Energy Strategies in Retail: Who Does What with Data and Analytics?

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IEA Workshop on Organizations and Behavior

13 November 2015   http://www.energy.ox.ac.uk/wicked/

Three Cs Model for Organizational Action: concern, capacity + conditions

- Are organizations concerned about energy?

- Do they have the capacity to address their concerns?

- What are the technical challenges that they face based on *their* portfolio?

3Cs in 2002

Concern — Concern about energy	Conditions — Opportunities for conservation	Capacity — Ability to act on opportunities	Policy approach to increasing energy efficiency (EE)	Speculation about whether price increases might encourage (+) or discourage (-) conservation action
Yes	Yes	Yes	Recognize/Encourage EE	+
Yes	No	Yes	Recognize past EE, create future opportunities	+
Yes	Yes	No	Technical assistance, incentives, peer support, education	+
Yes	No	No	Technical assistance, peer support, education, create future opportunities	+/−
No	Yes	Yes	Incentives, non-energy benefits, recognize past EE	+/−
No	No	Yes	Support continuous improvement, identify non-energy benefits, recognize past EE	−
No	Yes	No	Technology assistance, incentives, peer support	−
No	No	No	Mandatory efficiency standards	−

Janda, K. B., C. Payne, R. Kunkle, et al. 2002. "What Organizations Did (and Didn't) Do: Three Factors that Shaped Conservation Responses to California's 2001 'Crisis'." In Proceedings of *American Council for an Energy-Efficient Economy 2002 Summer Study*, (Asilomar, CA). Vol. 8, pp. 8.117-8.128. ACEEE.

Lutzenhiser, L., K. B. Janda, R. Kunkle, et al. 2002. Understanding the Response of Commercial and Institutional Organizations to the California Energy Crisis 400-02-018C Consultant Report. California Energy Commission: Sacramento, CA. www.osti.gov/servlets/purl/832751-6WN6Z0/native/
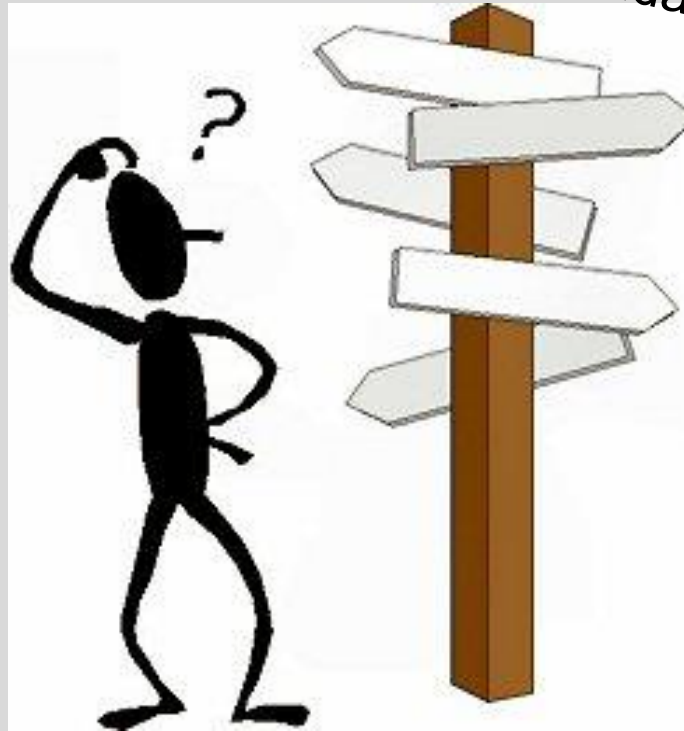
3C's through a multi-level perspective

Building Communities (grey area, neither organizational nor individual)	Analytical Level	3Cs		
		Concern (factors that shape attention to energy)	Conditions (factors that shape where energy actions occur)	Capacity (factors that moderate abilities to take energy actions)
	Organization	Legislative requirements, leases	Building retrofit opportunities, thermostat setpoints, standard operational hours, provision of space & equipment	Energy management structure; job titles & responsibilities; feedback & data availability; granularity of data
		Workstyles	Clothing choices, activities outside "normal" hours	Peer pressure & social practices; workgroup dynamics
	Individual	Attitudes, beliefs, habits, values	Use of task lights, computers, auxiliary heating/cooling devices; extra plug loads; operation of blinds / windows	Presence or absence of champions; expertise & understanding of systems; interest in and ability to act on feedback

Janda, K. B. 2014. "Building Communities and Social Potential: Between and Beyond Organisations and Individuals in Commercial Properties." *Energy Policy* 67 (April):48-55.

Common claims about energy efficiency…

BEMS

Voltage Optimisation

EPCs
(asset labels)

MEES
(Minimum energy
Efficiency standards)

DECs
(operational labels)

FITs
(feed-in-tariffs)

Demand response

ESOS
(audits)

LED lights

Behaviour Change

Quick wins

Staff Engagement

PVs

Rate negotiation

Feedback

Better billing

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A Better Retailing Climate:
Driving Resource Efficiency (Jan 2014)
targets to 2020

|	
Carbon (retail operations)	• We will reduce our absolute carbon emissions from retail operations by 25% by 2020 based on 2005 levels.
Resource efficiency in buildings	• We will cut energy-related emissions from buildings by 50% by 2020, accounting for growth, compared with 2005 levels.
Refrigeration	• We will reduce emissions from refrigeration gases by 80% by 2020, relative to floor space. • We will begin phasing out HFC refrigerants by 2015 and replace them with non-HFC refrigerants, in line with the Consumer Goods Forum Commitment.
Transport	• We will reduce energy-related carbon emissions from store deliveries by 45% by 2020, compared with 2005 levels.
Water (retail operations)	• We will measure water usage in sites collectively anticipated as accounting for 100% of usage by 2020. • We will set a reduction target when the targets are reviewed in 2015.
Retail waste	• We will divert waste from landfill so that less than 1% of our waste is landfilled by 2020.

The WICKED learning story:

what **new information and tools** can help different segments of **the retail sector** develop **proactive energy strategies?**

Working with…

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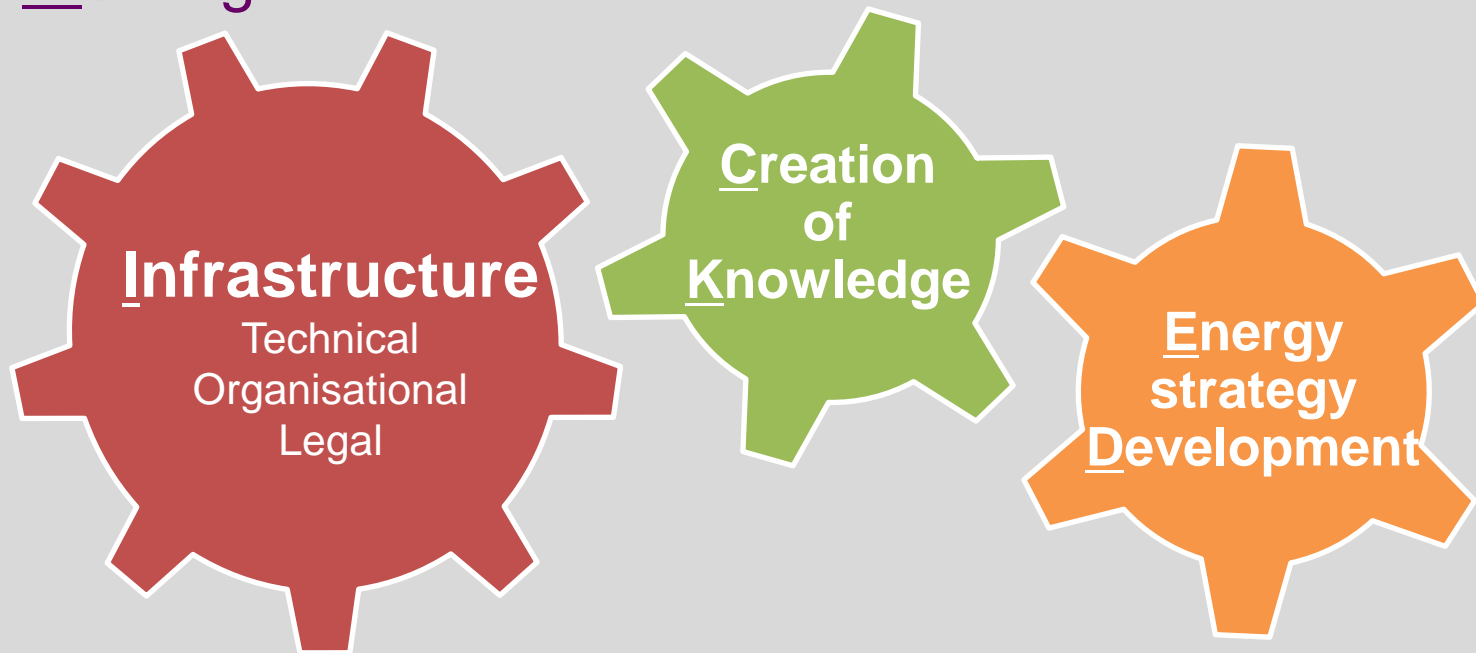
Partners, Participants, & Contacts:

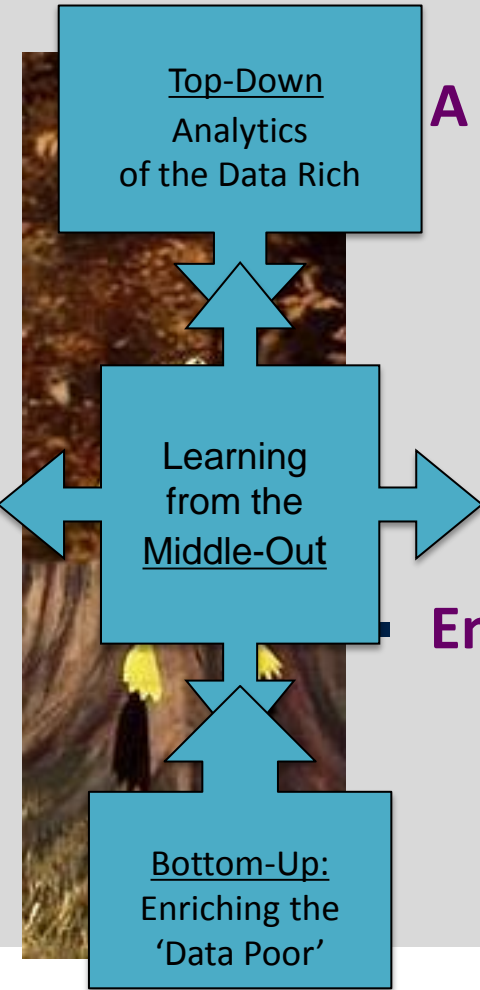http://www.energy.ox.ac.uk/wicked/

WICKED's perspective:
It isn't easy being "green"

A 'wicked' problem (Rittel & Webber 1973) is:

- Complex and interdependent
- Difficult to solve (may be difficult to recognize)
- Addressing one aspect of a wicked problem may reveal (or create) other problems
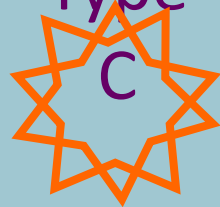
Energy use is a WICKED sociotechnical problem:

- The retail sector is diverse and complex.
- One size will *not* fit all.
- Technological solutions must fit organisational characteristics

Top-Down
Analytics
of the Data Rich

**Learning
from the
Middle-Out**

Bottom-Up:
Enriching the
'Data Poor'

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One size solution will not fit all.
What about 6 sizes...?

WICKED Market segments	Owner occupiers	Leased Space	
		Landlords	Tenants
Data Rich AMR + energy managers	Type A	Type B	Type C
Data Poor Manual meters, no energy managers	Type D	Type E	Type F

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Data Rich - Imagined

RETAIL

Indicative daily electricity consumption profile and typical energy use breakdown.

OTHER
EQUIPMENT
HVAC
LIGHTING

ENERGY (kWh)

12am   6am   12pm   6pm

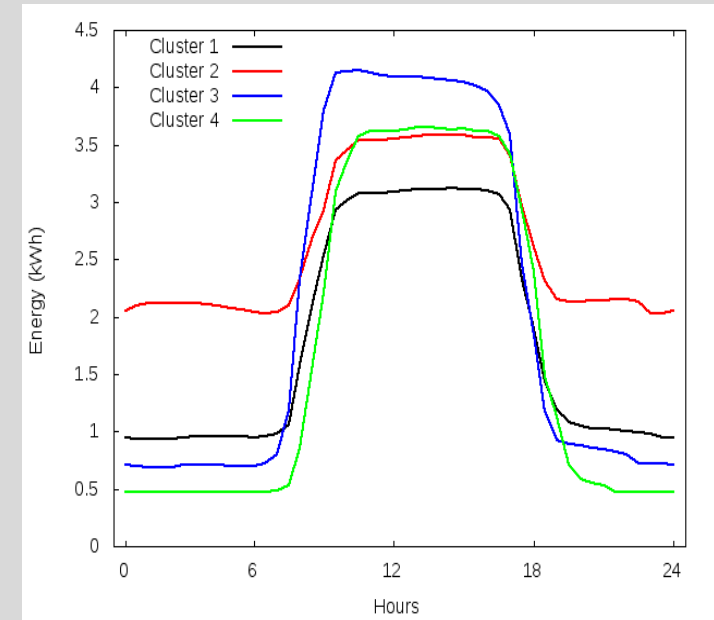https://www.solarmarket.com.au/your-business-need-solar
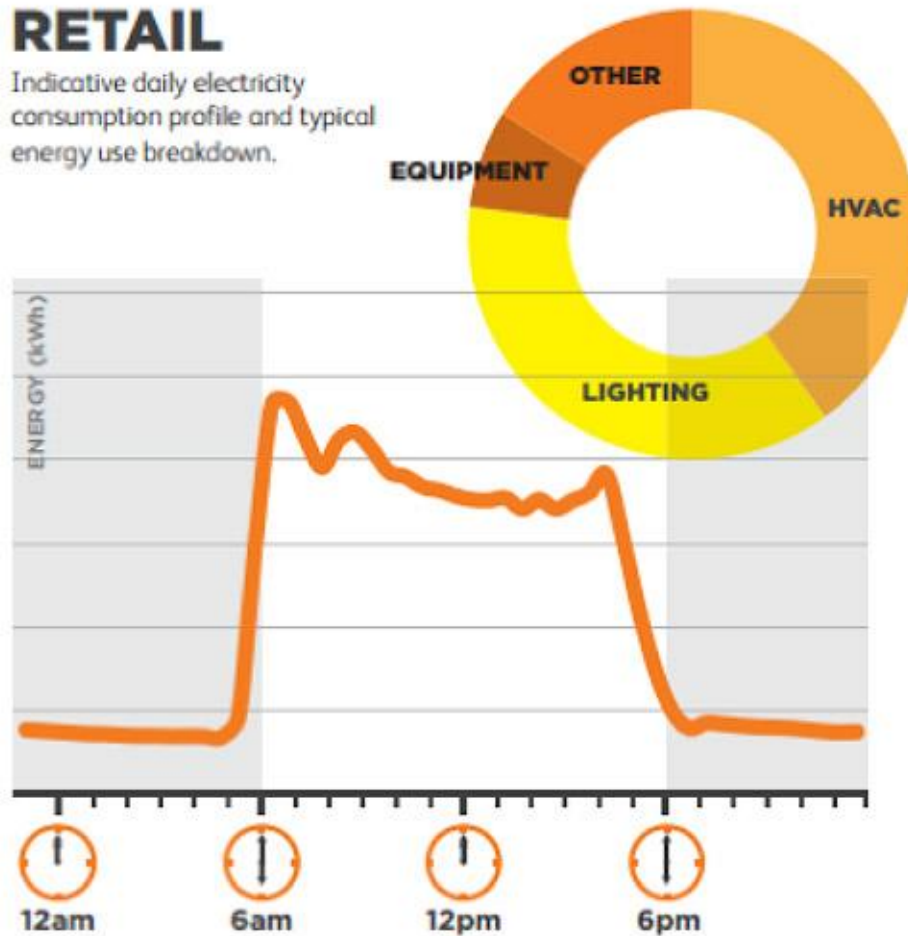
- 1 to 1 correlation between feedback and energy manager
- Data easy to obtain
- Predictable patterns
  - Anomalies will be obvious
- Portfolio is standard and constant

- Goals:
  - Reduce out of hours baseload
  - Reduce energy in use
  - Prove reduction strategies

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European Electronics Retailer
(data rich tenant)

C$_1$

- 663 shops in UK
  - 1 energy manager
- <30 min electricity readings
  - Apr 2013-Oct 2014
- Not a lot of "meta" data attached to it.
  - No size, number of employees, or other factors
- Meter problems
  - 2.8% were "stuck" (repeating values)
  - 0.8 percent "off" (values less than or equal to zero)
  - 0.3% of the meters were "intermittent" (lower # of readings)
- Across the data set, 20 meters (3.1% of the total) needed attention

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Green Leases at multi-national retailer (data rich tenant)

C₂

Marks & Spencer (M&S)

- 800 stores in UK + 400 overseas
- Governed by "Plan A" sustainability objectives
- Energy management outsourced
- Data difficult to obtain in shopping centers
  - Announced "green lease" policy in 2013
  - Negotiating **data-sharing** and cooperation with landlord as part of "green lease"

THE TENANTS & LANDLORDS **GUIDE TO HAPPINESS**

BEST PRACTICE AND GREEN LEASING

CHAPTER 3 **GETTING TOGETHER**

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Data Rich - Reality

- 1 to many:
  - 1 energy manager to at least 600 buildings
    - 3rd party analysis
- Stochastic patterns
  - Anomalies are **not** obvious
- Portfolio is
  - Neither standard, nor constant (may not be attached to data)
  - Data may not be easy to extract from meters & match with portfolio
- Major issues:
  - **Reduce out of hours baseload**
  - Reducing energy in use is problematic
    - Operations vs. core-business
  - Proving reduction strategies is inhibited
    - Company rules may prohibit change (e.g., 12 month payback target)

Data Poor: Budget Shopping Center (landlord/managing agent)

- 200,000 sqft budget shopping centre
  - 91 units (87 rented)
  - Built in the 1960s
    - Refurbished in 1980s
- Landlords have contracted centre management to managing agent
  - No energy manager
  - Agent only has energy data only for shared spaces
    - Data consist of estimated bills
    - Most meters are manually read

Budget Shopping Center
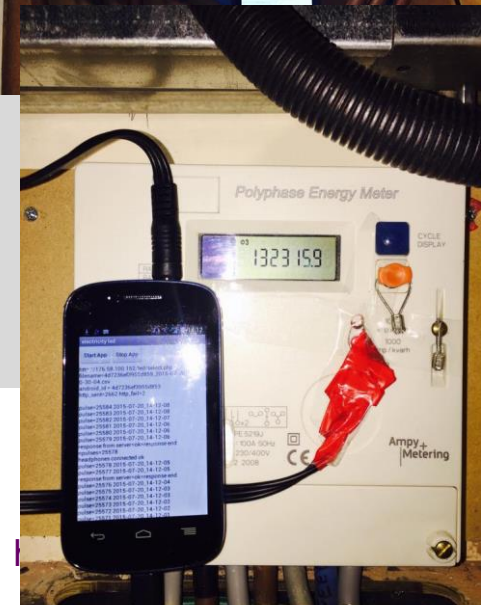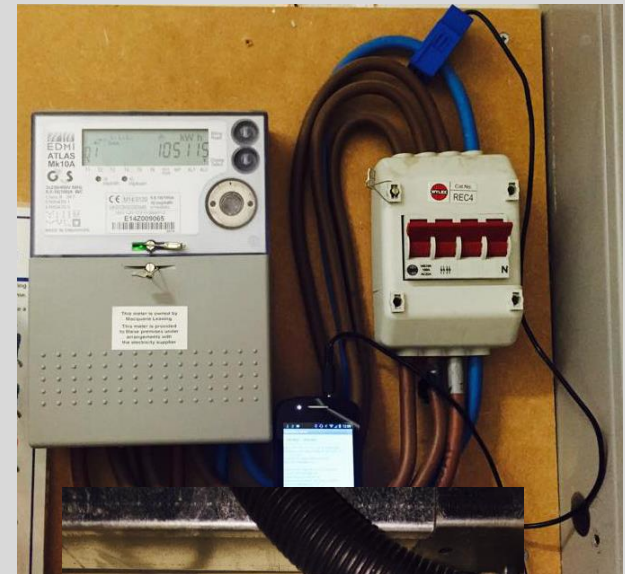# (data poor landlord/managing agent)

Proposed solution: Smartphone meter retrofit

E

- Phone + peripheral provides real-time data logger and communications to cloud

- Advantages
- 1 – cheap
- 2 – excellent communications
- 3 – highly configurable

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# Data "Poor" Tenant – Café chain

- Central environmental manager has data
  - 1000 stores
    - energy, water, waste
- Individual stores do not have access to data

Turning numbers into knowledge...

Comparing Wednesdays

We took 5 Wednesdays in the period and plotted them next to each other (in blue), along with the mean of all the Wednesdays in the 10 weeks (in green). This can show you how you're performing each day compared to historical data.

Power Usage
Average of Wednesdays
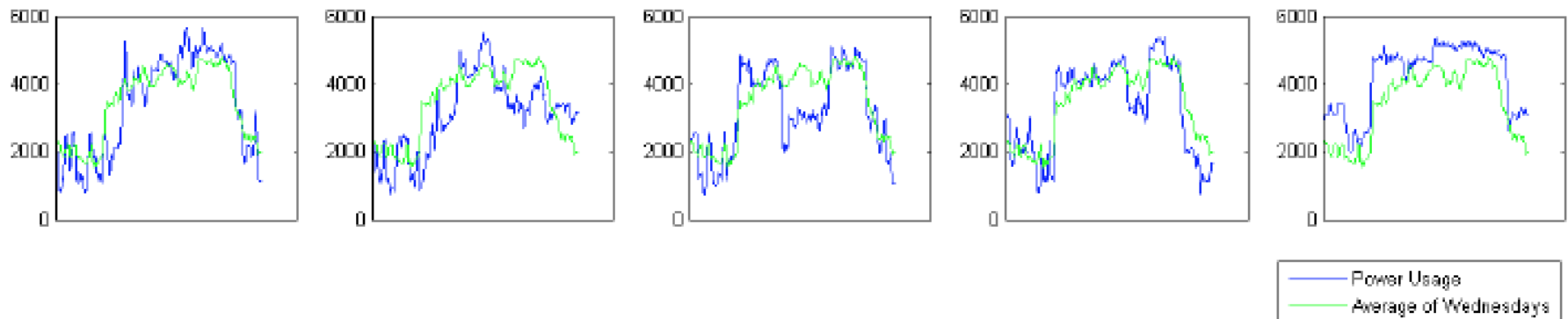
- Stochastic (rather than predictable) system

Turning numbers into knowledge…

Pilio
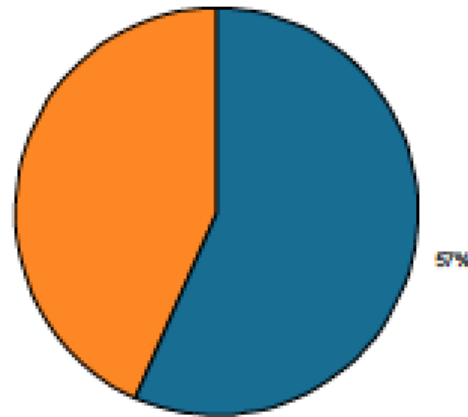ENERGY MANAGEMENT WITH SCIENTIFIC INTEGRITY

Out of Hours Usage

In Hours (Daily, 9-5)

10 weeks:
4,184 kWh   43%
£627.66

Year projection:
21,759 kWh
£3,263.80

1,332 coffees

Out of Hours

10 weeks:
5,460 kWh
£819.06   57%

Year projection:
28,394 kWh
£4,259.10

1,738 coffees

- Out of hours usage is greater than in-hours usage
- Feedback in "coffee cups"

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WICKED Summary: a tale of heterogeneity

- Data Rich

    - Meters need monitors

    - Analysis still evolving

        - Internal analysis with in-house energy team

        - External consultants

    - Displays & feedback at different levels

    - Leases may need amendment to make energy upgrades

- Data poor

    - 2.7 million manual meters

    - Smartphone as smart meter

    - Data rich may still be analysis poor

WICKED TAKE AWAYs...

- "Best" practice depends on how well EE fits
    - Within different organizations
    - Operating in heterogeneous markets
    - With different levels of personnel/staffing & access to data
- Unlikely that the solution set = 1
    - Market segmentation WITHIN organizational types may be necessary for policies achieve better results
    - **WICKED** thinks the solution set > 1, starting with 6
- *Socio-technical* innovation will drive more change across the sector than *technical* innovation on its own.

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http://www.energy.ox.ac.uk/wicked/

Thank You

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