BUILDING OPERATIONS STORIES & CONSEQUENCES FOR CHANGE

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• Why buildings?
• Why operations?
• Why stories?
Why buildings? #1

Primary Energy Consumption in Commercial Buildings is Increasing
(Source: US DOE Energy Data Book)
Why buildings? #2

Ecolibrium
The Official Journal of AIRAH

The great escape
Understanding why people are desperate to flee buildings

Adrian Leaman
Data credit: CBE Survey Explorer (Center for the Built Environment, University of California Berkeley)
Why operations?

Audit Report

The Department of Energy's Opportunity for Energy Savings Through the Use of Setbacks in its Facilities

DOE/IG-0817    July 2009
John Everett Millais, 1870, *The boyhood of Raleigh*
The plural of anecdote is a kind of data
THE WORLD OF DATA

NUMBER OF EMAILS SENT EVERY SECOND
DATA CONSUMED BY HOUSEHOLDS EACH DAY
VIDEO UPLOADS TO YOUTUBE EVERY MINUTE
DATA PER DAY PROCESSED BY GOOGLE
TWEETS PER DAY
TOTAL MINUTES SPENT ON FACEBOOK EACH MONTH
DATA SENT AND RECEIVED BY MOBILE INTERNET USERS
PRODUCTS ORDERED ON AMAZON PER SECOND

2.9 MILLION
375 MEGABYTES
20 HOURS
24 PETABYTES
50 MILLION
700 BILLION
1.3 EXABYTES
72.9 ITEMS

IN THE 21ST CENTURY, we live a large part of our lives online. Almost everything we do is reduced to bits and sent through cables around the world at light speed. But just how much data are we generating? This is a look at just some of the massive amounts of information that human beings create every single day.

SOURCES: Cisco, McKinsey: Hyperscale, RedHant Group, Twitter, YouTube

A COLLABORATION BETWEEN GOOD AND OLIVER MURRAY

IN PARTNERSHIP WITH IBM
Aim: improve buildings

• Buildings are not working so well
• Limited lines of attack: technology, technology investment, occupant behavior
  • Hard problem, superficial response?
• Operators as “missing link”
Aim: look deeper and more systemically

- “Informal” knowledge
- Counter/augment formal theory and assumptions
- Unwritten: politics, proof, platform... say it indirectly
- Multidimensional (systems framing)
- Use what people already know
**Stories**

- Lighting Controls
  - OPAQUE
  - CONTROLS
  - Interactive Labeling

- Kresge Foundation
  - OPERATOR INITIATIVE
    - Fully Engaged 24/7 Paying Attention
    - "Like a Hot Rod!"

- "Worm Bins"
  - REACTION / NO COMMUNICATION

- "Trusted old Technology"
  - Says the contractor
  - HOW DO CONTRACTORS MANAGE TRUST?
  - Being conservative while being an adopter...

- Mini-fridge Initiative
  - How to SAY NO
  - Appealing to Common Sense

- Auto-ON-OFF
  - OPERATOR OVER-RIDES
  - MANUAL vs. AUTOMATIC CONTROL

- Summer in D.C.
  - NAHB offices...
  - WINTER / SUMMER

- RAND Corp.
  - Air Conditioning Install....

- CBE Survey
  - "General Satisfaction"
  - WILLING to COMPLAIN about small things
  - EXPECT a certain amount of FAILURE

- Schools: Teachers don't have high expectations
  - POWER of VALUING COMMUNITY
What is a good building?
The building also harbored rats, and we were told that repairing things could "stir up the rat population." What the?!?! I mean, they don't hibernate! It was like they were implying that if the building suddenly became warm the rats might say, hey, let's leave our cold underground pipe and go up and enjoy the warmth!
People kept complaining ...

The guy before me ...
Stories told to occupants

• “We can change rules and regulations when we want to.”

• “Sometimes we bend the truth.”
They installed some high pressure sodium lamps in a parking garage. A scientist employed by the organization scolded the facilities manager for that change, saying that he was using the wrong ballast and it was screwing up his AM radio reception in the garage. So they reminded him he didn’t get AM reception before the lamp change, either.

“Oh yeah.”
So how much do energy savings matter?
**Billing Summary**

<table>
<thead>
<tr>
<th>Component</th>
<th>Previous Balance 12/30/1999</th>
<th>Payments received through 01/14</th>
<th>Late Charge</th>
<th>Adjustment</th>
<th>Balance as of 01/14</th>
<th>Total Loans</th>
<th>Total Service</th>
<th>Total Amount Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric Service</td>
<td>$32,218.45</td>
<td>$32,218.45 CR</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$29,911.87</td>
<td>$29,911.87</td>
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**Electric Service**

<table>
<thead>
<tr>
<th>Meter</th>
<th>Present</th>
<th>Previous</th>
<th>Multiplier</th>
<th>Price</th>
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</thead>
<tbody>
<tr>
<td>L057813448</td>
<td>6539.00 Regular</td>
<td>5895</td>
<td>720</td>
<td>$25.00</td>
</tr>
<tr>
<td>L057813448</td>
<td>1.55</td>
<td>720</td>
<td>720</td>
<td>$19149.98</td>
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<tr>
<td>KVARH</td>
<td>1259.00 Regular</td>
<td>1081</td>
<td>720</td>
<td>$10,713.60</td>
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<tr>
<td>Pfct</td>
<td>0.96</td>
<td>720</td>
<td>720</td>
<td>$0.00</td>
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<tr>
<td>Rate Schedule 43</td>
<td></td>
<td></td>
<td></td>
<td>$417.31 CR</td>
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</tbody>
</table>

**Taxes and Fees**

<table>
<thead>
<tr>
<th>Component</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>City Fee</td>
<td>$0.00</td>
</tr>
<tr>
<td>Sales Tax</td>
<td>$440.60</td>
</tr>
<tr>
<td>Total Taxes and Fees</td>
<td>$440.60</td>
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</tbody>
</table>

**Energy Generation & Delivery Cost for Your Rate Class**

<table>
<thead>
<tr>
<th>Component</th>
<th>Percent</th>
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</thead>
<tbody>
<tr>
<td>Generation</td>
<td>46%</td>
</tr>
<tr>
<td>Transmission</td>
<td>10%</td>
</tr>
<tr>
<td>Distribution</td>
<td>44%</td>
</tr>
</tbody>
</table>

**Comparisons**

<table>
<thead>
<tr>
<th>Component</th>
<th>Current Month</th>
<th>Previous Month</th>
<th>Same Month Year Ago</th>
</tr>
</thead>
<tbody>
<tr>
<td>Days Service</td>
<td>31</td>
<td>32</td>
<td>27</td>
</tr>
<tr>
<td>Avg. Daily Kwh</td>
<td>14957.4</td>
<td>15015.5</td>
<td>15040.0</td>
</tr>
<tr>
<td>Electric Charges</td>
<td>29471.27</td>
<td>27143.88</td>
<td>22472.58</td>
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</tbody>
</table>
I had a mentor who told me a trick. He said that you make or break the energy bills, but nobody knows that and they don’t pay attention.

But if you can make changes, create savings, and document it all, you’ll be a hero and you’ll always be employed.
I was knocking them dead with energy and cost savings, but money was not an issue with them, and the green trend didn’t matter. I did it because I care.
What happens with building automation?
Conclusions

Research
• Ordinary stories have something to tell
• Review assumptions
• If only ...
  • Not a matter of getting individual technologies or even behaviors “right”

In and outside of buildings
• Involve operators, give them leeway, visibility, and respect
• Work with real buildings & ask users
• IEQ shortcomings affect energy use and well-being: start fixing IEQ
Questions, comments, info:

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Occupants, Buildings, Operators (Energy Project) Research funded by California Air Resources Board (09-327)