energy fusion

Discussing the convergence of efficiency, procurement and flexibility

11.30-12.15

Turning big data into big money

What data is important? How do you acquire and action it to extract best value?

An end user view of ‘energy’ data management

Dr Maria Spyrou

17 April 2018

@DrSpyrou

A brief history of ‘my’ time

- Engineering Doctorate with Tesco and Loughborough University “Multi-scale analysis of the energy performance of supermarkets”
- Energy Efficiency Manager at M&S since 2015
- I’m not here to teach you how to suck eggs

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Let’s assume you had all the data in the world

- Half hourly energy consumption data
- Half hourly submeter data
- 5 second sensor data
  - Temperature readings in various parts of your building
  - Outside air temperature
  - Humidity
  - Air on- air off data from heating/cooling/refrigeration
  - Gas levels
  - Anything else you can dream of
- Occupancy data

Let’s assume you had all the data in the world

- Maintenance log data
  - Exact times of fault reported and commentary
  - Equipment level failure rates
  - Engineer comments
  - Replacement rates
  - Cost of replacement
- Capital project data
  - Exact dates and type of replacements
  - Efficiency / optimisation additions

Let’s assume you had all the data in the world

- Where would you start?!
- And how far could you take it?

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You could start by benchmarking your estate

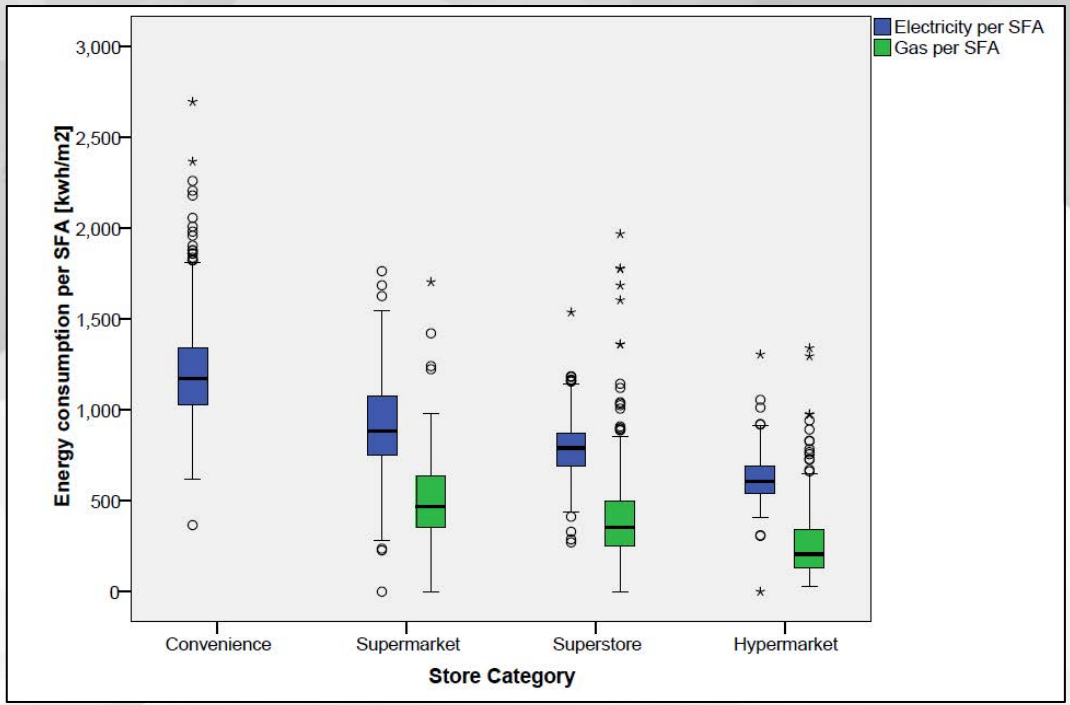


Figure from: Spyrou, M., Cook, M. J., Shanks, K., Lee, R., & Conlin, J. (2011). Energy Consumption Prediction Models for the Retail Sector. In CIBSE Technical Symposium, DeMontfort University, Leicester UK - 6th and 7th September 2011

You could start by benchmarking your estate

- Focus on the outliers and why they are under/over performing the rest of the group.
- Is there anything you can do to bring them back in line?
- Or are they just special cases?

Try to understand the effect of air temperature

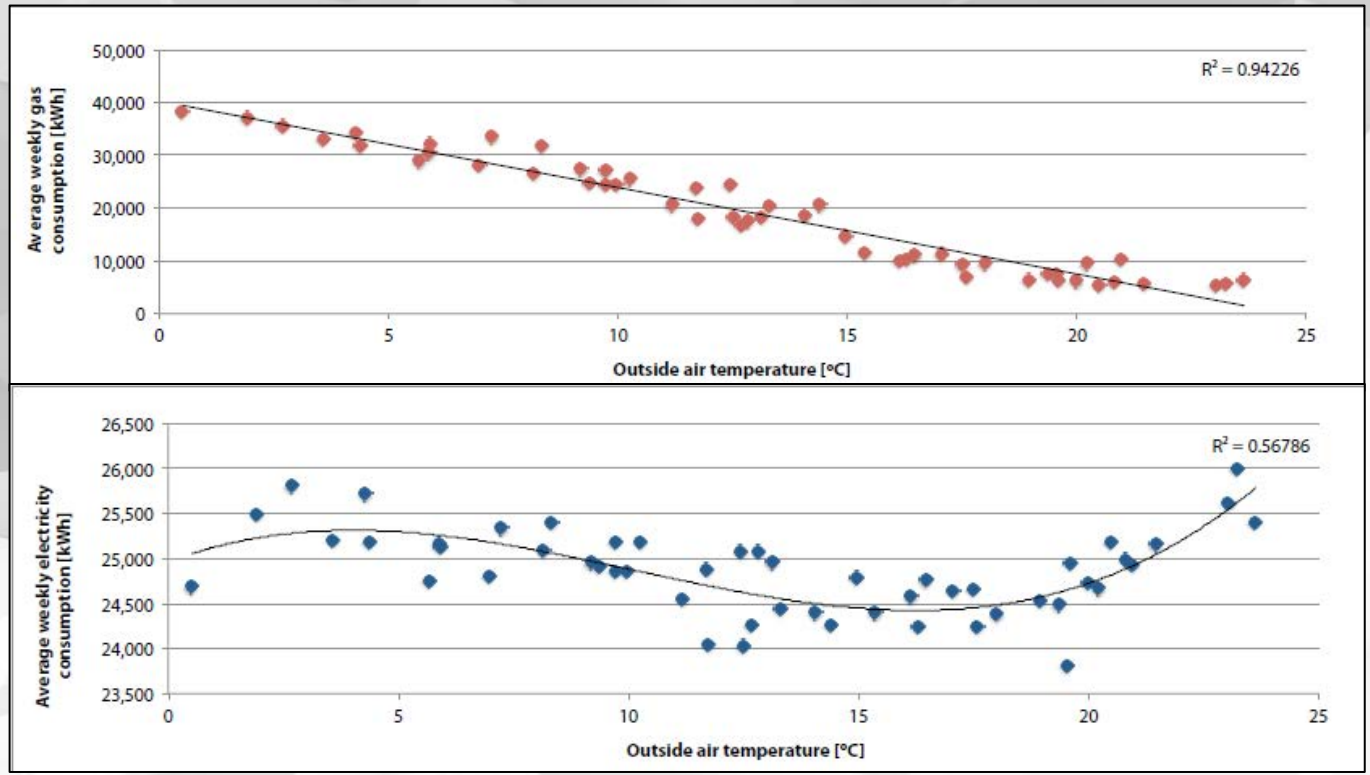
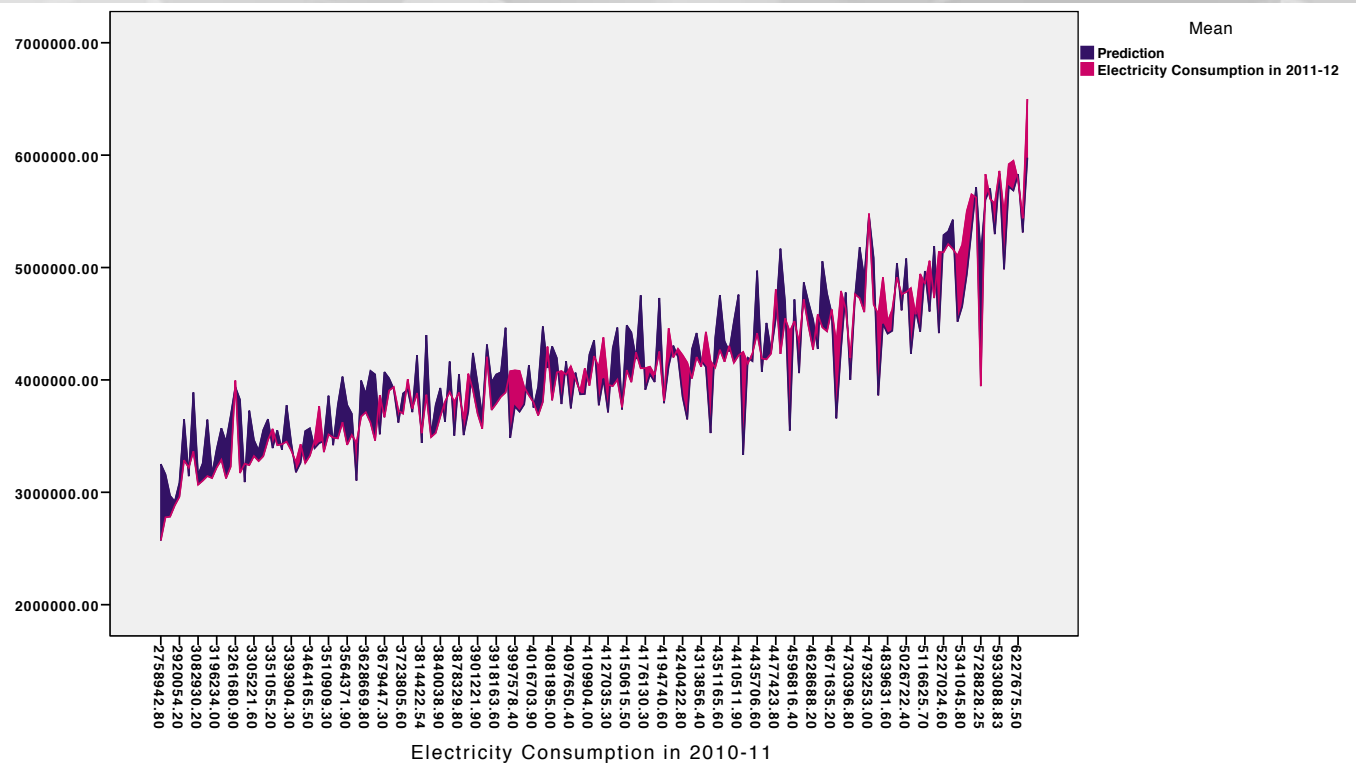


Figure from: Spyrou, M. (2015). Multi scale analysis of the energy performance of supermarkets. Engineering Doctorate. Thesis submitted to Loughborough University. Available at: https://dspace.lboro.ac.uk/2134/19598

Can statistics help us?



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Statistical methods

Statistical methods, even as simple as regression, can be used as tools that identify which buildings are performing inefficiently

- Automatic identification based on more than one characteristic
- Narrows down the buildings that need further investigation on a case-by-case basis
- Helps prioritise energy efficiency interventions

What can submetering tell us?

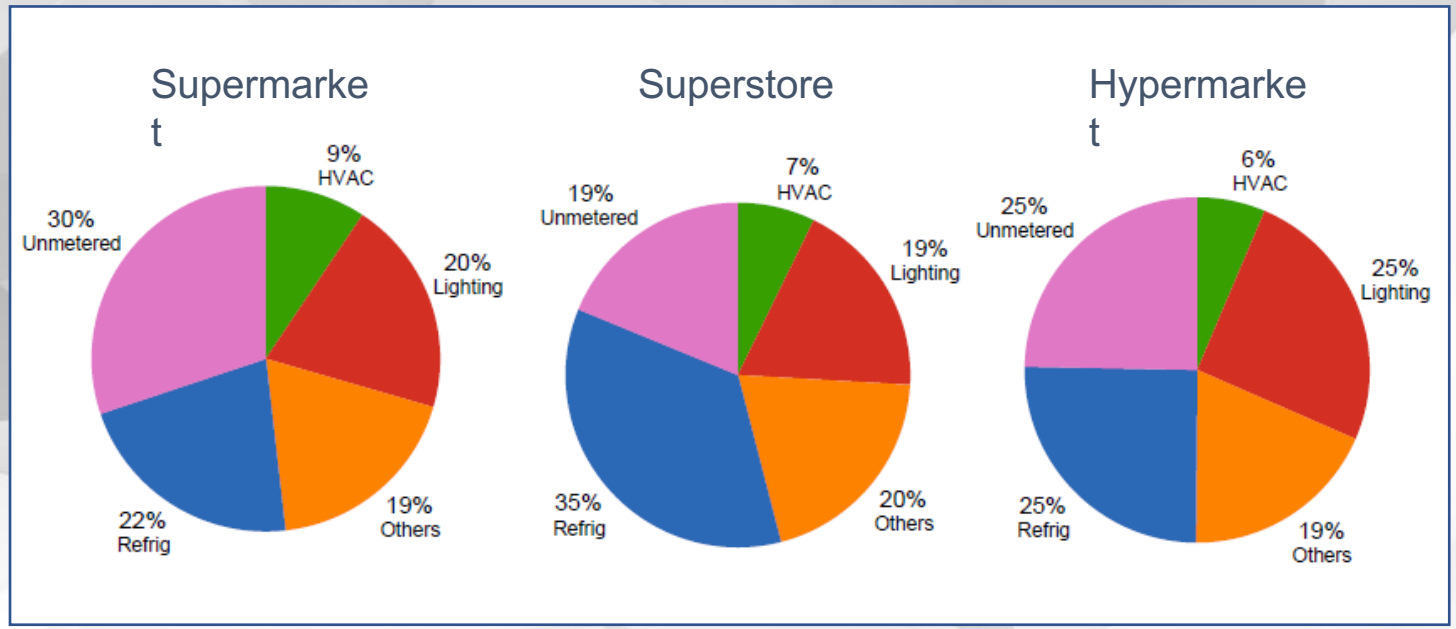


Figure from: Spyrou, M. (2015). Multi scale analysis of the energy performance of supermarkets. Engineering Doctorate. Thesis submitted to Loughborough University. Available at: https://dspace.lboro.ac.uk/2134/19598

Looking at store specific details

- 1 store
- 6 sub-meter types
- Outside air temperature
- 3 years worth of data

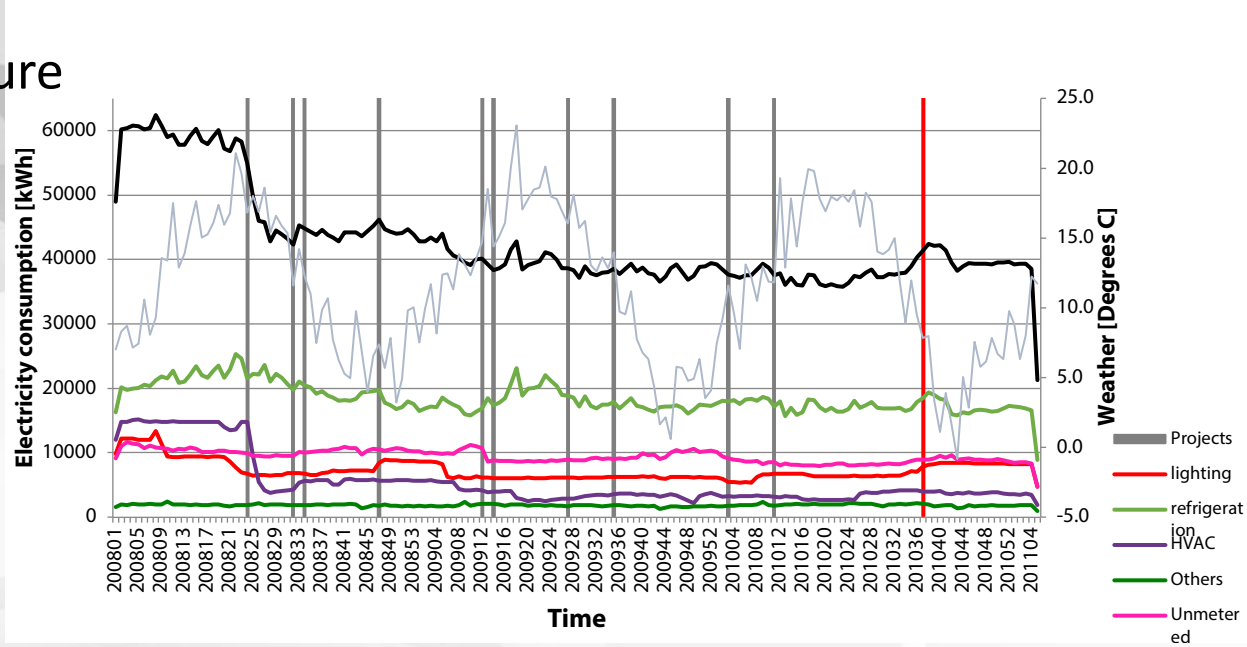
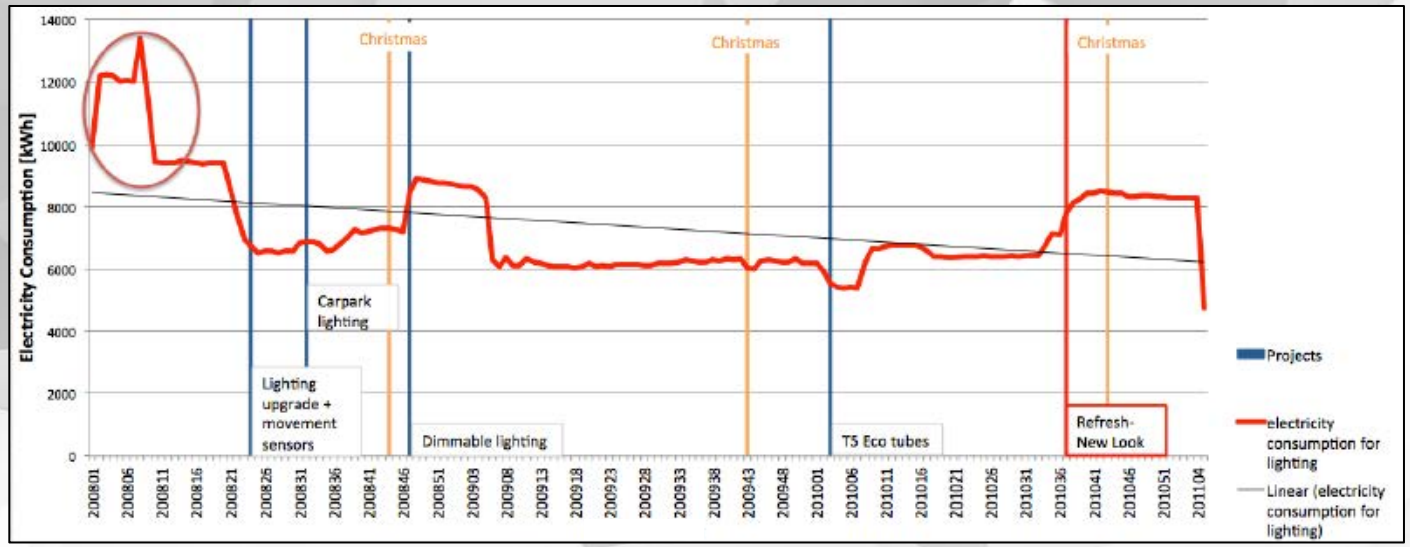


Figure from: Spyrou, M. (2015). Multi scale analysis of the energy performance of supermarkets. Engineering Doctorate. Thesis submitted to Loughborough University. Available at: https://dspace.lboro.ac.uk/2134/19598

Lighting submeter data for 3 years



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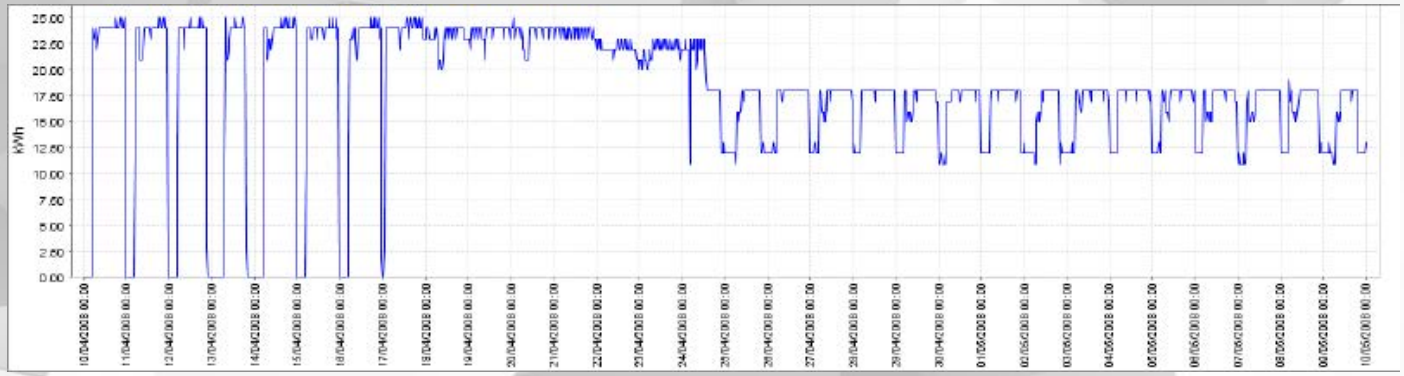
30 min Lighting sub-meter data for 4 weeks



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Other examples:

- Bakery ovens switched on before operational hours
  - Why?
- Lighting/HVAC staying on over Christmas
  - Why?
- Overdoor heaters staying on, or switched off
  - Why?

Can you take it any further?

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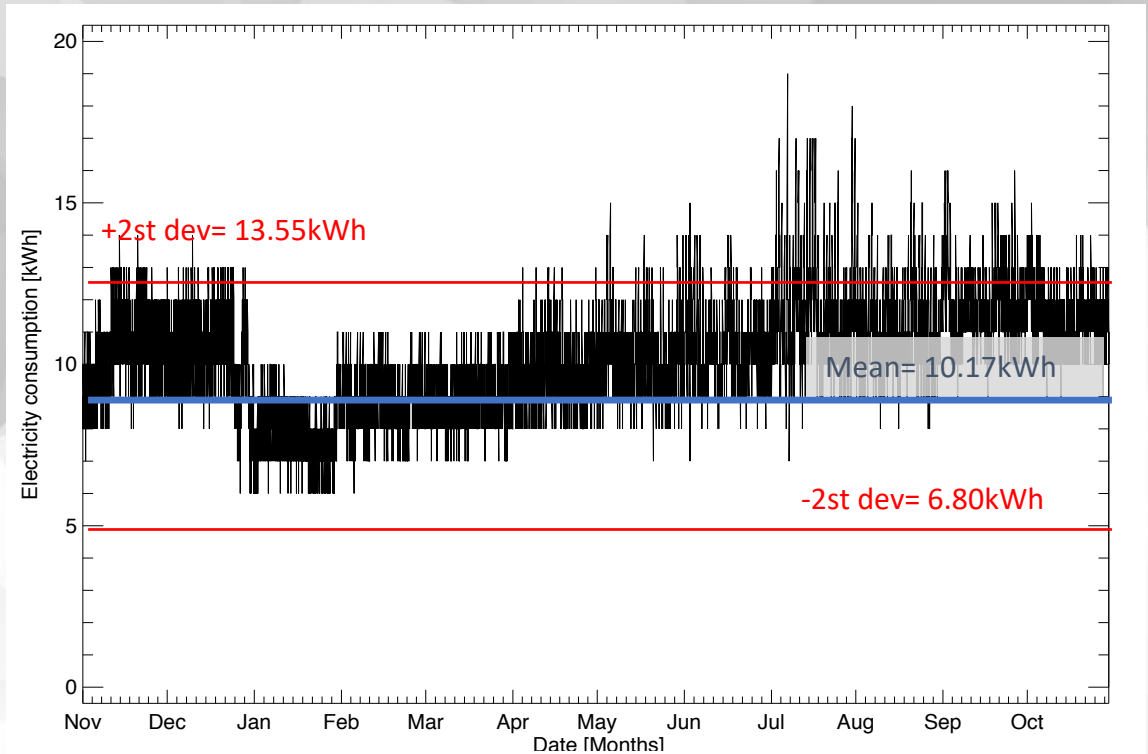
Refrigeration example – before



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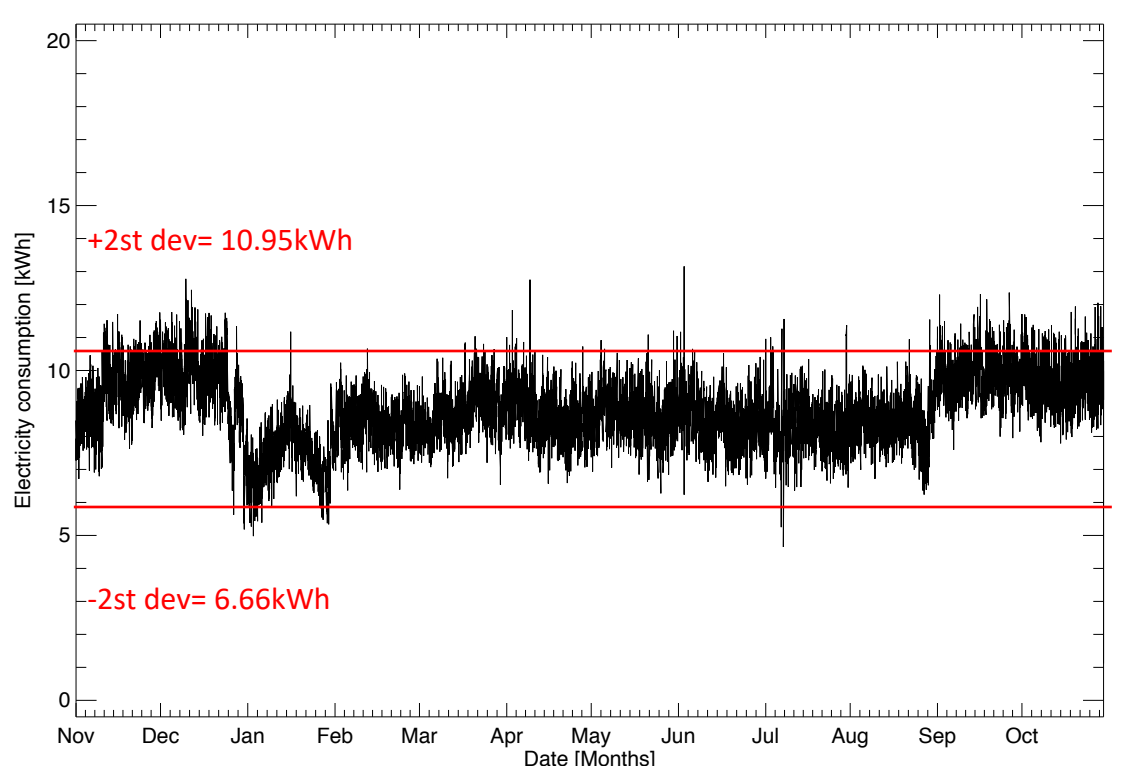
Refrigeration example – after



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What about Machine Learning and AI?

- Current advances in Machine Learning allow for fault finding and identification, as well as the potential for predictive maintenance
- This would include scenario building and forecasting, where one identifies a fault/patter in the data and then asks the algorithm to notify when it happens again

- More advanced algorithms can identify faults without any prior knowledge of the system, however these are rarer and require more processing power before deployment.

Summary; Is data a friend or a foe?

- Benchmarks can be used to identify good and bad performers, and if you have a small estate you can always compare to industry standards
- Deeper dives into submetering data can identify small sources of inefficiency that could be quick wins
- Further tools, such as statistical analysis, and analysis of maintenance data can lead to improved energy management
- Machine learning and artificial intelligence can help; but a large amount of data is required

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Thank you

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Big Data in to big money

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Why?

Data needs to drive an outcome – focus on the outcome

- Data is only valuable if you intend to do something with it
- Therefore, you need to know what you want to achieve before worrying about data and analytics
- Once you do know **why**, you can then focus on the **what** and the **how**

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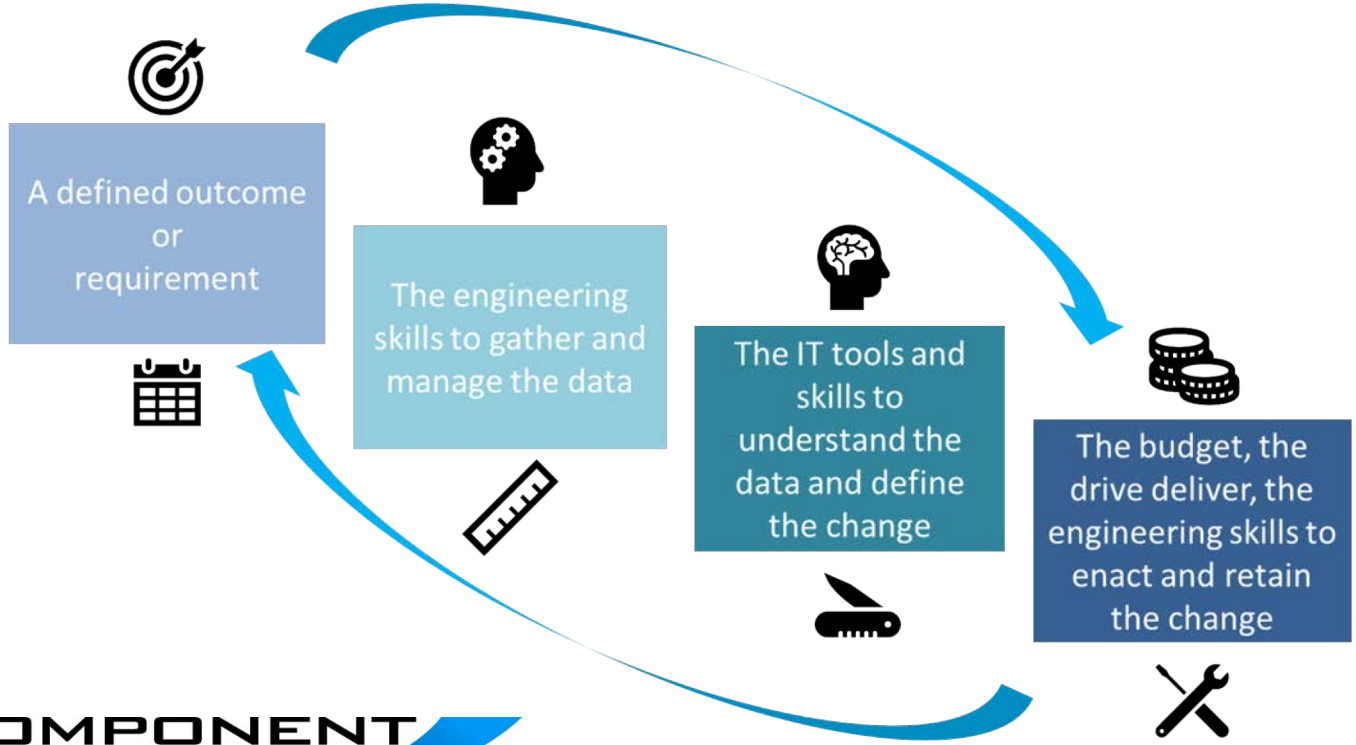
What do you need?

4 Key components are required to turn data in to benefit



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