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APPLIED BUILDINGS AND ENERGY RESEARCH GROUP

Briefing Paper

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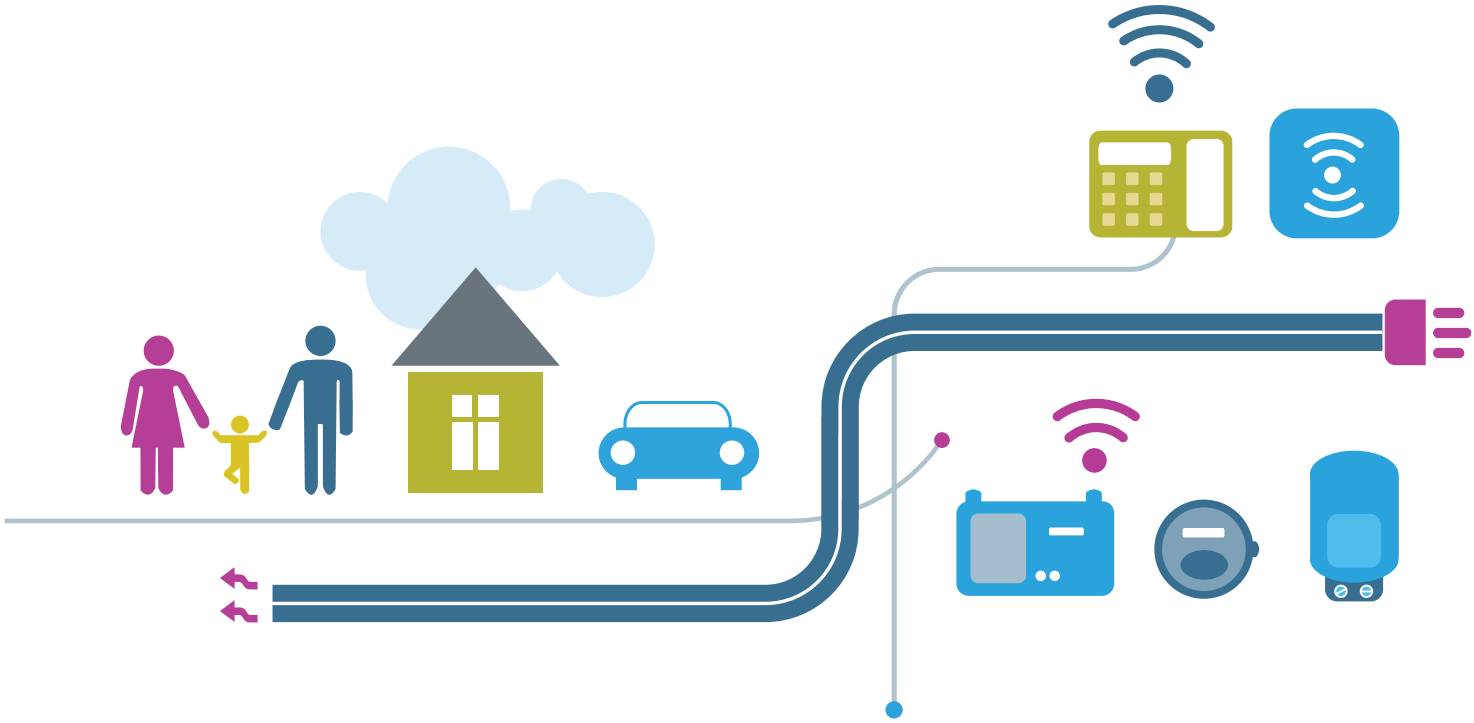
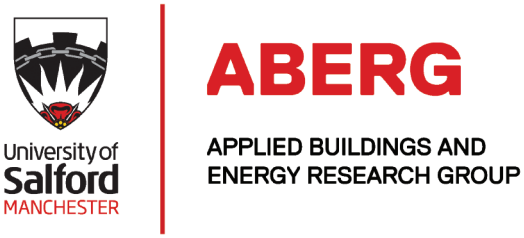
# CONSUMER ACCESS TO SMART DATA

## 'HOW DO WE GET CONSUMERS CONNECTED TO THEIR ENERGY DATA?'



This briefing paper was written for the benefit of industry as a collaboration between the Salford University Applied Buildings and Energy Research Group and BEAMA.





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# Introduction

The rollout of smart meters and energy displays in Great Britain is part of an essential upgrade of the national energy infrastructure. Although there are significant challenges, it is becoming clear that smart metering will enable a market for new products, devices and services that will save money, improve people's lives and help consumers and industry manage their energy more effectively. One challenge that remains is the ability of consumers to access, use and generate benefits from their energy data. Many consumers are unaware that this data is available to them, and where they are aware, they are unclear as to how to access it. This is potentially limiting innovation in a number of sectors, such as third-party tools for smart data analysis, smart heating and controls and research into energy demand in buildings. As the smart meter rollout progresses, the ability of consumers and innovators to access data should be promoted and potential barriers removed.

THE SMART METER ROLLOUT WILL ENABLE VAST AND EXCITING AREAS OF INNOVATION

This solution may be driven by access to data through the Consumer Access Device (CAD). There is a need for a much wider, cross-industry discussion about how to connect consumers with their data and the implications of this for energy management, but this paper is intended to inform that discussion by focusing on the connectivity challenges within the Home Area Network (HAN) and the classification of different device types. The main themes explored within this paper are:

- What is the technical feasibility of pairing the CAD with the smart metering HAN?
- What is the current regulatory framework?
- How might we engage with suppliers to help raise consumer awareness?

This paper is limited to discussion of the connection and use of Consumer Access Devices, but many more devices have the potential to be connected to the HAN. The issues described here apply to the majority of devices that can be connected to the HAN, including HAN Controlled Auxiliary Load Control Switches (HCALCS), which have the capacity to switch circuits such as charging points. It should be noted that most consumers will make only indirect use of their smart energy data, and that consumer control will in many cases consist of great consumer choice over which third parties and service providers have access to the data.

This paper is written with SMETS2 devices and systems in mind and is not intended to apply to SMETS1 installations, as once the rollout is complete we expect the majority of installations to be SMETS2. The difference is that SMETS1 installations communicate directly with the energy supplier, so may lose smart functionality if the consumer changes supplier. There are also no minimum requirements on the data items in the SMETS1 installation, and not all SMETS1 systems will support multiple CADs. The end date for SMETS1 installations to be counted towards an energy supplier's quota is currently set for October 2018, and work is ongoing to ensure the timely enrolment and adoption of all SMETS1 installs into the DCC system. BEAMA and its members continue to work with solution providers to identify options for SMETS1 installations to support CADs both before and after enrolment and adoption.

The smart meter rollout will enable vast and exciting areas of innovation. The purpose of this paper is to open a dialogue with key stakeholders to explore the ways in which we can put smart meter data in the hands of consumers to allow this innovation to take place. This document is for suppliers, policy makers, CAD manufacturers, third parties, innovators, consumer rights groups, and researchers. As this discussion paper is very much the start of the discussion, we have structured it as a series of questions that we hope will form the basis for further discussion and, ultimately, action.

# What is a CAD?

The main purpose of the CAD is to provide the consumer with high frequency data from the smart meter. The Smart Energy Code (SEC, 2017) defines a Type 2 device, of which a CAD is an example, as:

> ***'A Device that does not store or use the Security Credentials of other Devices for the purposes of communicatingwith them via its HAN Interface'.***

This is a very broad definition; an alternative description may be

> ***'any device that uses the ZigBee Smart Energy Protocol (SEP) to exchange data with the installed smart meters'.***

CADs are not explicitly mentioned or explained in the Smart Meter Installation Code of Practice (SMICoP). They are, however, mentioned in the Smart Energy Code (SEC) as Type 2 devices in the Communications Hub Technical Specifications (CHTS) and the Great Britain Companion Specification (GBCS).

According to the SEC, each installation must be able to support at least four CADs. These may include devices such as In-Home Displays (IHDs) which, while providing a data interface with the HAN, do not provide the same functionality as other types of CAD (see below). Other versions of CAD may include appliances or controls systems that have the SEP architecture embedded.

The definition of a CAD has the potential to be a source of confusion for both consumers and energy suppliers. Many things may be classified as a Type 2 device, or CAD. These include the IHD, which is generally included in a smart meter installation.

## How do we define a CAD?

This situation could be clarified by the categorisation process for Type 2 devices suggested below:


**1. In-Home Display:** These may hold historical data for comparative purposes, but have limited data transport facilities and are often used by consumers primarily to monitor present near real time data. This data cannot be exported. ***While a Type 2 device, for the purposes of this document it would not be defined as a CAD.***

**2. Gateway CAD:** This provides a bridge between the data generated by the communications hub (gas and electricity consumption) and WiFi, ethernet port, 3G or 4G cellular, mesh radio or another alternate WAN technology. It can transmit data either inside the property or to an external internet location.

**3. Combined Display and Gateway CAD:** This combines items 1 and 2 into one device. It allows viewing and transmission of data.

**4. Embedded CAD:** Where a CAD is embedded in a device intended for another purpose, such as a washing machine or electric vehicle, it performs the function of a Gateway CAD but may also be able to connect appliances to the HAN.

TABLE 1 : POSSIBLE CATEGORISATIONS OF CADS

Without a shared understanding of what a CAD is, there is the potential for confusion in the consumer-facing departments of the energy supplier. ***For the purposes of this report we do not define the IHD as a CAD.***

## Does this categorisation of the CAD improve the chances of consumer access?

Access to smart metering data without a CAD is limited. Energy suppliers and other parties may allow consumers to opt into half hourly data collection. This may be viewed using an online portal, where the consumer must log in to the supplier's website to view data. This is generally limited and there is no option to download the data. This has recently been supplemented by apps, some of which already make use of CAD functionality, that allow the viewing of 'live data'.

However, these solutions have several disadvantages, as half-hourly readings:

- May not offer the same resolution as provided by a CAD solution, which can offer reads between <10 seconds and 15 minutes
- May not allow third parties to integrate with the data
- May not allow for local storage of data or portability of data when changing supplier
- May not allow for easy analysis of the data by the consumer.

THESE LIMITATIONS MEAN THAT THE CAD REMAINS A BETTER OPTION FOR CONSUMERS WANTING TO ACCESS, ANALYSE AND SHARE THE ENERGY DATA FROM THE SMART METER.

## How easy is it for a consumer to have a CAD paired to their smart meter?

The method of pairing a CAD with a smart meter currently exists, but most consumers are not aware of this. Anecdotal evidence points to an ad hoc process of consumers attempting to pair CADs by asking the supplier to open the HAN for temporary access, or using CADs that have arrived pre-paired with their current smart meter installation. In terms of a customer experiencing a new smart meter installation, the CAD is not mentioned in SMICoP.

After the ZigBee Alliance identified that the anticipated method for pairing could not be supported by the Smart Energy Protocol, the Government consulted on local CAD pairing and subsequently suggested three alternative options for pairing the CAD (BEIS, 2017a):

***1. Not implementing local CAD pairing:***

Under this option, Government would take no further action to amend the technical specifications to support local CAD pairing. This would mean that a consumer would not be able to pair a CAD locally, but CADs could still be paired remotely by an energy supplier or another DCC User.

***2: Implementing local CAD pairing through GB-specific CADs:***

This option would deliver the originally proposed functionality for CADs, but without relying on changes to the ZigBee SEP. Instead it would involve creating new GB-specific functionality for CADs described in SMETS, CHTS and GBCS.

***3. Implementing local CAD pairing through the existing ZigBee standard:***

This option would use the existing ZigBee SEP to implement local pairing where possible. Under this option, to pair a device locally the consumer would have to enter a pairing code on the electricity meter. This code is set by the ZigBee SEP as 32 characters long.

## What is the most effective way for the consumer to have their CAD paired with their smart meter?

The most recent recommendation from BEIS is that option 3 is implemented to make the pairing. This code would be received from the energy supplier to put the communications hub into pairing mode. This task can also be completed by the DCC on a remote basis.

BEIS has highlighted the following options to receive the code. All these options require the party enabling the pairing to be a SEC Party or have a contract with a SEC Party.

1. A pre-paired CAD approach
2. Web application to enter MAC and install code
3. A phone call to provide MAC and install code (to energy supplier or DCC)
4. Postal system to send install code and MAC to energy supplier or DCC

BEIS recognises that most people would prefer to carry out this task remotely, supported by the fact that most CAD suppliers see this as the intended route for pairing.

# Consumer Benefits of CADs

## What are the main consumer benefits of access to their data?

There are many benefits to the consumer from the pairing of a CAD with the smart meter. These benefits are reported in the BEAMA publication ***Consumer access devices applications for data in the consumer home area network (CHAN) and wider market considerations*** (BEAMA, 2014). We have also seen a significant increase in energy engagement in homes using apps based on CAD resolution data compared to homes without high resolution monitoring. Some consumers will find it beneficial to use the high-resolution data from the CAD to get in control of their energy usage and understand what the next steps should be to make their home more optimised and energy efficient (Lewis, Xu, Bogacka, & Grigoriou, 2014). It is not the intention of this paper to reiterate these issues in detail. However, the following list summarises the potential consumer benefits that a smart meter installation enabled by a gateway CAD may have:

- Access for the consumer and third parties to accurate and high-resolution energy data.
- Control over data sharing with the supplier.
- Ability to switch to appropriate tariffs tailored specifically to the consumer.
- Ability to layer other data sources such as weather data, temperature data or information about the building over the top of the energy consumption data.
- Ability to transport data when moving supplier.
- Ability to move energy data to a new house to allow for comparison.
- Ability to make simple comparisons when interventions are made to behaviour or the building fabric, systems or controls.
- Ability of third-party tools to integrate with data, such as home energy management systems or price comparison or switching sites with the occupant's permission.
- Connected home and smart home systems that use real-time energy data.

### Current Market Penetration of CADs

Public awareness of smart meters is well researched. According to Smart Energy GB (Smart Energy GB, 2017), over 97% of respondents from a sample of 9,494 adults in the UK have an awareness of smart meters. There is currently no publicly available data on public awareness of CADs or on how many consumers have access to CADs. However, the potential marketplace is rapidly developing. There are now more than 8.6 million smart meter installations (Smart Energy GB, 2018). This figure is set to rise to almost the entire domestic housing stock and a significant number of small businesses, totalling around 30 million premises in Great Britain.

# Does current regulation support consumers' access to their data?

## Overview of Consumer Supplier Relationships

The current supplier regulations place an obligation on suppliers to offer their customers an IHD as part of the mandated smart meter installation. This will provide access to smart meter data. Many suppliers will also offer their customers a CAD (or combined IHD/CAD device).

Each supplier meeting the Electricity Act 1989 (UK Government, 1989) standard conditions of electricity has a duty to meet the following licence condition with regard to smart meters:

*Section 49.4*

*(d) on request of the Customer at the relevant premises, it both establishes and thereafter maintains a connection through the HAN Interfaces between the Smart Metering System and each Relevant Consumer Device that is located within a part of the premises to which the HAN extends and is the subject of the request; and*

*(e) the connection established in accordance with paragraph (d) enables that Customer to access (at any time and, in the case of the Domestic Customer, free of charge) by means of each Relevant Consumer Device, the Customer Information that:*

*(i) is capable of being stored in or held by the Smart Metering System (or any part of it); and*

*(ii) the Smart Metering System (or any part of it) is capable of sending to the Relevant Consumer Device.*

This is a clear instruction that suppliers have a licence condition to meet that allows a consumer to interface with the HAN free of charge in a domestic property with a smart meter fitted. Unfortunately, the definition of the Relevant Consumer Device is ambiguous; the glossary in the licence conditions states the following:

***Relevant Consumer Device means a Consumer Device to which devices forming part of the Smart Metering System are capable of being connected by virtue of the technical capability and functionality of those devices.***

This statement may be seen as a barrier due a lack of a formal specific definition. Or, conversely, a flexible statement such as this may promote for innovation of devices. This is obviously with the caveat that energy suppliers may not support devices on the HAN that compromise system security or stability.

## Should the regulation be specific or flexible to drive innovation?

The UK Government, in the smart metering programme as in many other sectors, tends to seek to promote innovation by making regulation flexible and principles-based rather than prescriptive and specific. Ofgem has been particularly careful to avoid presenting regulation as a 'tick-box' exercise, preferring to regulate for desired outcomes but not prescribe how that outcome is to be achieved.

## How does a consumer gain access to their smart meter data through the supplier?

**A supplier engagement exercise was undertaken to understand how a consumer might find information about to pair a CAD with their smart meter. It is a small survey into how easily consumer can get information from their energy suppliers about pairing a CAD or accessing its near real time data.**

Two main sources of data were used: an overview of energy suppliers' websites to assess available guidance around CADs, and a request for information about the pairing of CADs through an email or web portal request.

A review of the websites of the largest eleven domestic energy suppliers in the UK (by customer numbers, based on Ofgem data) found that none carried any consumer support information about CADs with the exception of OVO, which had a document referring to them but with no further information about pairing. This suggests that finding information would be difficult for a consumer.

A request was sent to the ten remaining large suppliers via email or web portal for information on pairing a CAD with a smart meter. Only one offered any solution at all. Four did not respond to the enquiry; two suppliers provided unclear responses and three responded that local CAD pairing was not possible at that time.

While this should not be treated as a detailed consumer survey, it does indicate the consumer experience of CAD pairing may be problematic, largely driven by the difficulty of accessing information. It is unclear how it will be possible if a supplier is unable or unwilling provide its customers with the necessary code.

# Future Discussion Points

We have identified some questions and issues for future consideration, but these should be considered by no means exhaustive.

## How can we address low awareness of CADs in the market?

### Lack of supplier awareness

Initial engagement with suppliers indicates that there is potentially a lack of awareness in consumer-facing staff, which will need to be addressed if wider access is to be achieved. Further to this, suppliers need to have confidence that the marketplace is fair and competitive, and no single supplier should have more onerous obligations. This will require standardisation across suppliers, which is addressed later in this section.

### Lack of consumer awareness

Good progress seems to have been made on public awareness of smart meters, but awareness of CADs may be very low. A more detailed consumer study would be required to fully establish this. It is recommended that similar research be carried out to estimate current levels of public awareness of CADs and to help build a suitable strategy for publicising the CAD.

It is important to note that not every consumer will be interested in a CAD, but support should be given to those who are.

### Installers to have a greater knowledge of CAD for customer services

Arguably, the best time to install or pair a CAD may be during the smart meter installation itself. This would allow for a pre-paired device to be handed to the consumer who could set the device up in their own home by entering a WiFi key. The installer would simply be responsible for checking the pairing of the CAD. This may be addressed by SMICoP, but it would assume that consumers are willing to accept the CAD offered by their supplier or have sourced a CAD prior to the installation that is acceptable to the supplier. Both of these options risk moving the market into promoting proprietary, rather than open-source, CAD solutions.

### Central point of information

A service which supports the understanding of CADs should be developed. This may be done through existing information services for consumers, and could include guidance for the public as to their rights to access their data, 'how-to' guides and links to relevant service providers.

## How do we manage the relationship between CADs and IHDs to help the consumer?

### Categorisation of the CAD

There remains some confusion as to the best way of categorising a CAD that distinguishes it from an IHD, perhaps specifically as a device that connects the Smart Metering HAN with the Cloud. We suggest that a categorisation should be agreed by industry and Government that allows a clearer understanding of the differentiation between these functionalities to develop.

### A CAD or an IHD?

The CAD and the IHD should not be considered mutually exclusive; some people will find it easier to engage with a simple IHD rather than with a data portal, and many users will want a CAD for long-term data and third-party usage but also an IHD for a 'quick check' of energy usage. Furthermore, while the CAD must be interrogated by the user if it is to provide the data, an IHD 'pushes' the information at the user and may be more effective at prompting discretionary energy savings. An analogy is that the CAD is like a watch, where a conscious effort is made to interrogate it for information, while an IHD will remind you of your current energy use just as an accidental glance at a clock will remind you of the time. For this reason, joint CAD/IHD solutions should be encouraged.

## What are the different ways in which consumer data can be accessed and shared?

### Mobility of data held by suppliers and third parties

The development of solutions that allow for common data formats across device models and device types will allow consumers to take their data with them when they change suppliers. If a consumer has several years of energy data stored in a portal, it is not good practice for this data to be kept locked to that one supplier or third party. This also requires importing systems to be enabled by other data portal operators. There should be more clarity about ownership and access to historical consumer energy data. The ability to move data securely between platforms is likely to require regulation of the data formats to deliver compatibility.

### Localised data exchange rather than cloud and back

Some current data portals use systems of data exchange with the consumer that rely on sending data to an offsite server where it can be viewed and stored. Given the sensitivity of smart meter data, some consumers may find it more appealing to keep the data in a closed loop home network, or local storage of the data on their own computer or USB card. Thought needs to be given to customers who do not want their high-resolution data to be sent via the internet, but the market for closed-system storage of such data is likely to be limited.

### No internet present?

Although many homes and small businesses have a broadband connection, some do not. It appears unfair to exclude this minority from the collection and analysis of high resolution energy data. They may store this data on site and make use of it at a later date. CADs may need to be flexible enough to allow for localised storage either through a closed network system or locally on the device.

### Access to data for all consumers

Researchers at the University of Salford have developed solutions to deliver energy consumption data via a smart speaker system when requested, giving the consumer who is visually impaired an option to receive live energy consumption data, predicted periodic usage and the other functions of a CAD. Innovations such as this should be encouraged. Not all consumers will be able to use an IHD, and the opening of the data channel through the CAD allows for solutions to be developed for all consumers.

## How many CAD devices might we need attached to a smart meter?

Whereas SMETS1 specifies only that a minimum of one Type 2 device should be supported (DECC, 2017), SMETS2 requires that the HAN should be able to support a minimum of four Type 2 devices (DECC, 2016). However, this number may need to be increased due to the potential demand for IHDs, Gateway CADs and smart appliances that are also acting as CADs in a single home. There are clearly technical issues to resolve to make this possible, particularly in a sub-GHz environment where the bandwidth for communication over the HAN may be more constrained. This is where innovative solutions may be found in the form of bridging devices between the Smart Metering HAN and the non-mandated Consumer HAN (for a detailed explanation of the relationship between the SM HAN and the C HAN and how the CAD can provide this link, see BEAMA, 2014 p10).

## How do we manage users and the security of their data?

### Verification of user

The architecture of the smart metering system has been designed with data security at its core. The system is decentralized in the sense that there is no centralized target or facility allowing a general cyberattack on all smart metering installations at once. This is because there is no central 'command centre' distributing messages to all properties. Instead, the Smart Meter Key Infrastructure (SMKI) allows for secure communications across the DCC network by authenticating the identity of trusted parties (DCC, 2017). The DCC is in effect the sole 'postman', and does not open the message or store its contents. The identities of both sender and receiver are assured in order to provide a secure, consistent service that is common to all users. Data is stored within the HAN in the CAD or IHD, and with the energy supplier or other trusted, authenticated DCC User in their own secure system. DCC Users must comply with stringent security requirements.

Once a CAD is paired to the network and the data exported into the Consumer HAN, these rules may cease to apply and consumers may choose to share their data with third-party service providers in different ways. How consumers are protected to ensure that they make informed choices and that their data is not misused is important to consider, particularly in the context of new data protection provisions. But it should be noted that the CAD is merely the conduit for extracting data from the HAN, and we do not expect CAD providers to be liable under GDPR or other data protection legislation for the choices consumers make about sharing their data.

### Moving CADs

When an occupant moves to a new home it should be possible for them to take their CAD with them. This could include an uninterrupted data history with them, allowing comparisons between their old and new homes. We expect new business models to emerge that allow for such continuation of service and increased compatibility between service contracts.

### Old CAD, new occupant

Where a new occupant finds an existing paired or unpaired CAD in their new home, there is the potential for the data of the previous occupant's data to be at risk. Should the CAD unpair automatically and remove access details? GDPR legislation placed requirements on the previous owners of devices. An analogy may be made with the example of a mobile phone: when left unlocked and passed or sold to someone else, it is the first owner's responsibility to remove any personal data.

### Right to be forgotten

Similarly, when the consumer leaves a data host they should be able to download their data and be able to wipe it from the system they are leaving. This is a legislative requirement, including under GDPR and other existing data protection laws, which may be placed on the platform provider rather than the operator of the actual CAD.

### Guidelines for data storage

Data may be stored securely within the HAN (on the IHD or CAD), but the specification only requires 13 months of data to be available in this way. Depending on the service contract, an energy supplier or other service provider may store a customer's data for longer, but where data is stored online and how long is it stored for, and what retention periods are suitable, will be subject to emerging market and business models and new regulations. It is expected that secure Cloud services will be a model for data storage, allowing occupants a detailed history of consumption patterns with which to make (or enable their service providers to make) sophisticated analyses to identify efficiencies and enable beneficial behaviour changes or new, better targeted services.

**There is a discussion to be had about whether a normalised mechanism for providing consumers access to their data is desirable.**

# Proposed Next Steps

The purpose of this report is to address the question **'How do we get consumers connected to their energy data?'.** The use of the CAD has been highlighted as a central part of addressing this question, but we have identified a number of issues that need discussion or clarification to help us move forward. We propose two steps in answering these questions:

- A roundtable event with a cross section of invited stakeholders to address market, technical, regulatory questions, as well as exploring the potential benefits for consumers, to be held in Central London on 8 May 2018
- A Smart Meter > Smart Homes Sandpit to be hosted by the University of Salford to provide facilities to allow the group to explore these technical questions.

## Roundtable Event

An invited representative group will be established to discuss the issues raised in this document. This should include industry, academia, policy and third sector (consumer groups). It should be open access, with boundaries set to avoid commercial disclosures. It is proposed that the roundtable will discuss and share ideas about, though not limited to, the following issues;

- Consumer and supplier awareness of CADs
- Regulation and definitions
- Technical issues of pairing devices
- Data access and sharing
- User management and data security

This will form the basis of a further position paper or report identifying how access to consumer data can be improved and the potential challenges and opportunities this will bring.

## Smart Meters > Smart Homes Sandpit

The University of Salford proposes a **Smart Meters > Smart Homes Sandpit,** allowing interested parties to discuss issues of a non-commercial nature that are applicable to the whole sector. These may include technical policy, standard guidance on smart meter data, the interoperability of systems, and further avenues of research to support the sector as a whole. The parties will be commercial organisations, academics, consumer groups and governmental officials. This will also provide demonstrations of innovative technology engaging with smart meter installations with a view to raising consumer and industry awareness of the features of smart meters.

The sandpit will be based at the University of Salford, where existing and developing smart meter and CAD technology can be tested in a secure controlled environment. It will provide:

- Fully compliant SMETS meter sets connected to head end
- Battery installation
- Solar PV installation
- Bi-directional EV charging points

**The sandpit project will deliver short technical research projects and demonstrations of functionality. For more details or comments about the roundtable or the sandpit, please contact:**

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**Professor Will Swan – w.c.swan@salford.ac.uk**

**Jeremy Yapp – jeremy.yapp@beama.org.uk**

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