

SENSOR: Dramatically Reducing HVAC Energy Consumption via Novel Sensors

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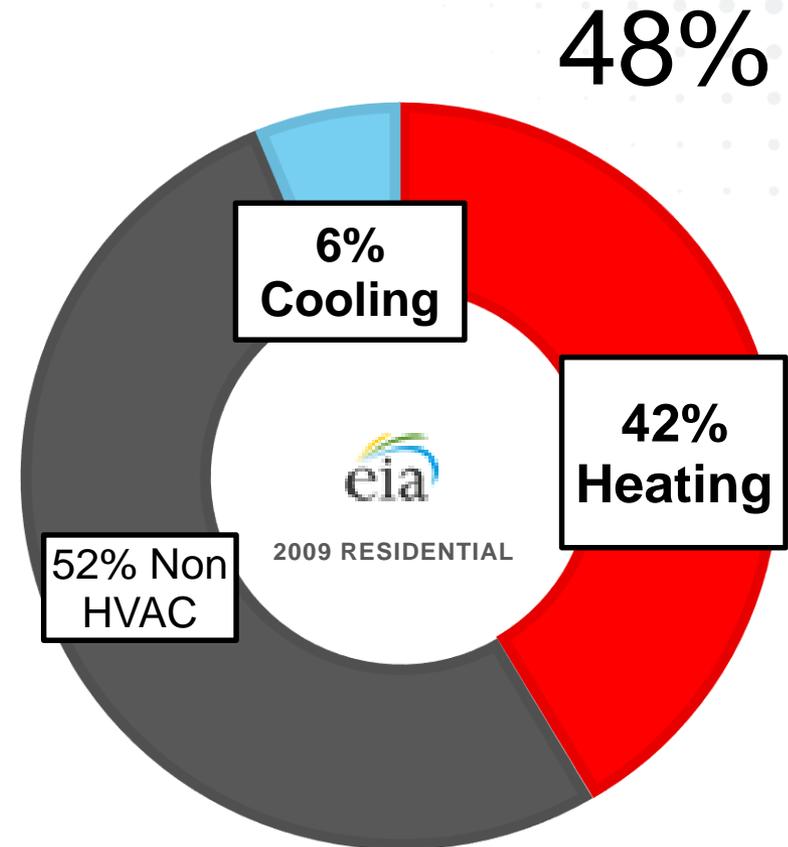
Why?



ONE Quad = {
36 Billion kg hard coal
180 Million Barrels of Oil (equiv.)
293 Trillion kWh (you use 900 a month)

Why?

- ▶ 40% all Energy in **buildings**
- ▶ ~ Half goes to heating & cooling
- ▶ Residential: 22Q
- ▶ Commercial: 18Q (**81 B\$**)

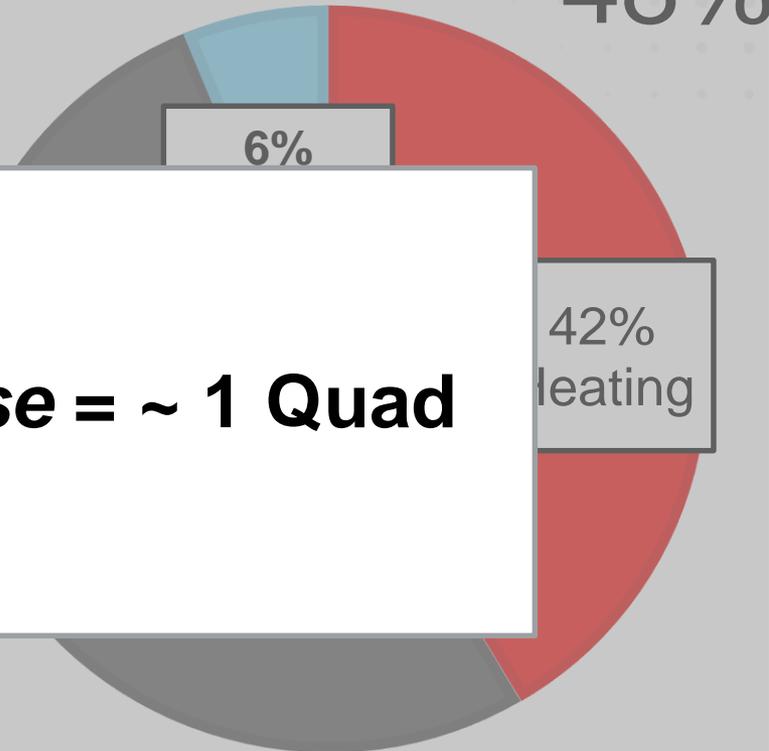


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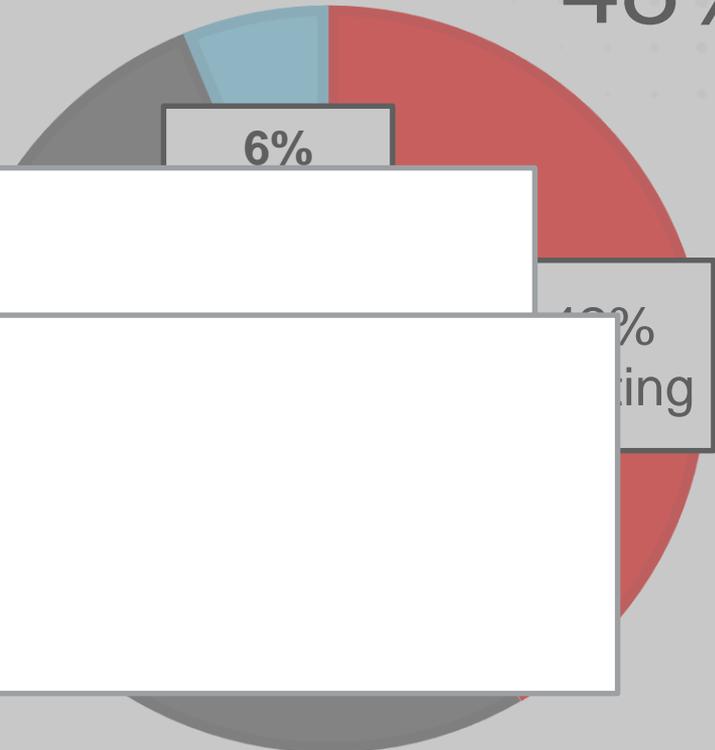
- ▶
- ▶

2.5% reduction in HVAC use = ~ 1 Quad

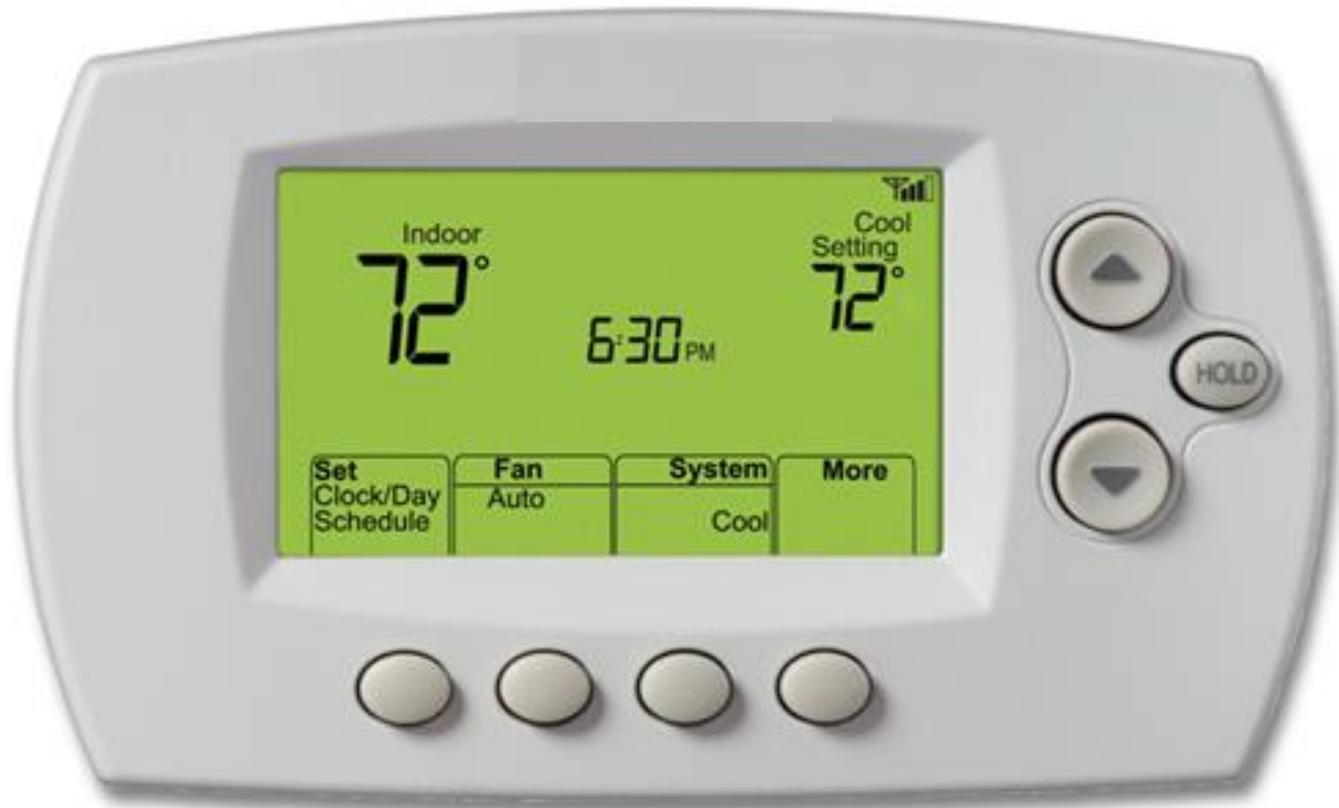


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What If...





ELSEVIER

Contents lists available at ScienceDirect

Building and Environment

journal homepage: www.elsevier.com/locate/buildenv



Usability of residential thermostats: Preliminary investigations

Alan Meier^{a,*}, Cecilia Aragon^a, Therese Peffer^b, Daniel Perry^b, Marco Pritoni^c

^a Lawrence Berkeley National Laboratory, Berkeley, California, USA

^b University of California, Berkeley, California, USA

^c University of California - Davis, California, USA

90% respondents rarely/never adjusted
20% displayed wrong time
50% on “hold” – same settings all day

*Human-Technology interface panel
Tues, 4pm, Maryland Ballroom C*

Extend to Commercial..

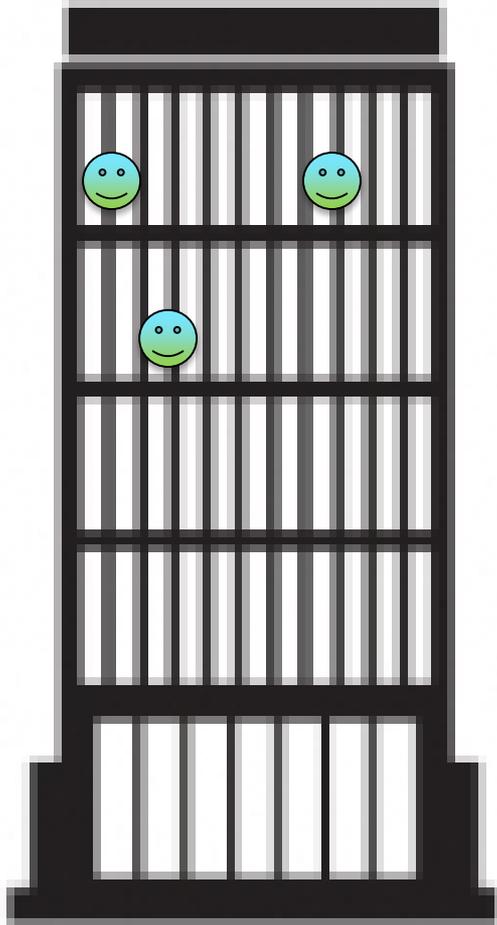
Add:

- ventilation
- multiple zones
- non-binary occupancy



Need to know: Where and How Many?

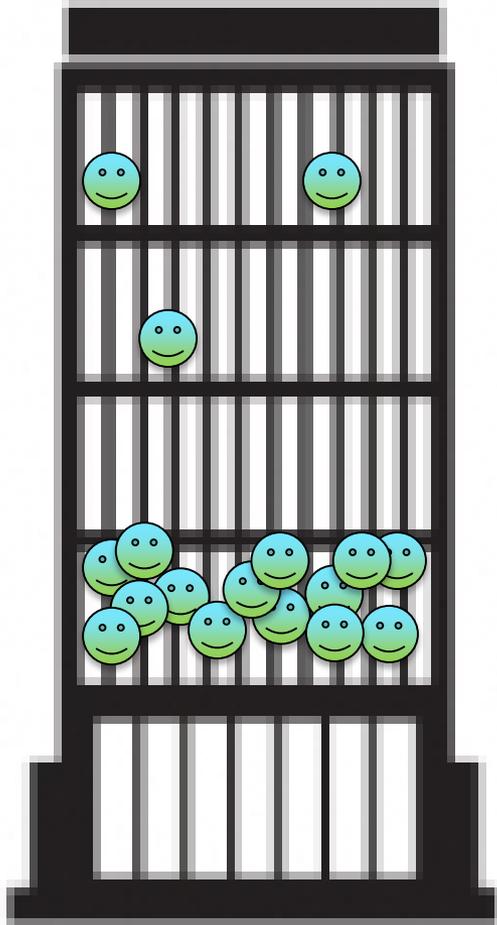
HOW?



Occupancy Sensing. 

Not motion sensing.

HOW?



Occupancy Sensing. 

Not motion sensing.

If we had this info now....

If we had this info now....

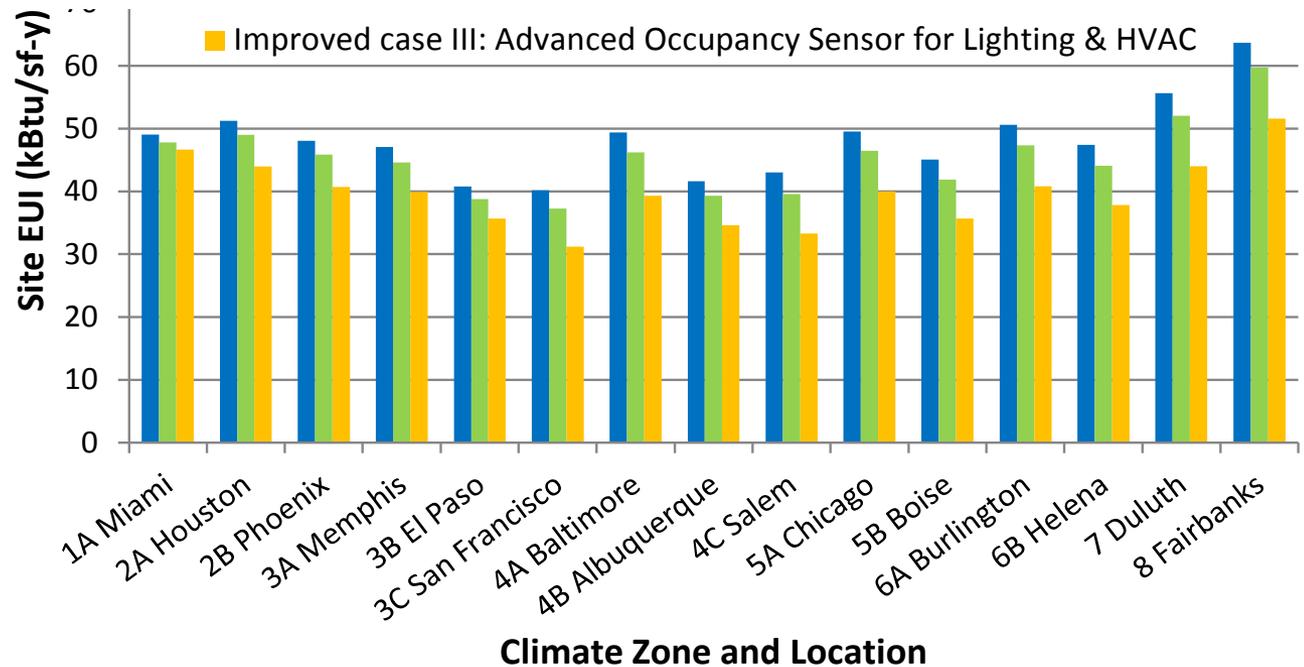
Energy Savings for Occupancy-Based Control (OBC) of Variable-Air-Volume (VAV) Systems

J Zhang
RG Lutes

G Liu
MR Brambley

January 2013

~15% reduction in HVAC energy



- Very detailed study
- EnergyPlus Sims
- Climate zones
- Large Office Buildings
(ASHRAE Standard 90.1-2004)
- Lighting only 1%!

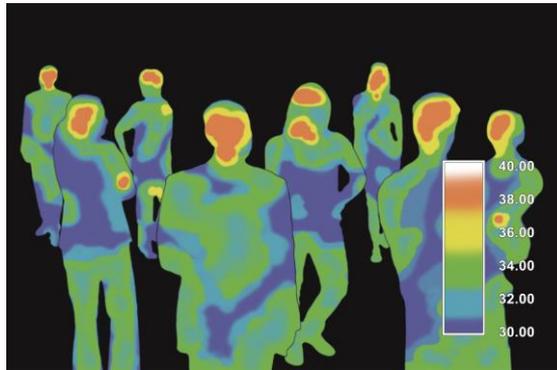
Current Limitations

- **Cost (this is the key!)**
 - Functionality
 - Deployment & Integration



***Are we trapped on a non-optimal technology path??
ARPA-E can break us out of the loop!***

Occupancy Sensing: Options?



CO₂?
%RH?
VOCs?



Thank you!

I want *your* input –

inventor, investor, fabricator, end user, customer..!



5:30 pm – 6:30 pm Tomorrow Chesapeake K – Informal Chat