



Indoor Air Sensors

Which Sensors? How Much? When? Next Steps?

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**Air Sensors International Conference
September 2018 / Oakland CA**

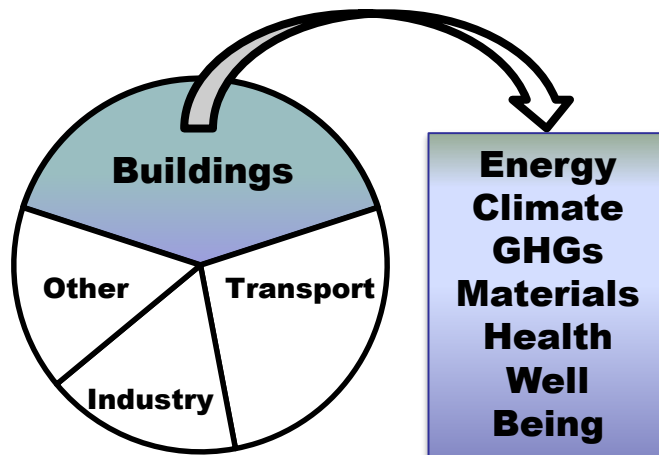
This presentation does not necessarily reflect US EPA policy

Why an Indoor Air Session?

- Where did you spend the past 24 hours?
- Where is air the most polluted, outdoors or indoors?
- Why Indoor Sensors?
Because Indoor Air Quality (IAQ) has biggest impact on human health and well-being

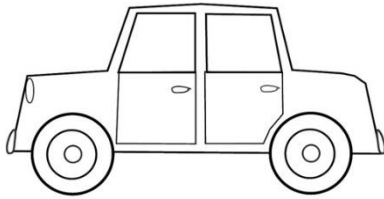
Indoor Sensor = Health + Savings

- Current ventilation control technology is 150 years old
- Ventilation has major impacts on Air, Climate, and Energy
- Ventilation on track to becoming largest energy use in buildings
- EPA, DOE, and others focused on building loads, lighting, plug loads
- Current ventilation “solution” is one size fits all (inefficient)



Buildings
14% of US GDP
40% of energy use
43% of carbon emissions
60% of non-industrial waste
13% of fresh water consumption
90% of our time is spent indoors
0.2% of all federally funded research

Sensors Providing Value such as Performance, Comfort, \$avings ...



100+



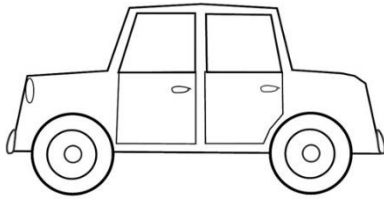
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Thermostats. Occasionally other sensors for security, lighting or CO2. Also have fire/safety sensors and sensors for utility billing

Question: Which sector has the largest impact on our health, well-being, and environment?



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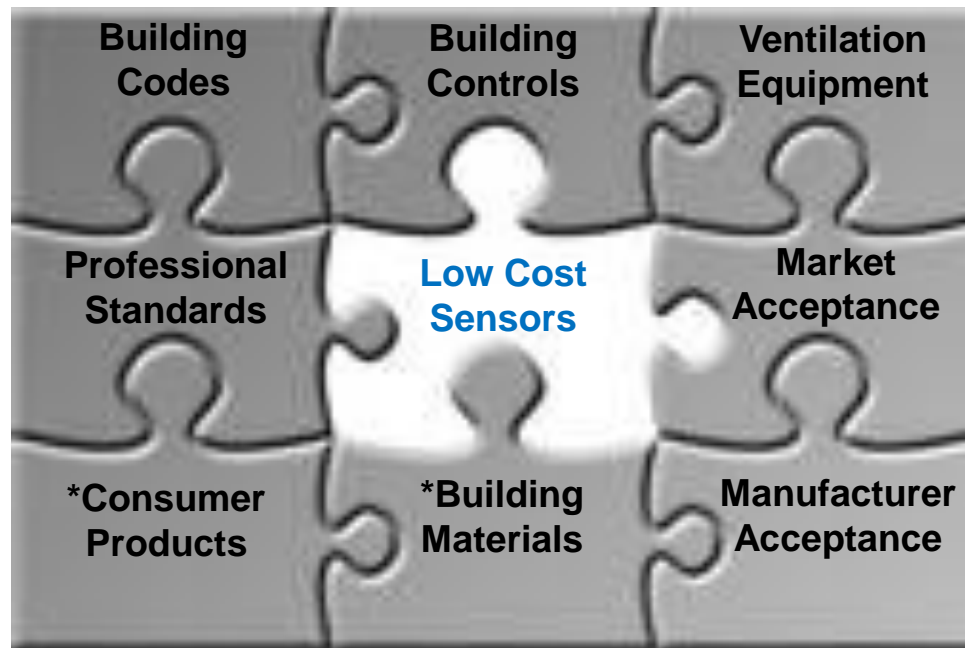
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One Primary Piece Missing

Every piece needed for a major leap forward in indoor air quality and energy use by buildings is in place (or solidly moving in right direction*) ... EXCEPT ONE



Which Sensors?

- Chemicals, PM (2.5?) and Mold
- Good start, but better sensitivity and speciation and cost
- One critical element missing ... standards
- NAAQS has been valuable for improving ambient air
- Which sensors requires broad input and consensus

How Much?

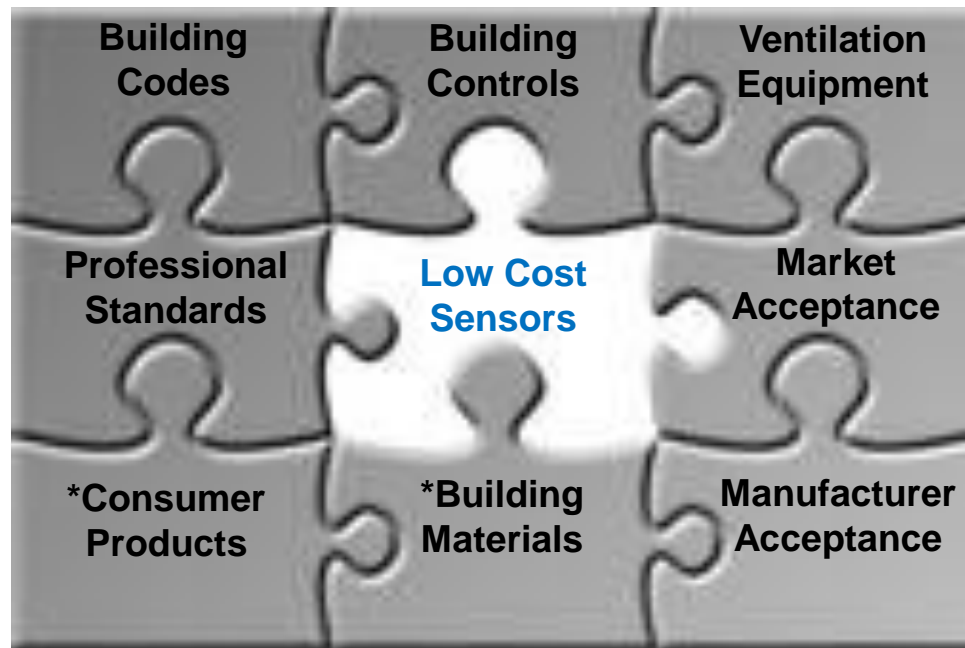
- Who has a thermostat in their home, office, school ...?
- Who here has a Nest thermostat?
- Market is over 200M thermostats
- Market for indoor sensors could be at least this large
- Cost depends of mass production
- If 3 sensors for each zone, each sensor in \$10 range
- IAQ-stat would need to be similar to thermostats

CO2 Stat Example

- Low cost (similar to thermostats) yet accurate CO2 stat became available in early 1990's
- Within 2 years the marketplace and manufacturers were widely adopting the technology
- It is reasonable to believe that if a similarly low cost and accurate "IAQ-Stat" became available, it would be immediately receive wide adoption in the marketplace

When?

- You pick when market is ready to adopt: Now? 10 years? 20 years?
- When does the puzzle say it will happen?



Next Steps

- Form a working group (industry, academia, government)
- Develop a TIP list (Target Indoor Pollutants)
- Sensor Challenge contest