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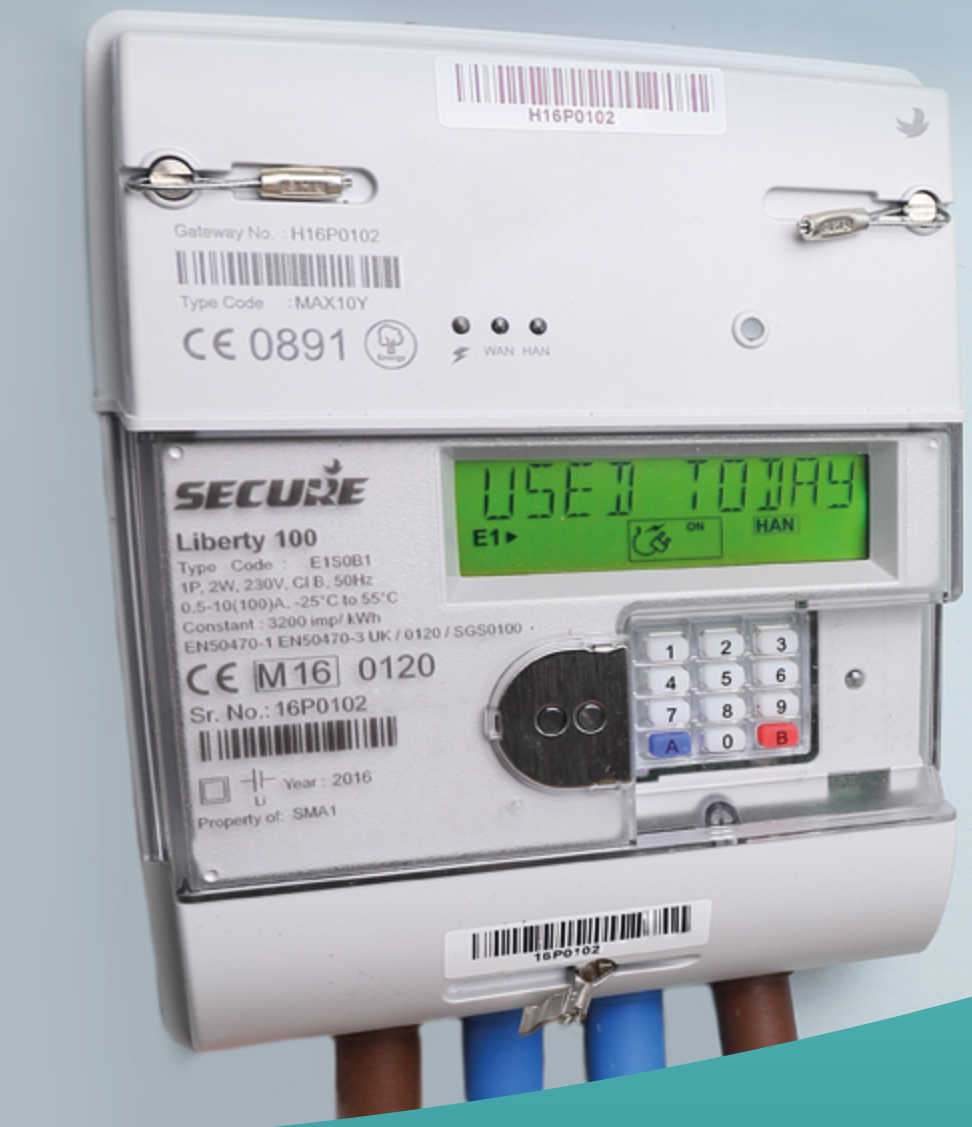

Smart Meter Strategy

June 2020

WESTERN POWER DISTRIBUTION

Serving the Midlands, South West and Wales

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1. Executive Summary

The Government is committed to ensuring that every home and smaller business in the country is offered a Smart Meter. The deployment of the Smart Meters is being undertaken by energy suppliers. Whilst originally planned for a 2020 completion, the programme is now likely to run until 2024.

Older style meters currently installed in properties require a manual reading to be obtained periodically by the visit of a meter reader. In addition the existing meters have no capability to provide anything other than a total energy consumed reading. For that reason it is only ever possible to determine an average consumption over the time period between meter readings.

The new Smart Meters will have a whole host of additional functionality. As well as being capable of being read remotely via an independent communications path they are specified to be able to record the energy consumed for each 30 minute period and to store this data. Data can be extracted from the meter by a new organisation called the Data and Communications Company (DCC). We are able to access data via the DCC although some data will be anonymised or aggregated for data privacy.

This 'time of actual use' data provides much better information with respect to the actual consumption behaviour of each customer. This opens up many opportunities for Suppliers to provide new and innovative time of use tariffs for customers. Ultimately customers should be able to take advantage of cheaper electricity at times of the day where supply is high and demand is low.

The installation of Smart Meters will allow WPD to gain much greater visibility of the operational state of the Low Voltage (LV) network compared to our current limited view. The LV system was designed to work passively with a level of spare capacity and inherent robustness. Our network planning is undertaken using established traditional operational assumptions. However these assumptions are now being challenged with the introduction of low carbon technologies such as heat pumps, home batteries and electric vehicles. These technologies have the potential to significantly increase the loading on parts of the LV network. In addition greater amounts of distributed generation need voltage regulation and management of two way power flows.

By taking information aggregated at the LV feeder level we will be able to see actual LV network demands over each half hour. These can be used to make informed decisions as to the availability of capacity and the ability to connect new load or generation. Our Smart Meter Data Privacy Plan has been approved by Ofgem on this basis, so that we minimise the amount of low level customer meter readings that we need to store.

The additional functionality and information available from Smart Metering therefore represents a significant opportunity for us to meet these challenges. We will be able to make use of the monitoring functionality embedded in each meter to increase understanding of the network and improve our service to customers in existing activities, while looking to more effectively facilitate the low carbon transition.

This opportunity however comes with its own set of challenges. In order to meet the mass rollout requirements within the required timescales the Suppliers need to undertake an accelerated meter installation programme.

This is approximately four times quicker than the current meter replacement and recertification program. In turn this is likely to result in an increase in associated WPD visits to properties in order to deal with issues associated with our equipment at customers' premises.

To ensure the data from Smart Meters can be used effectively, additional IT systems have been developed.

These include systems to interface with new and amended industry processes, along with connectivity models and data storage to allow network data to be collated and evaluated.

2. Smart Meter Horizon

The Smart Meter programme has the potential to provide data to enhance existing core business activities such as fault management, network planning and asset management. There are also potential benefits which can lead to future applications that will help the deployment of low carbon technologies and move to actively managed networks. With many of these applications, the benefits increase as the density of Smart Meters on the system increases.

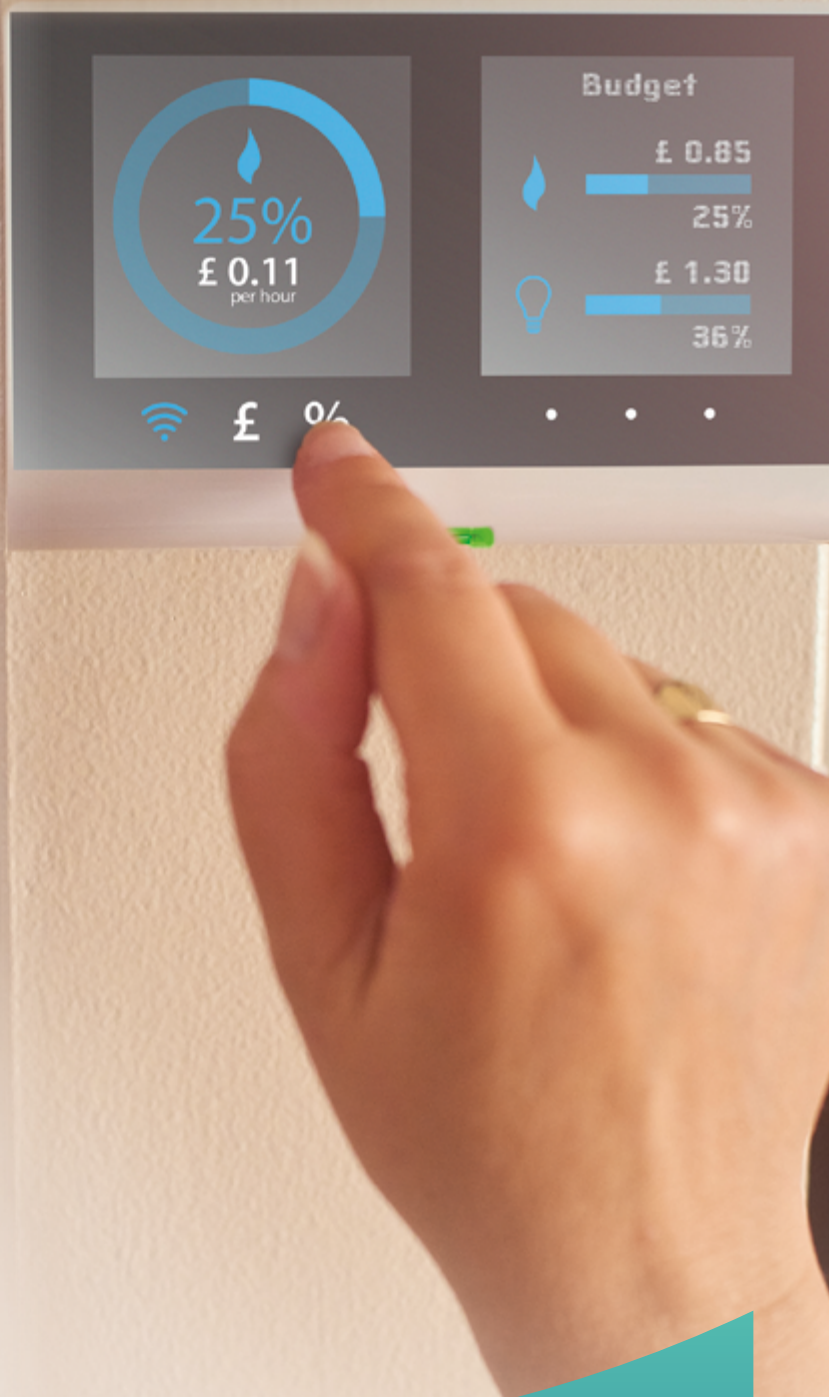
Whilst suppliers have been installing Smart Meters in the WPD network, most installed before 2019 were SMETS1 meters. These had limited functionality compared to newer SMETS2+ devices and until recently were not compatible with the DCC's national infrastructure. As such very little Smart Metering data has been received and consequently only minimal benefit has been realised to date. Some data is now being received from these meters as they become enrolled in the DCC systems.

This will continue to be the case until large volumes of SMETS2+ Smart Meters are installed and usable data becomes accessible from enrolled SMETS1 devices.

The deployment of SMETS2+ devices has increased steadily since Q3 2018 with WPD connecting to around 2,500 meters per day. The migration of SMETS1 devices has also commenced and we are seeing these volumes grow and expect a significant increase in these volumes in the next 12 – 18 months. WPD continues to lead the way with in excess of 772,000 electricity units installed within the four licence areas as Q1 2020. The installation of SMETS2+ meters will however need to increase rapidly if WPD is to begin realising benefits before the end of the rollout.

To take full advantage of the benefits we have established compliant interfaces with the DCC and established data storage systems.

The benefits from Smart Metering can broadly be split into two categories; existing business functions and future applications. From an existing business function perspective there are a number of benefits relating to fault management and capital investment. Future applications include functions relating to active network management and demand response.



WPD continues to lead the way with in excess of 772,000 electricity units installed within the four licence areas as Q1 2020.

3. Benefits Realisation

3.1 Overview

Smart Meter data will help us understand the real time operation of our network, especially at the low voltage level. Some of the data we get from Smart Meters can be used directly but some data, such as individual property load data, will be aggregated an anonymised before we can use it. Smart Meters also provide alerts which can be used to understand when a customer has lost supply or when the network is operating near limits.

3.2 Smart Meter Alerts

Smart Meters can provide alerts related to voltage excursions and loss of supply. We already have systems in place to interrogate loss of supply (AD1) alerts and pass relevant ones through to our local teams for action.

The benefits in this area can be summarised as the ability for us to understand the nature of a loss of supply, either a single customer or multiple customers, by using data from multiple Smart Meters. A secondary benefit which we have seen since acting on these alerts is that we are also aware when a third party might have inadvertently disconnected the supply or operated our equipment. In these cases we can offer safety advice.

Voltage excursions investigation is one of the projects that we plan to deliver this year. We will develop trigger points to turn voltage alerts into information that can pinpoint voltage abnormalities to teams.

3.3 Smart Meter Voltage Data

Voltage data can be used to understand how our network is operating. Data at the near or far ends of a network is especially useful as it can show trends in the demand or generation loadings of the network. For example, a high voltage at the end of a network can indicate high levels of embedded generation. Conversely low voltage can indicate a high level of load.

We can use this data as an early warning triage of our network. Substations with predominantly high or low volts over a long period of time can be identified and substation level monitoring can be installed.

3.4 Smart Meter Current Data

Current data is directly related to the quantity of energy being used by the customer. As such it is personal data and we do not have access to it in a raw form. Our Data Privacy Plan includes details of our systems which will interrogate this data and merge it, with other customer data, to provide an anonymised energy profile at substation cable level.

3.5 Benefits Realisation Timescales

The timescales for realisation of benefits vary depending on the nature of the Smart Meter data. Where a single point of data from a single meter can provide a benefit, this can be realised relatively early into the roll out period. Where a benefit requires us to aggregate data across a range of meters to provide an output, this benefit will only develop as the deployment of Smart Meters increases.

We are already making use of Smart Meter alerts relating to loss of supply. As more meters are deployed the benefit of this will grow, with the alerts being used to understand the scope of an interruption at an earlier stage.

Where a range of meters are required to provide an output, such as for load profiling, we have planned around a 80% penetration of Smart Meters as being the minimum deployment required. As the rollout develops and we see more meters on our network, we will review this figure. Our substation monitoring project will help develop the new figure and level of benefit.

The higher than expected level of SMETS1 meters seen on our network will impact on the benefits that can be achieved. Even after enrolment into the DCC systems, these meters will only provide limited data and will not contribute to any demand profiling outputs.

We do not have enough Smart Meters on our network to meet the 80% deployment required for profiling tasks. As more meters are installed and older meters are migrated this benefit will become closer to realisation. Our assumption is that the level of penetration required will only be achieved later in the Smart Meter roll out.

4. Current Projects

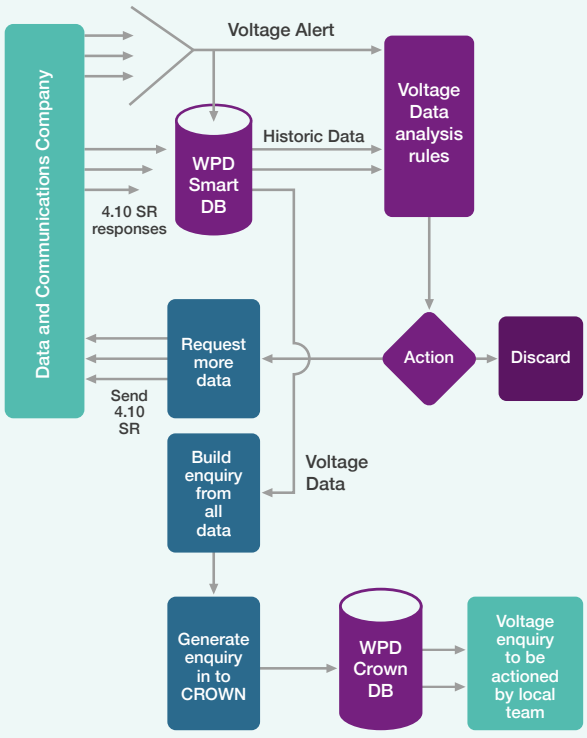
This section lists our current projects. They provide the basis for systems which can then be delivered into Business as Usual as enduring solutions for our teams. They fit into two main areas. We are expecting to exploit Smart Meter data to improve our modelling and network assumptions, for the benefit of all customers. We are also expecting to respond to as many specific meter alerts as we can to improve our customer service for individual customers.

4.1 Smart Meter Alert Handling - Voltage Alerts

Currently WPD receive around 500 "voltage complaint" enquiries each year directly from customers, the vast majority of which are actually within tolerances once investigated. The existing method to investigating the enquiry is a time consuming and labour intensive process which frequently results in the voltage being within standard parameters.

The functionality of DCC enrolled SMETS1 and SMETS2+ meters will allow us to complete more desktop analysis in the future. However, the steady increase of enrolled devices on the WPD network may prompt more automatic voltage alerts.

We are developing processes to facilitate reacting to voltage alerts once received from the DCC.



4.1.1 Planned Process

The SMETS1 and SMETS2+ enrolled devices can send alerts when over or under voltage thresholds have been exceeded. We are creating systems that evaluate the type of voltage alert and interrogate the alert to identify actual voltage level, time of alerts and recurrence or frequency of alerts.

Once this data has been analysed, triggers will be implemented to filter alerts depending on occurrence rate and time. Analysis of the network will then be undertaken to identify other enrolled devices on the same feeder.

When the analysis is complete and rules have been met, a "voltage complaint" enquiry will be raised within the database. This will be passed to the local network services team to investigate prior to contacting the customers in the locality. At this stage the enquiry follows the current well proven Business as Usual systems for investigation and remedy.

A process chart for the system is shown opposite.

4.1.2 Timescale

The work on this process has been delayed due to increased volumes of AD1 alerts and the enhanced filtering required by the business. Also systems are updated and implemented in line with DCC R3.0 and the Enrolment and Adoption programme.

The logic rules for voltage complaint analysis have already been written. We can now start to apply them as the work for DCC R3.0 is also complete.

A selection of local teams will be appointed to test the output from the rules using alert data received. They will review the quality of output data and report back on the effectiveness.

Process changes as required will be made once testing is completed. Procedures for the roll out as BAU will be written once testing is complete and the system will become live during 2020.

4. Current Projects

4.2 Reinforcement Planning – LCT Detection

LCT Detection is a project which uses meter reading data to identify Low Carbon Technologies (LCTs) such as solar panels, electric vehicles and heat pumps. As a first step towards analysing Smart Meter data we have investigated the options to use meter readings and other data that is carried over Electralink's data transfer network together with Elexon data to provide some signposts to changes of demand and use on our networks.

The project has already investigated changes in consumption and usage at an individual customer level. Where consumption increases significantly it will potentially indicate a property with either an electric vehicle or a heat pump recently added. A reduction in consumption could indicate that small scale generation has been added to the property. We have developed a Proof of Concept and are now validating the results as a part of our Virtual Monitoring project.

4.2.1 Timescale and Progress

The evaluation project was completed in 2019 and approximately 15,000 LCT installations were identified throughout the WPD footprint mainly using consumption data.

Validation now continues through the Virtual Monitoring project.

4.3 Reinforcement Planning – Virtual Monitoring "VM Data"

The 'VM Data' project will deliver a Virtual Monitoring (VM) capability on WPD's network. This will reduce need for physical monitoring, avoiding the costs associated with physical monitoring and transformer replacement; supporting better phase balancing on the network.

An operational LCT detection model will be created to fill in the visibility gaps for electric vehicles and other LCTs on the DNO's network, using insights and learning from the LCT Detection project. The modelling will use existing data to advance WPD's understanding of LCT locations.

4.3.1 Timescale and Progress

Validation of the LCT Detection model is underway with on-site checks being made for predicted LCT usage. This will be completed by June 2020.

The more dynamic VM Data elements, which will provide profiles and assumed data for our distribution substations, are due for completion in autumn 2020.

4.4 Reinforcement Planning – Smart Meter Profiles

The penetration of Smart Meters will affect the accuracy of energy profiles that we can derive at substation feeder level. The greater number of Smart Meters which supply data to our modelling systems will improve accuracy. All previous benefits assumptions have used an 80% penetration level as the requirement to gain quality information. We are testing this assumption with real substations and real Smart Meter data, taking advantage of the output that our Data Privacy Plan will allow.

We have selected five distribution substations across our network with different levels of Smart Meter penetration from 100% down to 60% on individual low voltage cables and feeders. We have fitted monitoring equipment at the substations and will collect three months of live data from them. We will then compare the profiles recorded with ones which we can interpret from available Smart Meter data.

4.4.1 Timescale and Progress

Substation monitoring equipment was fitted in March 2020. At the same time we commenced the extraction of Smart Meter profile data. In June 2020 we will collect on-site measured data and compare it to the Smart Meter profiles we generate.

5. Projects delivered as Business as Usual

5.1 Outage Alerts – Last Gasp from Meter

WPD already uses a High Volume Call Taker (HVCT) system to provide automated messaging and logging for customers who experience a loss of supply. The last gasp functionality of the SMETS2+ metering systems will allow us to receive loss of supply alerts directly from an affected premise into our High Volume Call Taker.

This functionality and application has been live in our systems from day one of going live with communicating with the DCC. We receive and react to Power Outage Alerts that we receive into our systems. Since WPD started receiving Power Outage Alerts from SMETS2+ Smart Metering systems there have been several challenges, particularly relating to spurious alerts. This is when we receive a Power Outage Alert but it is not due to a fault on our network.

As a result of these challenges, considerable resource and time has been spent adapting our systems to accommodate unexpected behaviour.

Consequently our current process is as follows:

- AD1 Alert Received.
- A check is performed to see if we have received the install alert (N16) on the same day.
- If we have received the N16 the AD1 is not actioned further.
- If no N16 received our system automatically sends a SRV 7.4 (Read Supply Status) message to the meter.
- If there is a successful response the AD1 is not actioned further.
- If there is no successful response this system will hold the alert and then retry sending the SRV 7.4 message to the meter.
- If there is a successful response the AD1 is not actioned further.
- If there is no successful response then the message is passed through to our Dispatch Teams who will investigate further, deploying staff if required.

Snapshot of performance – January 2020

Alerts Received from the DCC system	**36,983**
Filtered out automatically by our smart system	**24,694**
Sent to our HVCT system	**11,589**
Filtered out by HVCT - Cross referenced to known incidents	**10,180**
Sent to WPD Dispatch teams for further investigation	**1,409**

As WPD act on AD1s received, ongoing process improvements are adapted as required and the system is a top priority. The main cause of the spurious AD1 alerts is when engineers are pulling the fuse whilst on site, electrical contractors undertaking work at the property and Over The Air (OTA) firmware upgrades that are sent to some electricity meters by suppliers.

WPD are working closely with the DCC to investigate both Power Outage Alerts and Power Restoration Alerts to fully understand the behaviours of each meter type in both an outage scenario and on an OTA upgrade. With the ongoing work and trials being undertaken between all parties involved with power outage alerts, improvements in reliability and credibility are hoping to give teams more trust in the system that the alerts are genuine.

WPD will continue to monitor and update our systems as necessary following feedback from the teams involved to continually improve efficiency of outage and restoration alerts.

6 Completed Projects

We have been working to create systems to accept Smart Meter data throughout our current RIIO-ED1 distribution price control period (2015-2023) and will continue developing and refining our solutions in the subsequent ED2 period up to 2028. This work continues and most of the foundations that we require are now in place. Most notably, WPD was the first company to obtain approval for a Data Privacy Plan to access customer data from meters.

6.1 Data Privacy Plan

Following discussions involving Ofgem, BEIS, Citizen's Advice and the ICO, Ofgem have approved our Smart Meter Data Privacy Plan for accessing household electricity Smart Metering consumption data.

The plan approval allows WPD to collect and process half hourly domestic Smart Meter consumption data. As the number of DCC enrolled meters increases this data will become more useful to us.

6.2 Request and Response Handler

The Request and Response Handler project created the link between WPD systems and the DCC enrolled Smart Meters. This system allows communications relating to DCC enrolled devices to be sent and received. It also automatically sends commands when a DCC enrolled meter is installed to configure the device. The initial build is complete and is being used as BAU to pass data to/from Smart Meters into our systems.

However this is being frequently adapted as required to ensure an efficient and responsive system.

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