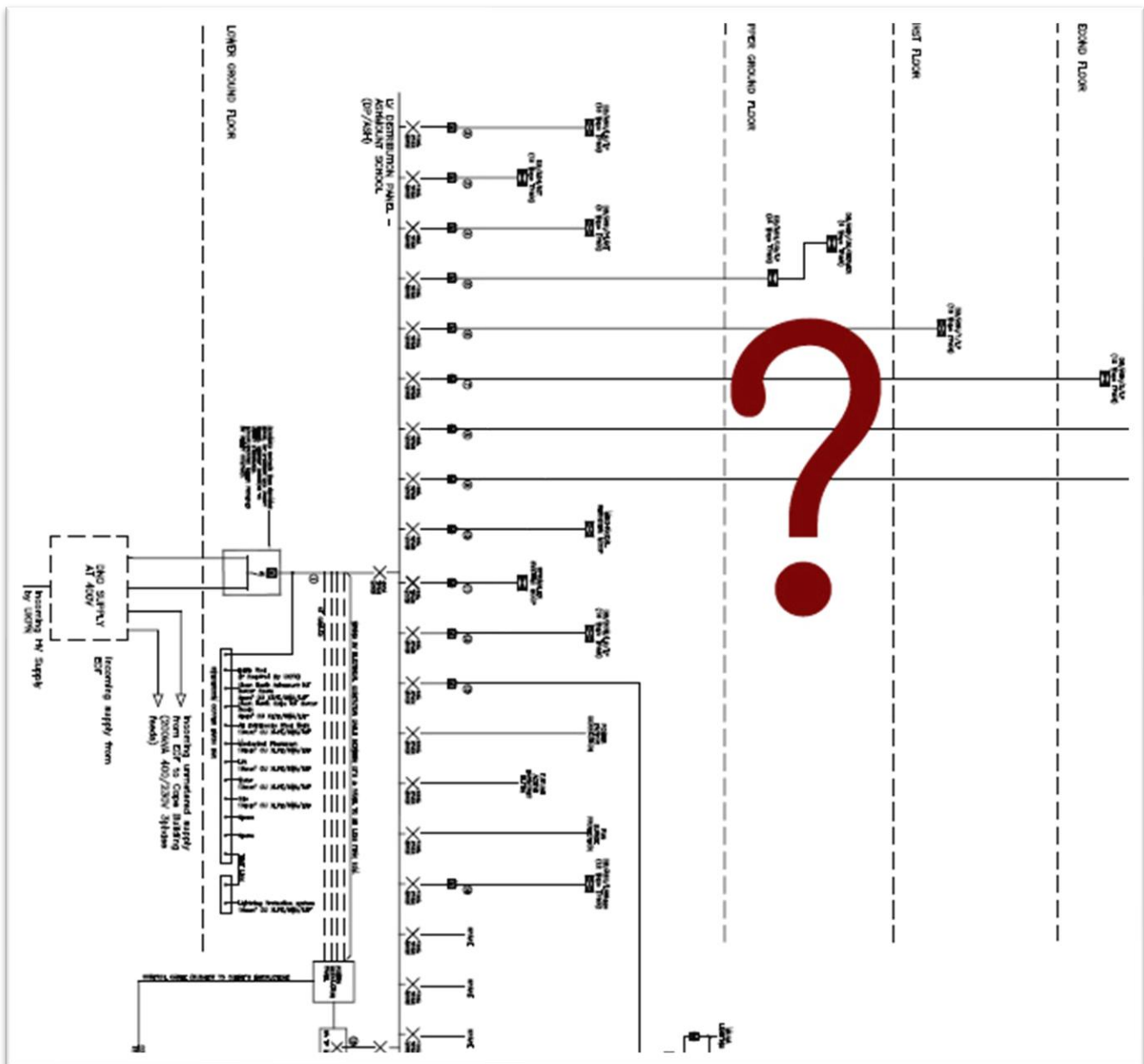




MAKING SENSE OF METERING: HOW DO WE MAXIMISE OUTPUT VALUE?

*White paper report
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Overview

This white paper report was put together to summarise the CBx breakfast briefing “Making sense of metering”, held at UCL Energy Institute, London on 01 May 2014.

An open discussion on metering regulations, strategies to maximise output value, and the importance of data visualisation and communication to enable a better understanding of energy consumption.

With special thanks to our fantastic panel of industry experts; John Davies, Head of sustainability at Derwent London; Luke Nicholson, Director and Founder of Carbon Culture; Dan Grandage, Head of responsible property investment at Aberdeen Asset Management; and Mat Colmer, Lead Technologist at Technology Strategy Board.

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METERING DESIGN & THE BUILDING REGULATIONS

The valuable role of metering has been recognised by the Building Regulations since 2002 with the inclusion of requirements for sub-metering in non-domestic buildings. Part L2: Conservation of Fuel and Power for all new and existing non-domestic buildings states various criteria for the reasonable provision of sub-metering.

While the criteria are very specific, there are many cases where direct implementation results in a strategy that is not suitable to the requirements of the occupants; there may not be enough meters or the correct specification of meters to provide sufficient information for analysis, there may be too many meters creating an overwhelming amount of data or, in some circumstances, it may not be possible to ascertain what a meter is measuring. Furthermore, direct meters are just one of the methods that can be employed; others include hours run, indirect metering, by difference and reasonable estimations of small power and little training exists in making the appropriate selection.

As well as legislative compliance, effective metering is about providing information to the building operators, allowing them to understand where the building is performing well and where the building is performing less well. This makes it possible to manage and take action on optimizing the building operation.

Part L2 does not give suitable recommendations for developing an overall metering methodology. There is a need for better industry guidance in this area that considers building typology, the data outputs necessary for legislative compliance, its future occupants and the skills and understanding of the future facilities team.

Government's Energy Efficiency Best Practice Programme has developed some guidance on developing a metering strategy for new buildings,

'Building Management Systems are being employed for a task they are not designed for'

Mat Colmer, Technology Strategy Board

given in General Information Leaflet 65. The Chartered Institute for Building Services Engineers (CIBSE) have developed TM39: Building Energy Metering (a guide to energy sub-metering in non-domestic buildings) put together with retrofit also in mind. While both of these documents promote greater understanding, they are more process-focused than detail and case-study focused. The Better Building Partnership's 'Better Metering Toolkit' is a much more in-depth document that is very useful for landlords or facilities managers who would like to understand metering strategies and the functions of various meters for energy consumption profiling. However, this does not address the need for industry guidance on designing bespoke metering strategies.

NEW BUILDS

The Technology Strategy Board (TSB) is an arms-length government organisation affiliated to the Department for Business Innovation & Skills (BIS) and is the UK's innovation agency. One of the TSB's large programmes was the £8million Building Performance Evaluation stream which funded the evaluations for 366 dwellings and 56 non-domestic case studies. The programme began in 2010 and will finish at the end of this year. CBx will be holding an evening event in November to reveal some of the results; details will be available on the CBx website. The TSB will be officially disseminating from early 2015 and data will be hosted by CarbonBuzz as published case studies, in the main, and all other outputs are available at:

<https://connect.innovateuk.org/web/building-performance-evaluation/outputs>

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Early feedback from the case studies indicates that regardless of the efficacy of the designed metering strategy, the implementation is failing. Sub-meter information needs to have an interface in order to be useful. In general, this data is fed back to the building management system (BMS), however, the primary function of a BMS is to communicate the instantaneous operation of a building – what is happening now and how can that be amended – and stores only up to a month of historical data. As such the BMS is often employed for a task it is not designed

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for.

A BMS dataset is not sufficient for meaningful and insightful interpretation whereas an Automatic Monitoring and Targeting (AMT) system is an end-to-end metering system which collects building data and produces regular analysis reports for the building operator. Example reporting includes consumption usage, daily profiles, day vs. night vs. weekend usage, maximum demand and load profiling. These systems are expensive and therefore are rarely found outside commercial environments.

Findings have also highlighted a lack of training in this area for facilities managers (FM) or building managers. If FMs download BMS data every 6-8 weeks, this results in large gaps in information where the BMS will begin to overwrite leaving an incomplete picture of the operation.

Sub-metering can fall victim to ‘value-engineering’ which is often client (budget) driven. In these cases it’s not necessarily the sub-meters that are targeted – it may be the heating sectors or distribution boards are reduced and therefore the related sub-meters are

‘Energy optimisation and management can help to drive down obsolescence figures’

Dan Grandage, Aberdeen Asset Management

removed. Consequentially, the granularity of information you’re getting from your building is diminished. Similarly, cost reduction exercises can affect the BMS; interfacing software may be stripped back greatly affecting the degree of control and information exchange. Finally, metering commissioning and reconciliation of outputs to the main fiscal meter are rarely carried out properly. Commissioning is often compressed due to programme or budget issues.

THE DATA CHALLENGE

Aberdeen Asset Management (AAM) is a global company holding primarily offices, retail parks, and industrial with both multi and single-let tenancies in their fund. Whereas the TSB work streams have been evaluating the metering of buildings in early occupation, AAM are looking at how to retrofit their existing stock.

Moving beyond compliance, AAM are looking at protecting the assets and the rental income. As energy is a significant and variable cost, this must be addressed in order to provide the best value for their clients, thereby driving down obsolescence figures.

Dan Grandage, Head of Responsible Property Investment at AAM has been leading a large metering evaluation and retrofit programme across the global stock. The main concentration of effort has been in reducing landlord-influenced energy as this is where they have the most control.

The initial observation was that relevant data on a single asset was held in a number of places by various building professionals; property managers, asset

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management fund, procurement specialists, CRC consultants and accounts teams. Due to this, the principal task has been to develop a single system of record for energy data and broader, non-volumetric sustainability information.

In terms of implementation, AAM are prioritising main meters and then sub-metering where there are high energy loads – typically in multi-let offices. In undertaking this programme, AAM learned that 60-80% of the existing installed meters did not comply with the EU MID Directive requiring that all meters which are billed from, including tenant areas need to be a standard accuracy level. This can be advantageous for a sophisticated metering retrofit programme as the upgrade of these meters would be covered by the compliance and maintenance budget, leaving extra resource for interfacing, training and development. Whilst the metering contractor is on site, it may also be cost-effective to consider installing gas meters and water loggers installed simultaneously.

Implementation is being carried out in 3 steps;

1. define the requirements; what is already installed and where are meters required?
2. establish where existing meters must be read manually and where invoice data is fed into various accounts teams
3. map out portfolios and properties and the metering status quo

There have been some issues with extracting the data from the half-hourly meter installations across the AAM stock; in some instances new meters are having to be replaced, in others data is having to be extracted from the suppliers' websites. Suppliers do not update their information in real time and this can lead to a data lag of between 24 hours and several months.

AAM have implemented the ENVISI platform as their single system of record. As well as storing all sustainability-related data generated from an asset, it also sends automatic reports to M&E contractors, FMs, BMS engineers, asset managers and property managers. It allows alarms to be set up on daily

'A single system of record may be one solution to the left-on-the-shelf challenge'

Dan Grandage, Aberdeen Asset Management

profiles and facilitates project tracking. When a list of recommendations is generated each can be assigned to the relevant person on the system which then tracks the progress of those actions. In the previous CBx white paper, 'Making Energy Audits Work for a Resilient Portfolio', the 'left-on-the-shelf' syndrome is discussed. Automated, single systems of record may be one solution to this epidemic.

"A commercial client is equally responsible for the delivery of an effective metering strategy."

John Davies, Derwent London

RETROFIT & THE VALUE OF QUALITY METERING

John Davies, Head of Sustainability at Derwent London, is responsible for creating and leading the company-wide sustainability agenda.

Derwent London are a London-centric Real Estate Investment Trust (REIT) with assets predominantly in Zone 1. They own 4-6 million sq.ft of floor space and their primary focus is on mid-market properties; acquiring properties of low market values and low market rents but with potential to enhance and extract value through refurbishment and regeneration.

One of their main aims is providing responsible design and delivery of rental space for their clients. In terms of metering this means specifying a high quality

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metering strategy. Derwent London take a collaborative role in the design of their metering strategies in order to arrive at the ideal solution. As a commercial client, they feel it is also their responsibility to ensure an effective solution where engineers may lack bespoke knowledge. Again, there is space in the industry for better guidance in this area. It is clear that building professionals have a real duty to the smaller, one-off projects such as education buildings to ensure that high-quality, bespoke metering strategies are delivered as these clients are unlikely to have experience of their own in this area.

Leading on from this, Derwent London pay particular attention to ensuring the strategy is implemented as designed and does not fall foul of cost engineering. Meters are installed to measure output as well as input. This can be particularly useful for rainwater harvesting systems where it is impossible to ascertain where the water is being used. Likewise, it is difficult to know how much of the potable top-up is being utilised. Similarly, the heat energy being thrown out from a boiler is not known unless it is metered.

Derwent offers added value to their tenants by metering their consumption providing them with good quality, consistent data which helps them to manage and optimise their energy use across their floor space. In turn, this helps Derwent London understand tenant demand, trends and impacts and gain influence where otherwise their reach would end. They issue a regular Sustainability e-newsletter including 'how tos' and info-graphics describing demand line and trend profiling in an easily digestible format. Behaviour change and awareness is promoted by various competitions.

As a result some tenants have made interventions such as increasing the set-point in data centres and server rooms. They also have the ability to buy energy from directly from Derwent and therefore pay better commercial rates. All these activities also enhance the landlord-tenant relationship.

It is useful to landlords to be able to categorise certain tenant types and if they have particular requirements. For example, this type of information would help to define an IT-heavy tenant which could be physical number of computers on desks, server-room space or data-centre space.

Derwent London are also moving towards an automated system with a help-desk function that will facilitate change management; monitoring the interventions undertaken in order to understand the influence on energy consumption.

"It is important to identify outputs to be metered as well as appropriate inputs."

John Davies, Derwent London

CARBON GAMIFICATION

Occupants are a major factor in the operational energy consumption of a building. As well as good design in the early stages of a project, there is a need for a mechanism to reduce occupant-driven operational energy consumption. Luke Nicholson is founder of Carbon Culture a digital sustainability platform for business, government, cities and citizens and has been looking at how metering and other sustainability data can be utilised as a driver for behaviour change. Carbon Culture's main aim is to promote joined-up and collaborative working across the population in order to maximise the benefits from sustainability data. They aim to include everyone in their efforts from building industry professionals to building occupants.

The main challenge identified was the dispersion and protectionism over data that is being collected across the industry. Currently, the main purpose of the data collection is to satisfy legislative requirements and corporate functions to meet compliance or management lines. Carbon Culture have been exploring ways to make it more valuable, promoting

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the treatment of data as business resource. Bolstered by the knowledge that there are huge advantages to

“Gamification techniques can be used to create interventions from kids to CEOs based on the same dataset”

Luke Nicholson, Carbon Culture

sharing data and insights, they have been working to harmonise sustainability data into the same forms.

The industry uses a range of different ways of collecting data on the metabolism of a building (AMR and BMS for example) on energy water and waste and yet more at a city scale such as substation data. The integration of each type of data into a single platform or set of forms is a costly and time consuming process compared to the utilisation of the data thereafter. In response to this, Carbon Culture has built a social gaming platform to create multiple interventions based on the same set of information, whether for school children or CFOs. This has reduced integration costs and allows changes to be implemented to interventions from business-to-business or city-to-city without onerous cost implications.

They have used a combination of behavioural data and numerical data to create a variety of touch points for different users. Outcomes or interfaces could be for building managers or policy makers, for visitors to a gallery or for people using public transport networks. Importantly, the interventions also measure the outputs or consequences of the activity which is an essential way of understanding their effectiveness.

Carbon Culture's 'Utility Graph' tool creates easy-to-use visualisations of energy data on a much higher frequency basis than is normally available. This allowed building managers at DECC to unlock a 10% gas saving within a couple of weeks on the basis of better visualisation. This type of intervention works

really well for technical users who are already pre-disposed to care about carbon and energy however different approaches are necessary for the everyday building occupant.

Gamification is the use of game thinking and game mechanics in other contexts to engage users in solving problems. Carbon Culture have been employing these techniques in order to engage school children and office workers including their intervention called 'Corridors of Power', put together to assist with reducing lighting consumption in the Houses of Parliament.

CARBONBUZZ

The CarbonBuzz platform can facilitate the recording and interpretation of metering data at a range of complexities. The built-in capability for representing zones within whole-building energy consumption can give an accurate picture of the breakdown between mixed-use case studies and multi-tenanted vs. common area buildings.

Once the by-fuel bars have been reconciled, it has the capacity to apportion energy end uses to the fuel bars making it possible to use this information for undertaking diagnostics on a building. When utilised to capture year-on-year consumption data, increases and decreases in end use energy such as lighting, cooling or fan power will become clear and notes can be entered against each of these to record interventions or variables that may be a factor in these changes.

In any area where the sub-meter information has not been reconciled with the fuel information, the magnitude of the discrepancy will be displayed as a grey, missing section, indicating where further investigation may be necessary.

A main aim of CBx is to augment the CarbonBuzz database as a by-product of our work streams in a drive to generate ever-more robust and contemporary

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energy consumption benchmarks for the industry as a whole.

RESOURCES

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