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)

~100 Quads
Why?

- 40% all Energy in **buildings**
- ~ Half goes to heating & cooling

- Residential: 22Q
- Commercial: 18Q ($81 B$)
Why?

- 40% all Energy in buildings
- ~ Half goes to heating & cooling

2.5% reduction in HVAC use = ~ 1 Quad
Why?

- 40% all Energy in **buildings**
- ~ Half goes to heating & cooling

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

J Zhang  
RG Lutes  
G Liu  
MR Brambley  
January 2013

If we had this info now….

~ 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