Department for
Business, Energy
& Industrial Strategy

Smart Meters and Demand Side Response

The Government is committed to ensuring that every home and small business in the country is offered a smart meter by 2020, delivered as cost effectively as possible. The roll-out of smart meters is an important national modernisation programme that will bring major benefits to businesses and the nation as a whole.

Smart meters are the next generation of gas and electricity meters. They will offer a range of intelligent functions and provide consumers with more accurate information, bringing an end to estimated billing. Consumers will have near real-time information on their energy consumption to help them control and manage their energy use, save money and reduce emissions.

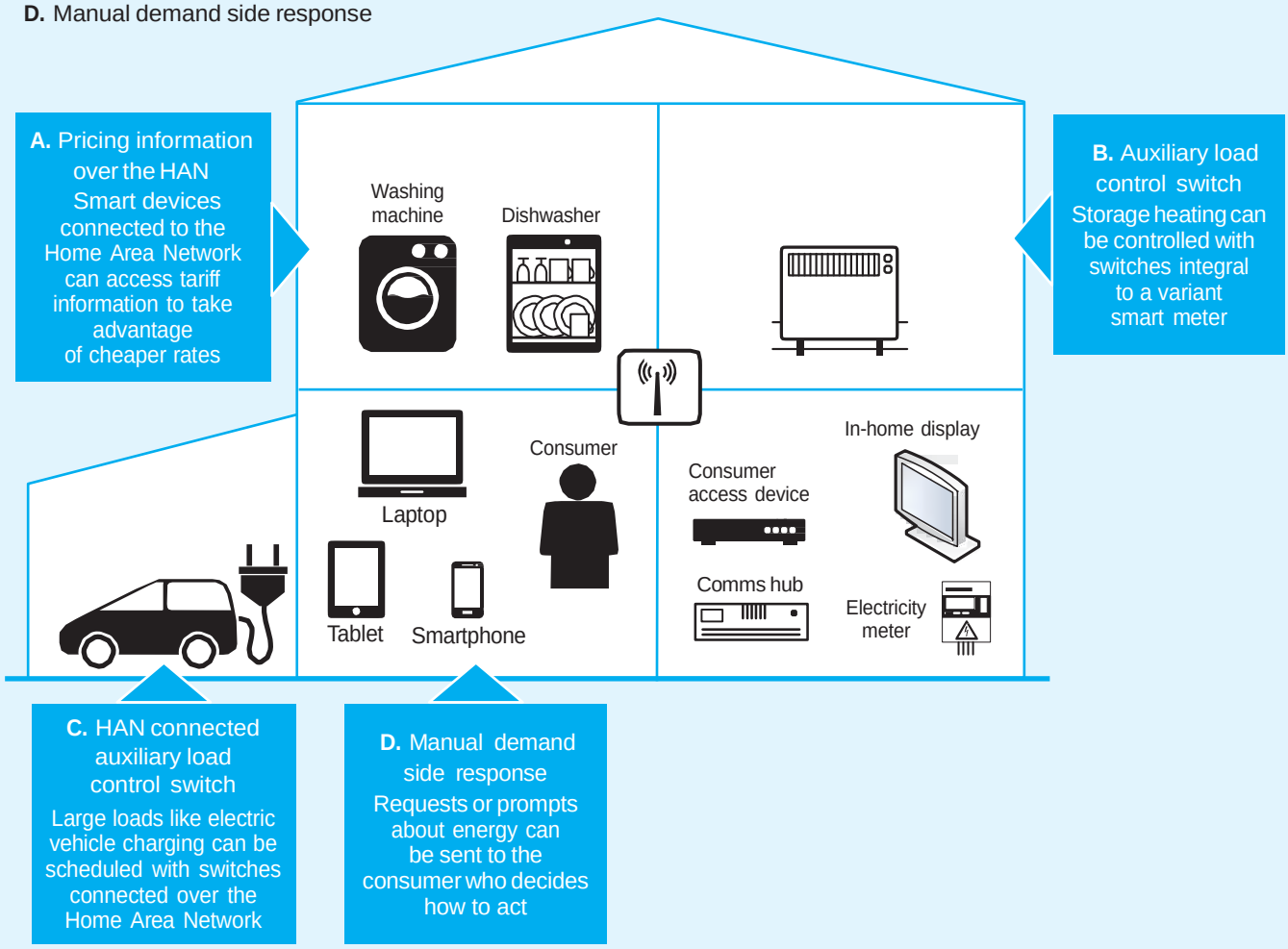
Smart meters will facilitate demand side response (DSR) through a number of load control features supported by the smart metering system. DSR could give consumers new options to help them manage their electricity usage, allowing them to schedule usage for particular times or to vary it on demand to save money. Widespread use of load control could also allow better and more cost effective balancing of supply and demand, reducing the costs associated with predicted or unexpected peaks and helping to provide security of supply as well as helping with the integration of renewables. This could potentially reduce expenditure on building generation capacity and reinforcing the transmission and distribution networks, contributing to keeping energy bills as low as possible for households and businesses.

It will be the consumer's choice whether they decide to use load control services, or time of use tariffs. Access to any consumption data necessary to enable these services will be governed by the smart metering Data Access and Privacy Framework.

This leaflet explains how the GB smart metering system can support different types of load control mechanisms to make domestic demand side response possible.

Overview

A. Pricing information over the HAN
B. Auxiliary load control switch
C. HAN connected auxiliary load control switch
D. Manual demand side response



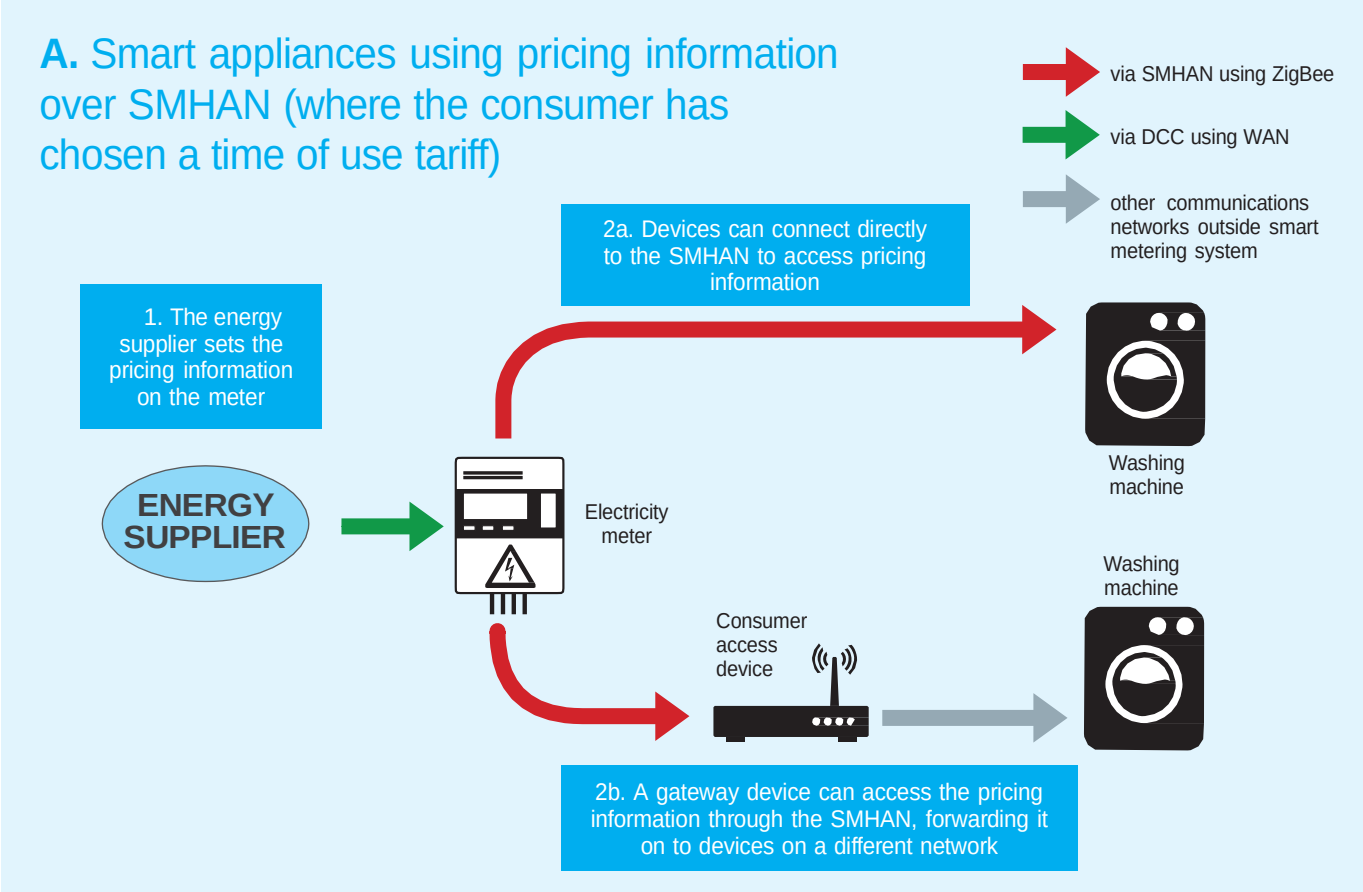
Smart meter load control mechanisms

Smart electricity meters are capable of recording half hourly energy consumption data, providing pricing information and enabling remote load control. The GB smart metering system provides access to data through two main routes.

1. Users of the Data Communications Company (DCC) who have the consumer's explicit consent can access the consumer's half hourly energy consumption data, including maximum demand levels.
2. Devices connected to the smart meter Home Area Network (SMHAN) with the consumer's consent can request electricity pricing and consumption information from the smart meter up to every ten seconds, which could be sent to other devices in the home or over the internet for cloud storage/analytics.

Details of how data can be accessed, including consumer protections, can be found in the leaflet "Smart Meters, Smart Data, Smart Growth" at: https://www.gov.uk/government/publications/smart-meters-smart-data-smart-growth

The load control mechanisms described in this leaflet can be implemented using the smart metering system. They are not mutually exclusive, either from each other or from other forms of load control which do not use the smart metering system. It will be the consumer's choice whether they decide to use such services.



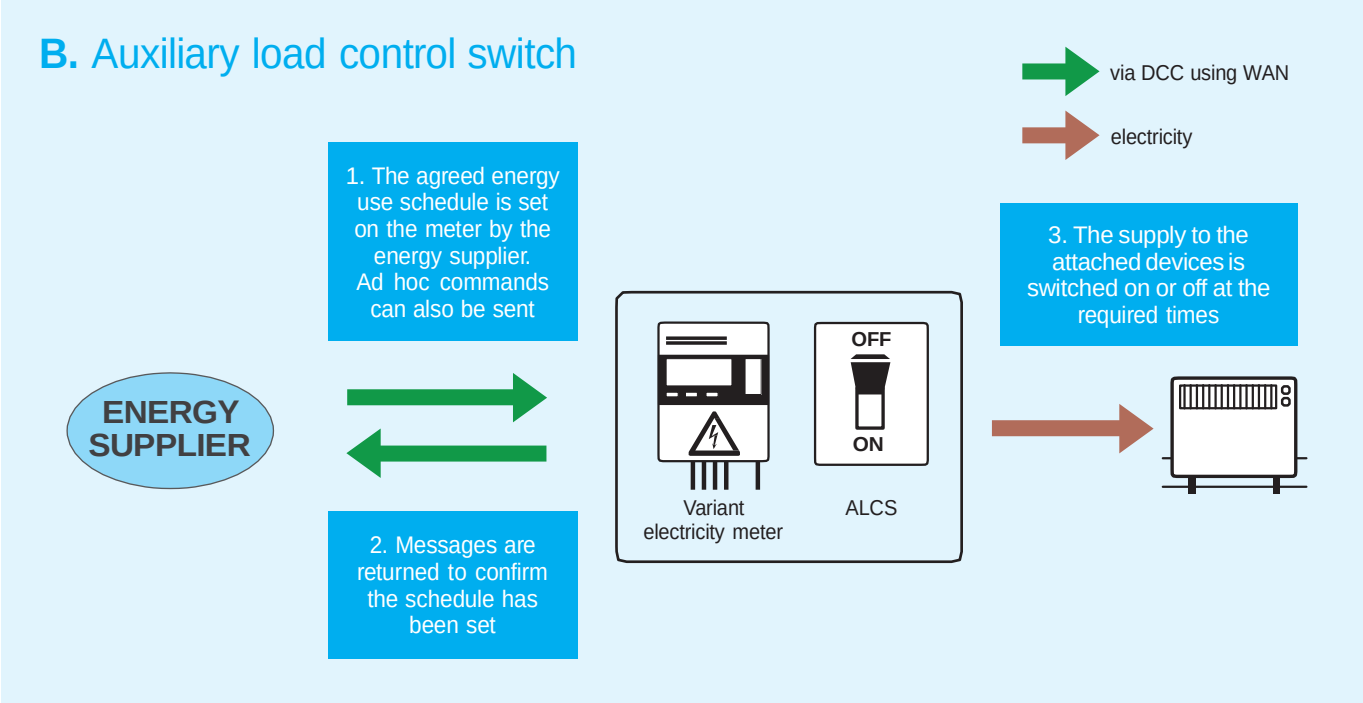
Smart appliances using pricing information over SMHAN

Appliances using the ZigBee Smart Energy (ZSE) standard can be connected directly to the SMHAN to access pricing and consumption information available from the electricity meter. This includes the calendar of different rates for Time of Use tariffs, which can be used to schedule activity to take advantage of different rates. Smart appliances may use pricing information to identify the most cost effective times to use energy, while a combination of battery storage and micro generation technologies such as solar PV may use it to identify when to use energy generated and when to store it or export it to the grid.

Appliances that communicate using other standards (for example, WiFi) can connect indirectly to the SMHAN via a gateway device, a type of Consumer Access Device (CAD) which provides a 'bridge' between the SMHAN and the appliance on a different network. This allows integration of appliances using different communication standards and also allows other information or command signals to be integrated from a variety of sources (for example, local weather forecasts from a smart phone) to inform decisions on when the appliance should be activated.

Example Applications

This method of load control gives flexibility in how appliances connect and respond to signals, making it easier to integrate a wide range of household appliances. The benefits are likely to be greatest from EVs and heatpumps and other forms of electric heating, however other appliances such as white goods could also make a significant contribution.



Auxiliary load control switch

Variant smart electricity meters, sometimes known as five terminal meters, have an auxiliary load control switch (ALCS) integrated as part of the meter. The ALCS can switch the electricity supply to the devices connected to it on or off.

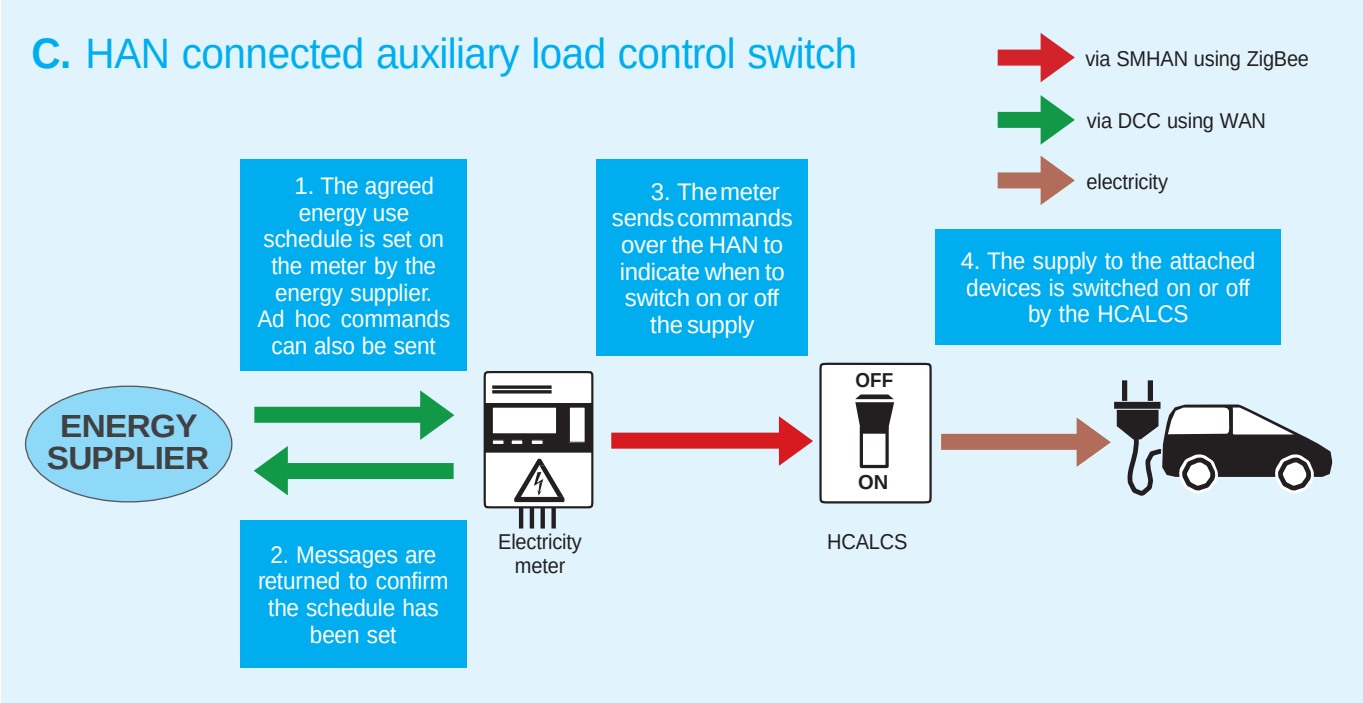
The switching pattern agreed between the consumer and supplier can be set via:

- A calendar in the meter providing the schedule.
- Subject to the agreement made between consumer and supplier ad hoc commands from an energy supplier – allowing changes as required, perhaps in response to wider network conditions (for example, when energy generated by wind or solar PV is higher or lower than expected for a period).

Example Applications

ALCS enable a load to be switched independently of the main supply so it is suited to large scheduled loads such as storage heaters, water heaters, electric vehicles and heat pumps, which can be placed on the auxiliary supply.

It functions like today's Economy 7, providing a scheduled period of power, but could also allow more sophisticated scheduling to respond to periods of increased or reduced supply for example to respond to renewable generation.



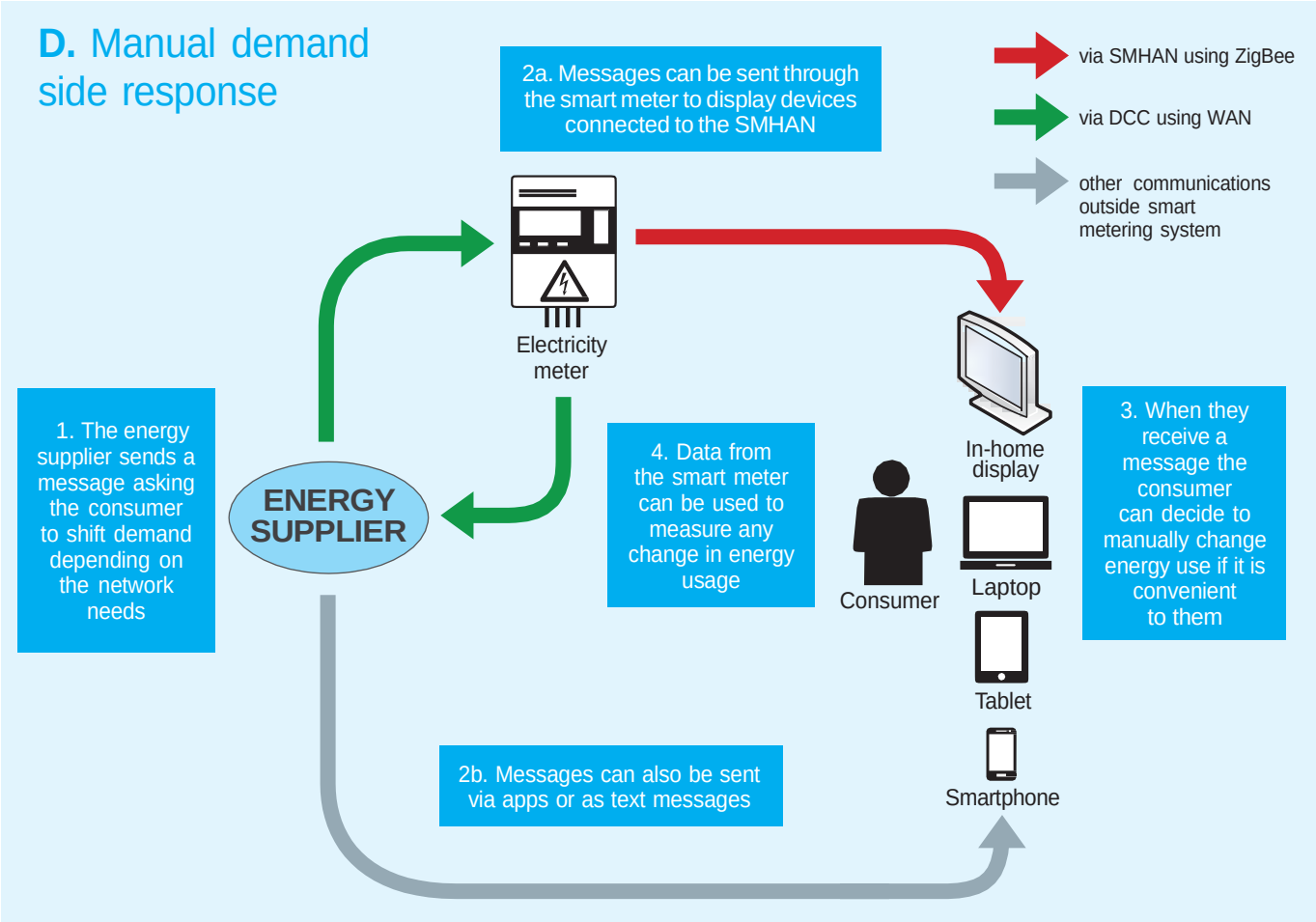
HAN connected auxiliary load control switch

A HAN connected auxiliary load control switch (HCALCS) provides the same function as an ALCS, switching on or off supply to a given load, but rather than being integrated with the electricity meter the switch is remotely connected to the meter via the SMHAN.

The same commands are available through the smart metering system for HCALCS as for ALCS, with smart meters supporting up to a combined total of five ALCS and HCALCS, which can be switched independently.

Example Applications

HCALCS can be installed at the location of the load for example an EV charging point in the garage, avoiding the need for new wiring back to the meter. HCALCS could provide flexibility, for example, if a consumer with a smart meter (that does not include an ALCS) buys an EV at a later date.



Manual demand side response

The smart metering system provides opportunities for manual forms of demand side response, which could then be measured through the smart meter data.

Rather than directly interacting with the supply or function of an appliance, requests or prompts could be sent to the user through whatever method is most convenient to them (for example, via in-home display, text message, email, smartphone app) asking them to take action to vary their energy use at particular times or to reduce their demand to a pre-agreed limit. The smart meter data would then provide evidence of the action taken, allowing comparison with previous behaviour or to that before the sending of the message. This would make it possible to identify and reward action.

Example Applications

Consumer behaviour is the target of this method of demand side response, so examples may be prompts to reduce usage at times of unexpectedly high demand or to switch off heating when warmer weather is forecast, with associated rewards for taking action.

Example Applications

A service to help consumers with budgeting, where the consumer selects their target for maximum demand to keep within and then receives alerts when they are approaching this level. Incentives such as reduced rates or reward programmes could also be offered for not exceeding the targets in a month.

Related considerations

Consumers will need to make a positive choice about taking up DSR measures, an important driver of this will be the consumer proposition. Developers of products and services will need to consider how to incentivise consumers to opt-in and how viable business models can be created.

Benefits

There are a number of ways that DSR results in consumer and wider industry benefits which combine to give greater security of supply and support cost effective low carbon generation:

- Shifting demand to times when energy is less expensive on the wholesale market.
- Reduced out of balance costs due to more accurate forecasting.
- Improved grid management reducing infrastructure and investment costs.

Consumer benefits could be driven through new products and services, for example:

- Demand aggregators – ability for third parties to offer groups of consumers incentives to reduce demand.
- Smart appliances – development of devices with in-built ability to respond to price signals.
- Home Energy Management Services – automated management of heating systems responding to price signals.

Time of use tariffs

All smart electricity meters are capable of supporting Time of Use tariffs, which are key to unlocking the benefits of DSR as they can give consumers a direct financial benefit from shifting when they consume energy.

Time of Use tariffs may be:

- Static – prices vary according to calendar set by energy supplier.
- Dynamic – prices vary according to ad hoc signals sent by energy supplier.

Half-hourly settlement will be an important element in making Time of Use tariffs cost reflective and BEIS is working with Ofgem to remove the barriers to suppliers and consumers choosing half-hourly settlement by early 2017. This work will also consider the approach for moving to market-wide half-hourly settlement with a decision to be taken, including timescales, by the first half of 2018.

Security and resilience

The smart meter system includes features to support system security and resilience in relation to load control, for example:

- Randomisation – where tariff and load switching times are randomised to avoid loads switching at the same time.
- End-to-end security – where, for example, messages are secured using public key cryptography.

DSR mechanisms that do not use the smart meter system would need to include appropriate security and resilience features.

Further information

Smart meters: information for industry and other stakeholders:
https://www.gov.uk/guidance/smart-meters-information-for-industry-and-other-stakeholders

Data Access and Privacy Framework:
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/43046/7225-gov-resp-sm-data-access-privacy.pdf

Smart publication:
https://www.gov.uk/government/publications/towards-a-smart-energy-system

Ofgem Electricity Settlement:
https://www.ofgem.gov.uk/electricity/retail-market/market-review-and-reform/smarter-markets-programme/electricity-settlement

BEAMA Connected Homes Demonstration – Beyond Smart Metering:
http://www.beama.org.uk/resourceLibrary/the-beama-connected-homes-demonstration---beyond-smart-metering.html

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