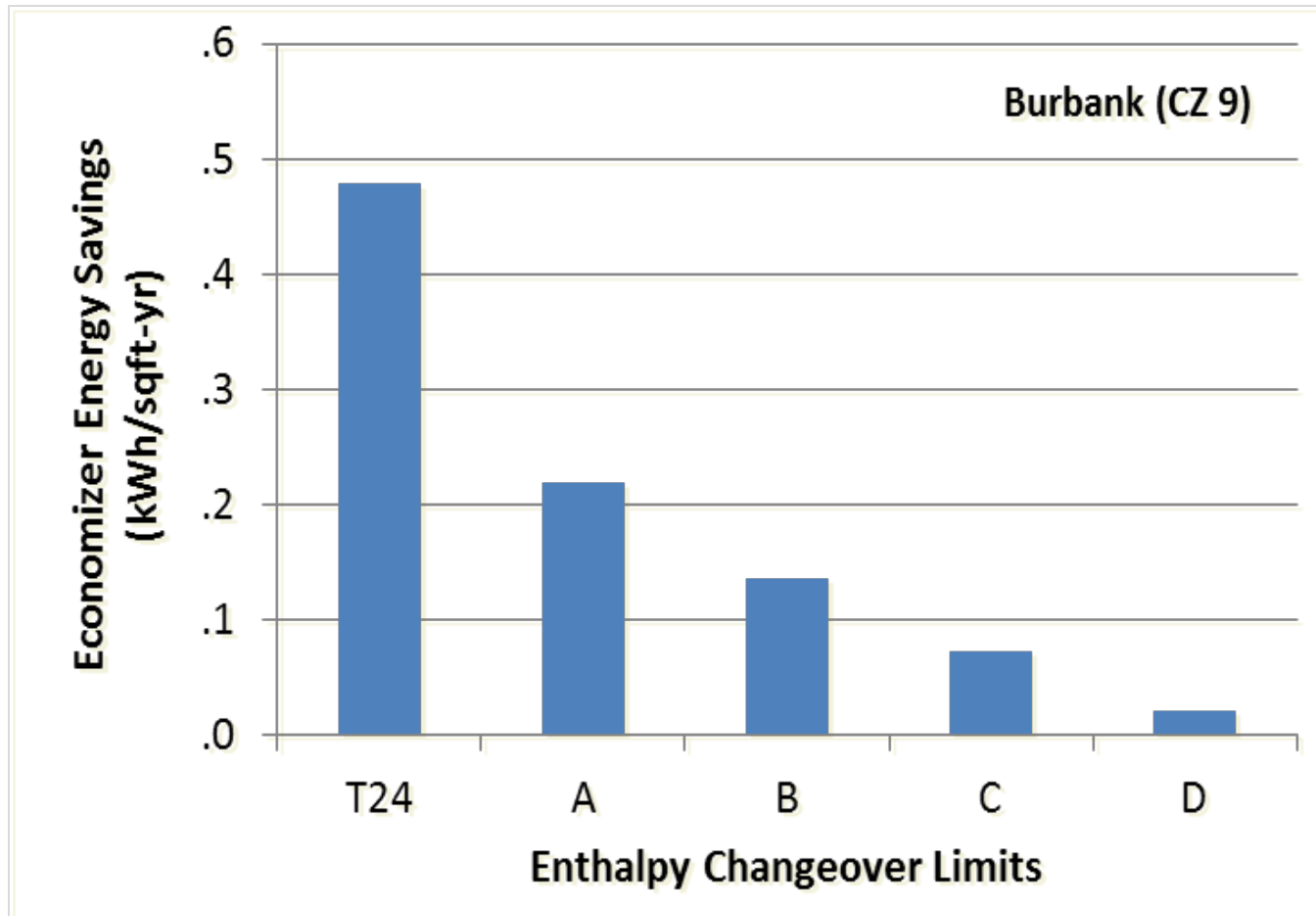
# Unrealized Efficiency: Complex Code Compliance



# Unrealized Efficiency: 2/3 of Economizers are Failed



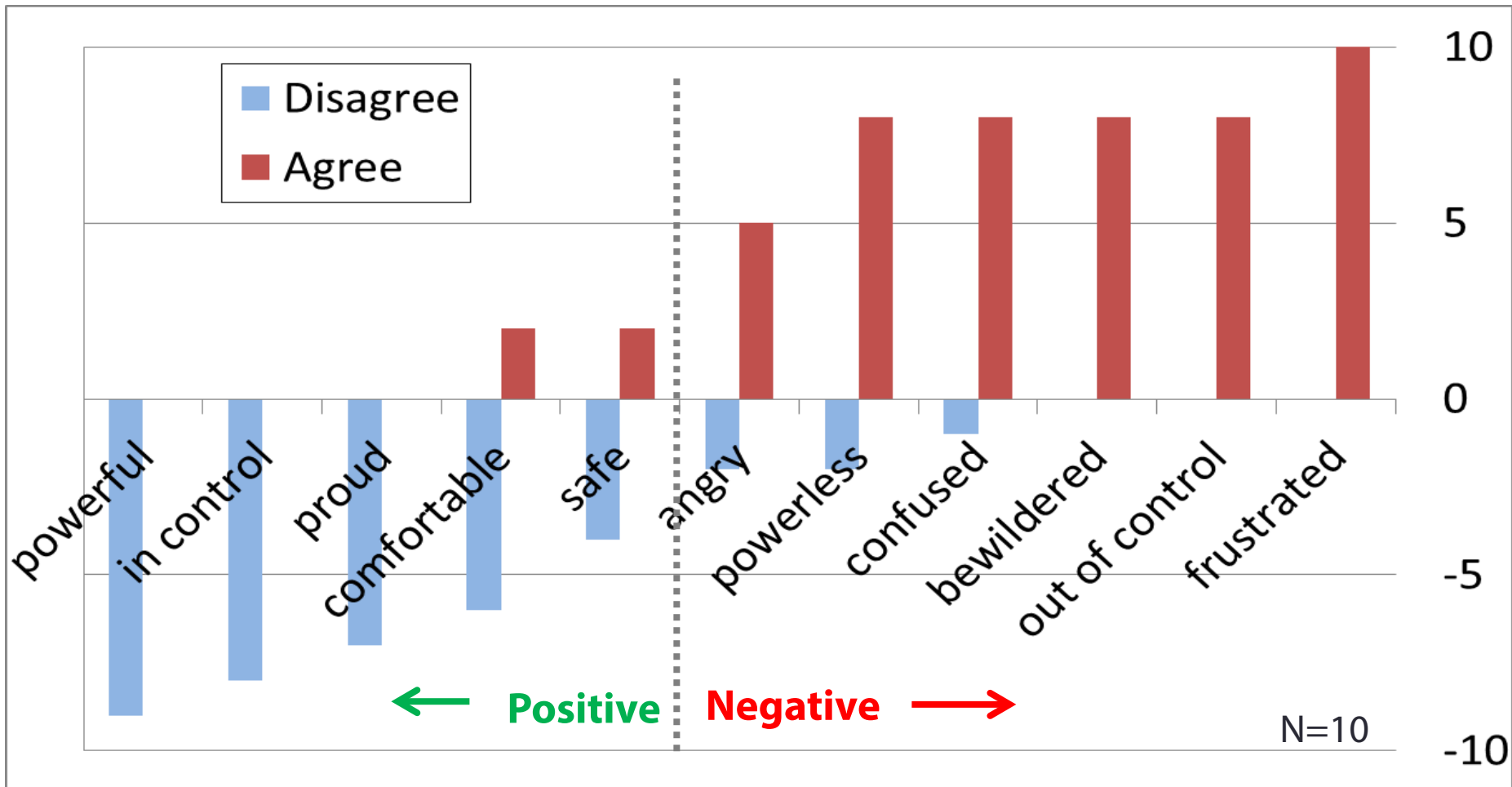
# Unrealized Efficiency: Field Settings Matter



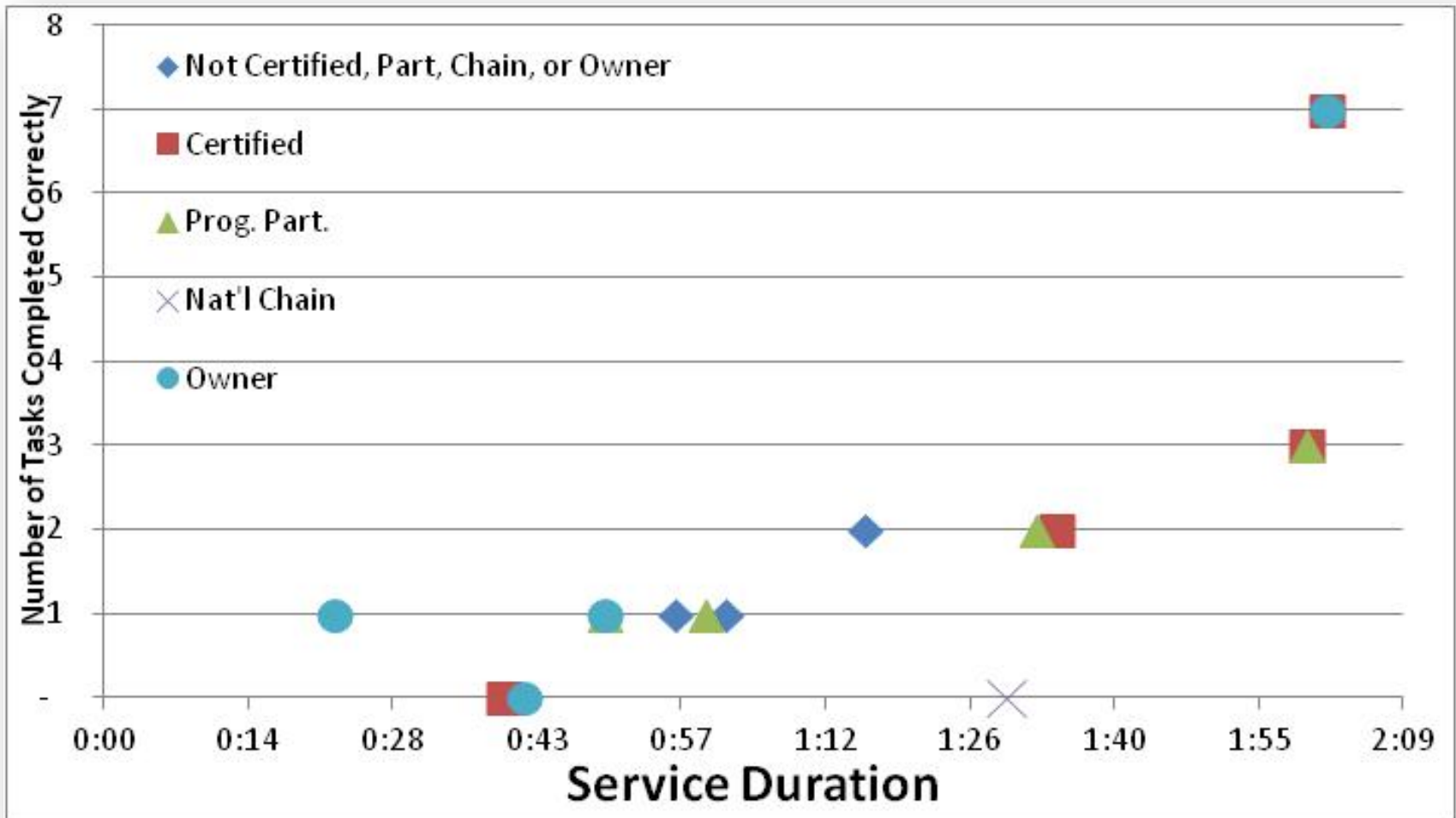
# Unrealized Efficiency: Smart Isn't Always Wise



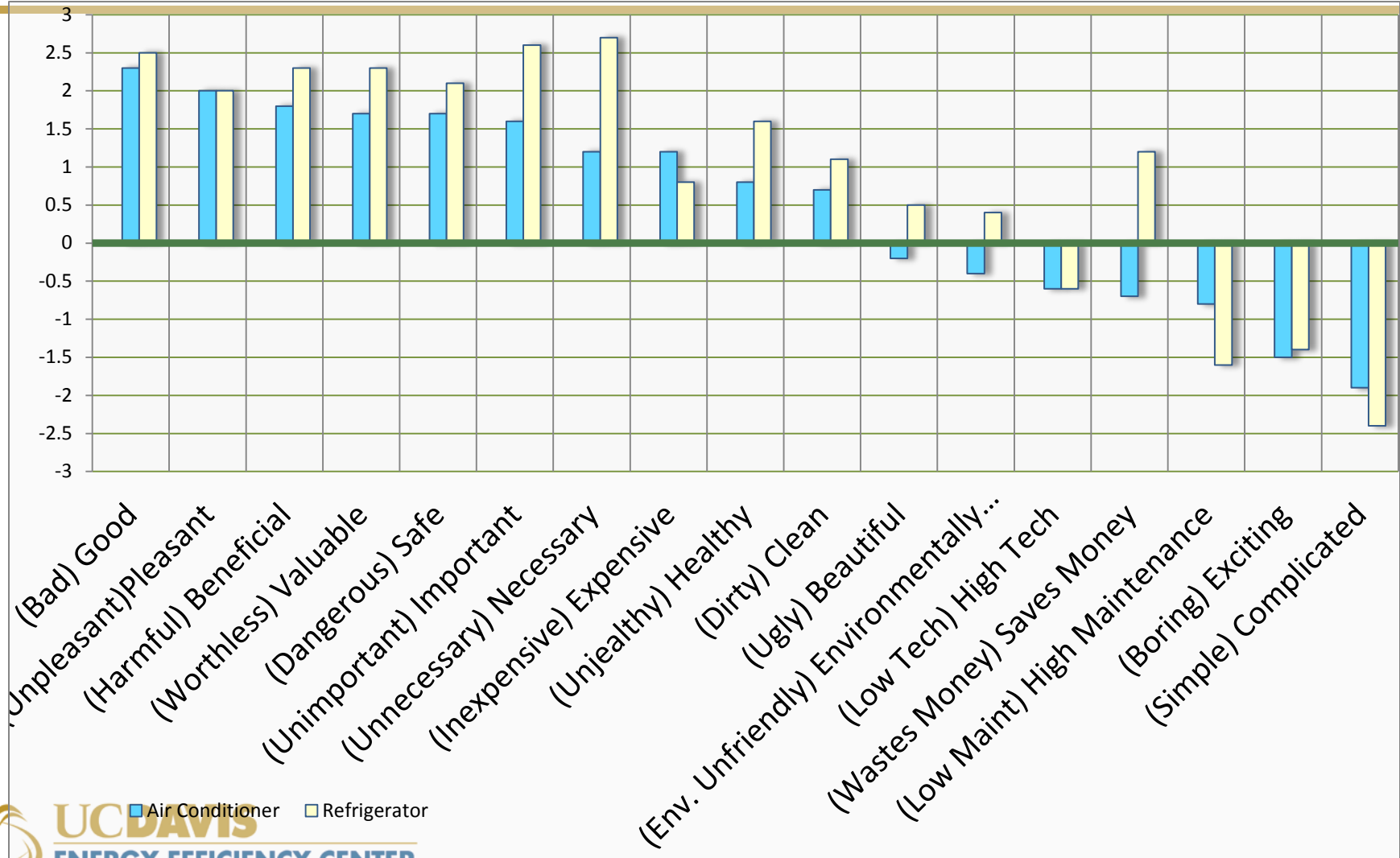
How does using your new smart thermostat make you feel?



# Unrealized Efficiency: Sometimes We Cut Corners



# Unrealized Efficiency: AC Looks Like a Fridge



# Unrealized Efficiency: Low Quality Work is Cheap



## Mr. Not-So-Great Contractor:

- 🌀 Little or no training or experience
- 🌀 No license
- 🌀 No worker's comp
- 🌀 Beat up, uncalibrated tools
- 🌀 No measurements
- 🌀 In and out as fast as possible
- 🌀 No permit, no Title 24
- 🌀 But...

- **Very low bid!**

# How to Realize Efficiency

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*Face the  
real world,  
and  
understand  
your role in  
it.*





# Realizing Efficiency: High Quality Work Takes Time



## Mr. Great Contractor:

- 🌀 Great training and experience
- 🌀 Sophisticated tools and accurate measurements
- 🌀 Attentive to detail
- 🌀 Gets a permit/complies with T24, with lots of energy efficiency
- 🌀 **Much higher bid! (~\$1500)**
- 🌀 Tough sell?

# Realizing Efficiency: The Kitchen Table



- Can customers tell the difference between them?
- How will they benefit from the difference?



# Realizing Efficiency: Perceived Sophistication



An Authority	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Not an Authority
Expert	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Not an Expert
An Advisor	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	A Swindler
Sophisticated	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Unsophisticated
Trustworthy	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>	Untru
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To:



Acme Widgets Inc.  
123 C St.  
YourTown, CA 12345

Joe Blow, Facilities Manager

## Economizer Service Report

From:

**Tom's Mechanical, Inc.**  
234 Industrial Avenue  
MyTown CA 54321

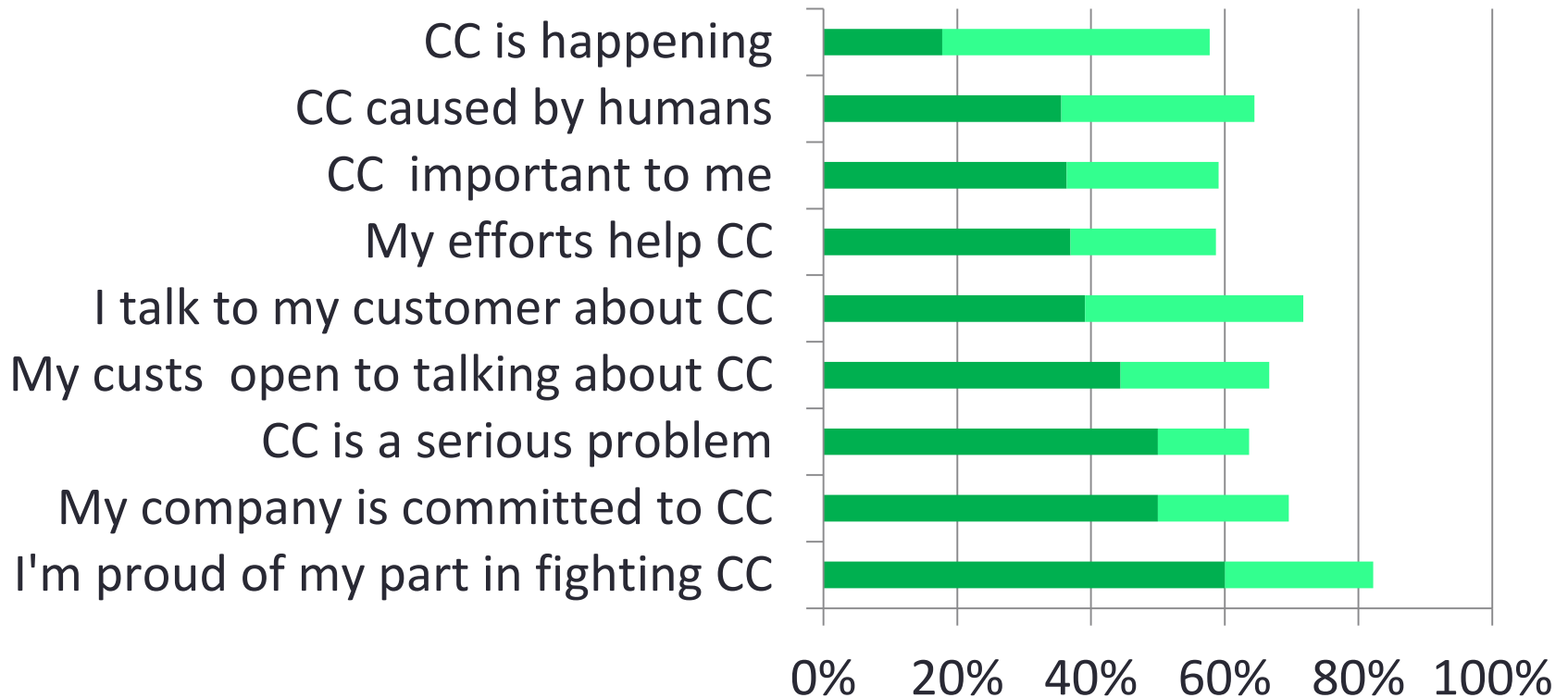
Contractor: Tom Thumb, Lic. 1234567  
Technician: Sean Dogood

December 15, 2013

# Realizing Efficiency: Deep Motivations



■ Strongly Agree    ■ Slightly Agree



# Realizing Efficiency: Stds. and Certifications



**ANSI/ASHRAE/ACCA Standard 180-2012**  
(Supersedes ANSI/ASHRAE/ACCA Standard 180-2008)



**ASHRAE Guideline 32-2012**



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## HVAC Systems

See Informative Appendix D for approval dates by the ASHRAE Standards Committee, the ASHRAE Board of Directors, Air Conditioning Contractors of America, and American National Standards Institute.

ASHRAE Standards are scheduled to be updated on a five-year cycle; the date following the standard number is the year of ASHRAE Board of Directors approval. The latest edition of an ASHRAE Standard may be purchased on the ASHRAE Web site ([www.ashrae.org](http://www.ashrae.org)) or from ASHRAE Customer Service, 1791 Tullie Circle, NE, Atlanta, GA 30329-2305. E-mail: [orders@ashrae.org](mailto:orders@ashrae.org). Fax: 404-321-5478. Telephone: 404-636-8400 (worldwide) or toll free 1-800-527-4723 (for orders in US and Canada). For reprint permission, go to [www.ashrae.org/permissions](http://www.ashrae.org/permissions).

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Approved by the ASHRAE Standards Committee on January 23, 2012, and by the ASHRAE Board of Directors on January 25, 2012.

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“I came into this game for the action, the excitement. Go anywhere, travel light, get in, get out, wherever there's trouble, a man alone.”

-Harry Tuttle



# Conclusions

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- 🌀 Realizing Zero Net Energy Buildings requires seeing the real world.
- 🌀 The gap between Unrealized and Realized Efficiency: 80/20 rule.
- 🌀 Examples of Unrealized Efficiency:
  - code compliance is hindered by the complexity of the process
  - economizer settings are easy to change and have a huge impact
  - some smart devices aren't so wise
  - quick in and out service doesn't allow for quality work
  - customers perceive a commoditized service
  - low quality is cheap
- 🌀 Examples of Ways to Realize Efficiency:
  - salesmanship—showing the difference and the value—is critical
  - perceived sophistication adds to perceived value
  - deep motivations can lead to higher quality work
  - standards and certifications can help ensure quality work
  - attracting students requires this kind of thinking

# Questions?

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