

TBDG Design Note

Document Title:	Reactive Install and Leave
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Purpose of Paper*	FOR INFORMATION	FOR COMMENT	FOR DECISION
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Summary of Document Purpose	To provide clarification on the installation and operation of smart meters when there is expectation of DCC WAN coverage on installation, but no DCC WAN coverage at installation (“reactive install and leave”)		
Submitted By	Peter Morgan, BEIS	Meeting Date	17/08/2016
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*Delete as appropriate

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1. Introduction

1.1 Summary of action required from TBDG

1. TBDG is invited to note this paper and that no changes are required to existing baseline documents (SMETS, CHTS, DUIS, etc) or the drafting of SEC.

1.2 Identification of the issue

2. This Design Note describes how features of the smart metering solution may be used when the communications hub is unable to access the DCC's WAN where the WAN Checker has indicated that there should be WAN coverage at the installation location at the time of installation – "reactive install and leave". The issues addressed are:
 - How will suppliers be able to determine WAN availability?
 - What can suppliers do if there is no WAN availability at installation?
 - Treatment of specific activities with 'no WAN':
 - Meter reading
 - Change of Tenancy
 - Change of Supplier
 - Prepayment
 - ALCS/HCALCS
 - Outage reporting
 - Tariff updates

2. Background and Context

3. Smart meters are designed to be operated in conjunction with a WAN service which will transfer information between equipment in the home and DCC, for onward communication with DCC Users (suppliers, network operators and other users).
4. The DCC's WAN service will be provided by the Communication Service Providers (CSPs). The service covers communications from DCC to the location of electricity meters where a CSP-supplied comms hub will be installed. The initial CSP contracts include commitments in relation to:
 - WAN coverage: CSPs are required to provide coverage to a Committed Coverage Level (CCL) by end-2020 (CCL for Arqiva is 99.75% and for Telefonica is 99.5%), to CCL less 1.5% by end-2016 and to 80% of CCL at DCC Live
 - Installation: the contracts set performance measures for first-time install and successful installation after defined periods. For Arqiva these measures are 80% for first-time install, 90% within 30 days and 99% within 90 days. For Telefonica the measures are 90% first-time install and 99% within 90 days
 - Service availability: connectivity must be maintained to 99.9% of successfully installed comms hubs. There are additional performance measures associated with comms hubs where connectivity has been lost for more than 10 days

5. This Design Note does not cover 'never WAN' situations (which describes those premises where there is no expectation of DCC WAN by 2020) or situations where there is no expectation of WAN at installation but there is by 2020 ("proactive install and leave"). As of March 2016 these are still areas of policy development and design notes to reflect these areas (once policy is fixed) may be requested through TBDG or SECAS.
6. Other regulatory changes arising from the July 2015 "Install and Leave" consultation response are not considered and of scope of this note and it has been assumed that the regulatory changes (changes to the Operational Licence Condition and SMICOP) required to facilitate "Reactive Install and Leave" are in place. In addition this paper assumes that DCC will change its systems to send an alert to the current (as well as the previous) supplier when WAN connectivity has been established (a change request will need to be raised). This will require a SEC Party to raise a change request.
7. This Design Note also assumes familiarity with existing obligations and industry processes associated with change of supplier (eg existing supplier obligations with respect to industry data flows; effective switching licence obligations, data protection obligations. It is up to suppliers how they discharge these obligations).

3. Smart Metering Design Approach

3.1 Determining WAN availability

The DCC provides a WAN checker that informs users of the availability of WAN at a given location. It is accessible via either the Self Service Interface (SSI) or through a Service Request through the DCC User Interface (DUIS). Users may search for WAN coverage at property locations by either the Unique Property Registration Number (UPRN) or by full or partial post code with or without house name/number. Results returned include:

- CSP (the CSP responsible for this location/area)
 - Postcode
 - Property name/number (where appropriate)
 - Coverage availability (Yes or No)
 - Anticipated coverage date (if coverage availability was No), or "No Coverage Intended"
 - Likelihood of connectivity
 - Communications Hub WAN Variant to be used (for example Cellular or MESH)
 - Auxiliary equipment required (for example Antenna)
 - Additional information
8. When an installer is on site he/she may be able to determine the WAN availability if they have access to a "WAN checker". This is usually some form of hand-held signal detector, calibrated to record whether an adequate WAN signal is available. The installer may also be able to determine from the LEDs on the comms hub whether it has established a successful connection to the WAN.
 9. Suppliers are free to determine their own roll-out plans, including whether to abort a particular installation or whether to install. However suppliers should note that CSPs' obligations to

resolve first-time install incidents within 90 days only cover comms hubs which are installed and powered in a customer premises.

10. Suppliers can update DCC inventory for the comms hub and meter status, and assign an MPxN to a meter, using SR8.4¹. In install and leave situations the status can be set to “Installed Not Commissioned” (noting that this status for meters is intended for situations where a HAN has been established). If a supplier subsequently interrogates the DCC inventory for a given MPxN it can infer that a comms hub with an “Installed Not Commissioned” status is indicative of an install and leave situation. Interrogation of the DCC inventory for a meter in a known Install and Leave no WAN situation may yield one of the following statuses (the status of Suspended has been omitted) plus potential conclusions that may be drawn:

- Installed Not Commissioned – meter has been installed, meter is associated with an MPxN on DCC systems, potential uncertainty as to whether HAN has been established (there are two possibilities: (1) supplier has manually set the status; or (2) whitelist response and updated CHF device log have been returned using an HHT)
- Whitelisted – meter has been installed, supplier has sent command to whitelist meter to comms hub, response has been received by DCC, high degree of certainty that HAN has been established, meter is associated with an MPxN on DCC systems
- Pending – meter has been pre-notified by supplier, meter should not have been installed, HAN connectivity not established

3.2 No WAN at installation

11. In normal (DCC WAN present) circumstances the commissioning of devices into DCC will be completed by processing commands and responses transported over the WAN. The following steps may be performed²:

- Step 1: Communications hubs and meters are installed and powered up
- Step 2: the Communications Hub establishes connectivity with the DCC and is marked in the Smart Metering Inventory (SMI) as “Commissioned”
- Step 3: the Supplier sends Service Requests such that devices to form the Smart Metering System (and so exist on the Comms Hub’s HAN - the minimum being either an ESME or GSME) are added to the device log of the Comms Hub and subsequently joined to the HAN – these devices are then marked in the SMI as “Whitelisted”, and on receipt of the CHF device log backup, “Installed not Commissioned”
- Step 4: ESME’s and GSME’s send alerts back to the Supplier indicating that they are ready to be commissioned
- Step 5: the Supplier sends Service Requests to set the time on the ESME and/or GSME and so sets the SMI status to “Commissioned”

¹ As described in DUIS Version: 0.8.2.1 Dated: 27th May 2016

² Further detail may be found in the Install and Commission Design Note

- Step 6: Other devices are joined to the relevant meter and where a type 1 device are marked as “Commissioned” in the SMI
12. For reactive install and leave situations suppliers will need to develop business processes which recognise that ‘no WAN’ conditions may be detected at various stages of planning and installation. Regardless of when the possibility or actuality of a ‘no WAN’ situation is determined, suppliers may choose to:
- Postpone or abort the installation and re-schedule recognising that the obligation on DCC to provide WAN coverage within 90 days only commences where a Comms Hub has been installed in the premises and is powered on
 - Proceed to install the equipment and the HAN, leaving the installation in a state where it can be connected to the DCC as soon as the WAN becomes available at that site
 - Proceed to install the equipment without establishing the HAN, noting that this approach may require a revisit in order to establish the HAN
13. Smart meters will meet suppliers’ roll-out licence condition³ (provided they are SMETS-compliant) provided that they have been installed at a site.
14. Suppliers will need to raise an incident via SR 8.14.2 for instances where they install and leave – this Service Request initiates the 90 day SLA for DCC to provide WAN coverage to that site.

Install and leave smart (Han Established)

15. In no-WAN scenarios it will not be possible to commission smart metering systems using commands transported over the WAN. One option – either if the lack of WAN is known in advance or only detected during the install process – will be to ‘install and leave smart’. This will result in the HAN being established (i.e. allowing data to be exchanged between devices, for example from meter to IHD) without WAN communications. ‘Install and leave smart’ can be achieved using the relevant DCC Service Requests delivered using an HHT. This can be done offsite (equipment is powered up in back office facility, paired, powered down, transported to consumer premises, installed and powered up) or onsite (in consumer premises).
16. In the onsite scenario the installer will install the meters and comms hub in the consumer premises and on powering-up the comms hub no WAN connection is achieved. The comms hub will initiate HAN communications but cannot join other devices to the HAN until their device IDs have been added to the comms hub ‘whitelist’. This can be performed by:
- joining a HHT to the comms hub using the InterPAN process detailed in GBCS
 - transferring relevant pairing and configuration commands from the HHT to the devices. These commands would need to have been prepared and downloaded to the HHT by the supplier using relevant DCC SRs⁴
 - transferring the responses to the commands (stored on the HHT) back into DCC

³ See Electricity Supply Licence Condition 39 and Gas Supply Licence Condition 33

⁴ It should be noted that all HAN-format commands can be carried to site using a HHT with the exception of firmware updates.

17. In the offsite scenario⁵ the initial steps are the same as for onsite. The devices are then powered down, taken to the consumer premises and installed. SMETS devices are designed to restore their settings and HAN connections after a power interruption and so when they are installed and powered up they will re-establish the connections and configurations that were programmed offsite. The offsite approach does have the limitation that if any of the pre-configured devices fails to power-up successfully on-site, it cannot be replaced by another taken from the installer's van stock.
18. Where the response to SR8.11 has reached DCC (via SR8.13 Return Local Command Response, used to unload an HHT) the device status will be marked in DCC Inventory as: "Whitelisted" if only the response to the SR to whitelist is returned; or "Installed not Commissioned" if in addition the CHF device log is returned. Where the response has not reached DCC and the supplier has not notified DCC that the meter has been installed, the device status will remain as "Pending".
19. In the 'install and leave smart' scenarios the consumer will benefit from some smart functionality in that they will be able to monitor their consumption in both kWh and £p on an IHD. However, it will not be possible to modify the configuration parameters (e.g. tariff) without returning to the property with a HHT (see below). Furthermore meter readings will not be retrieved electronically and bills will continue to be determined using estimated or manual meter readings (including 'customer own reads'). Critical Responses and critical Alerts generated by meters will be buffered in the communications hubs as per CHTS section 4.4.4.

Install and leave dumb (HAN not established)

20. A further option available to suppliers is to physically install the meters, comms hub and other devices but not form the HAN or configure the devices: this is referred to as 'install and leave dumb'. In this scenario the consumer will not have any smart functionality other than that available through the display on the meter (e.g. consumption in kWh). Again the supplier will be responsible for informing the DCC that the devices have been "installed not commissioned".
21. A second site visit will be required to establish HAN connectivity and dispense SMICOP obligations (which could be undertaken when WAN is established or before) noting that this could be undertaken by someone other than a meter installer (as no further meter installation should be required).

3.3 Implications of losing WAN service

22. A no-WAN situation can also arise after a smart metering system has been successfully installed and commissioned. The smart metering system may subsequently lose WAN service for a variety of reasons – for example:
 - Environmental changes such as installation of foil-backed insulation, a metal box next to the comms hub, or surrounding the building in scaffolding

⁵ It should be noted that CHISM Section 3 Pre-installation Procedures state that 'A Party shall take all reasonable steps to prevent any Communications Hub in its possession from establishing a connection to the SM WAN prior to its installation for the purposes of Commissioning the Communications Hub Function'

- Temporary interruption to service due to WAN downtime or a fault at a network node
- Change to signal strength such that continuous connectivity cannot be maintained

23. The CSP contracts require that connectivity is maintained to 99.9% of installed comms hubs. Additional performance measures and contractual incentives apply where connectivity has been lost for more than 10 days. These terms incentivise DCC to maintain a high level of service availability, but do not eliminate the possibility that individual premises will, from time to time, suffer from no-WAN conditions. The following section discusses how users may address specific functions while the WAN service is unavailable.

3.4 Treatment of specific activities with no WAN

24. This section discusses how a number of activities may be addressed in no-WAN situations. The cause of the no-WAN situation may be either 'install and leave' or 'lost WAN'. In all these instances an HHT will be required to change configuration settings on the meter.

Meter reading

25. Suppliers need to retrieve meter readings in order to calculate bills and submit data to settlement. With legacy metering, suppliers have established procedures under which both billing and settlement functions can be performed using estimated readings or 'customer own reads'. Customer accounts and settlement volumes based on estimates are updated when actual readings become available.
26. Suppliers will need to consider how they will collect meter readings for billing and settlement in cases where they are unable to communicate with a smart meter. Their business processes are likely to be tailored to the cause and/or duration of a communications outage, for example:
- Install and leave (smart or dumb): the consumer can be advised that for a period (up to 90 days) there will be no WAN communications to their meters. During this period the customer could be asked to provide 'own reads'; the supplier could take a manual reading; or the supplier could calculate an estimated reading
 - Install and leave smart: given that the HAN is operational, a further option is for the supplier to use a HHT. An HHT can be joined to the HAN⁶ and a service request executed to retrieve data from the billing data log (if the billing calendar was configured when the meter was installed) or to take ad hoc readings from the meter registers
 - Commissioned but WAN service lost: customer or HHT reads could be made as above or – if the WAN outage is known to be temporary – the supplier may decide to raise an estimated bill and wait for the WAN service to be restored
27. HHTs could also be used by Export Suppliers, Network Operators, Supplier Nominated Agents or Other DCC Users to retrieve meter data (subject to role based access control and the customer granting access to the premise and the data, where relevant). Alternatively, in the case of data required by a DCC User for a customer with a long-term no-WAN situation, the DCC User might choose to provide a CAD device to retrieve meter data and then link it to the internet for WAN

⁶ Note that this will require access to the comms hub as it needs to be power cycled in order to initiate the ZigBee Inter-pan which allows an HHT to be joined to the HAN.

communication (this is not possible in the 'install and leave dumb' scenario as the CAD must be joined to the HAN).

Change of Tenancy

28. Suppliers will need to consider their obligations under the Data Protection Act in respect of personal data held on the meter taking into account factors such as:

- Accessibility of any personal data over the HAN;
- Accessibility of any personal data over the meter user interface (noting, for example, that prices on the meter may not have applied to the previous or current tenant);
- Accessibility of any personal data on above minimum specification IHDs (eg an IHD with internal storage of 13 months half hourly data); and
- Permission from previous tenant to share data.

Change of Supplier

29. The CoS and Prepayment CoS Design Notes provide a description of the steps that need to be undertaken at CoS, assuming that WAN service is available.

30. For install and leave situations where the meters have not been commissioned there is no requirement to update security credentials, but this will need to be done once DCC WAN is available and the meter is commissioned.

31. If the WAN service is unavailable the operational options available to the gaining supplier are as follows:

- Wait for WAN service to be available: this approach might be preferred if there is an expectation that the service interruption is temporary. In this context 'temporary' could be interpreted as being <31days, that being the number of entries in the Daily Read Log. A meter read is expected to be provided to the losing supplier that is reflective of the Supply Start Date (SSD). Waiting for WAN service to be available is a valid approach for both install and leave (smart or dumb) scenarios and situations where the comms hub was commissioned but has subsequently lost WAN connectivity. If the WAN outage is longer-term the supplier might need to ask for a customer read at SSD⁷
- Visit the premises with an HHT: Where there is HAN connectivity the SR6.23 CoS Update Security Credentials, SR4.6 Retrieve Daily Read Log and configuration commands can all be downloaded to a HHT, carried to site by the gaining supplier and then executed. This will enable the meter to be brought into the same state as would have been the case if the WAN service had been available. To retrieve the CoS opening read from the Daily Read Log, the site visit will need to be performed within 31 days of SSD.

⁷ The gaining supplier will need to collect a read of the billing registers, either by means of a customer read (registers can be displayed on the meter) or by a site visit with a HHT.

32. Suppliers will also need to consider how they communicate with the consumer if the CoS transactions are not processed at SSD, for example:
- The meter will continue to display the name and contact details of the losing supplier
 - The tariff used to calculate financial values will be that left by the losing supplier
 - If a CAD is present and reliant on tariff details, the CAD will also continue to use the losing supplier's tariff until CoS transactions are processed
 - If the meter is in prepayment mode (see below) the losing supplier is the only party able to issue a valid UTRN top-up (until the security credentials are updated by the gaining supplier)
33. In situations where there is HAN connectivity the gaining supplier will need to collect a read of the billing registers either by means of a customer read or via a site visit with a HHT to retrieve data needed by the losing supplier to enable them to determine the final bill and (where applicable) for settlement⁸. Until the security credentials are updated the losing supplier can also configure the meter via a HHT so could load a 'null' tariff or change the supplier contact details (using SR 3.4)..

Prepayment

34. SMETS meters are designed to allow manual input of UTRN top-ups. This requirement was specified to ensure that prepayment customers are not left off-supply in the event of a communications failure, generally where the loss of communications is temporary.
35. Technically the smart metering solution will support no-WAN prepayment top-ups over an indefinite period so long as there is no change of supplier (UTRN generation is tied to supplier security credentials)⁹. However suppliers will need to consider the following before setting a smart meter into prepayment mode where a no-WAN state might exist for a longer period:
- Existing prepayment regulations: Energy Supply licences require that prepayment meters are only installed where "safe and reasonably practicable"
 - Prepayment interface devices (PPMIDs): in the case of an 'install and leave smart' the HAN will be operational thereby allowing a PPMID to be installed and joined to the meter. Installing a PPMID would allow the consumer to invoke emergency credit, manually enter a UTRN top-up and re-enable electricity supply without accessing the meter. A PPMID cannot be installed in the 'install and leave dumb' scenario
 - User interface: SMETS does not prescribe any particular design of user interface and suppliers will need to consider how practicable it is to enter 20 digit UTRNs on the meter for a given set of consumer/ premises circumstances
 - Balance reconciliation: suppliers have stated that they expect to perform off-line reconciliation of prepayment balances and adjust the Meter Balance as required. Without

⁸ For gas the gaining supplier must submit an opening read for settlement but the losing supplier is not obliged to submit a closing read (although may raise a dispute)

⁹ The gaining and losing supplier can enter an agreement whereby the losing supplier continues to supply UTRNs to the gaining supplier.

a WAN connection this can only be performed by downloading the balance adjustment to a HHT and making a site visit (this does not work for 'install and leave dumb')

- Configuration updates: similarly any other required changes to prepayment parameters (tariff, debt recovery, emergency recovery, etc.) can only be applied through the use of a HHT (which will not be possible for 'install and leave dumb' where alternatives such as configuring settings at manufacture would need to be considered)

36. At CoS the losing supplier can consider whether it needs to access the Prepayment Daily Read Log which includes data items such as Meter Balance, Emergency Credit Balance and Debt Balances. It is assumed that suppliers will be able to access data on top-ups and debt recovery from their back office systems but, if the WAN has been unavailable, the supplier may be unable to determine whether Emergency Credit has been invoked. Please also refer to the PPM CoS Design Note on the SECAS website.

ALCS / HCALCS

37. Auxiliary Load Control Switches (either integral to an electricity meter – ALCS – or connected via the HAN – HCALCS) are used to switch specific circuits within a premise, typically for space or water heating, often linked to multi-rate tariffs (e.g. Economy 7). ALCS¹⁰ may either be switched according to a regular programme set by a calendar configured in the meter or in response to ad hoc commands sent by the supplier via DCC and the WAN.

38. In a no-WAN situation it will not be possible to update the calendar or issue ad hoc commands to an ALCS unless a command is carried to site using a HHT and executed (which requires the HAN to be operational).

39. If a supplier issued an SR7.5 Activate Auxiliary Load service request prior to WAN availability being lost there is a risk that, in no-WAN conditions, an SR7.6 Deactivate Auxiliary Load instruction would not be executed. For this reason, the Activate Auxiliary Load service request includes a duration parameter. If a Deactivate request is not received within the specified duration, the ALCS will deactivate automatically.

40. In an 'install and leave' situation with an ALCS the options available to suppliers are as follows:

- 'Install and leave dumb': the only option is to preconfigure (i.e. prior to installation) a variant electricity meter with internal ALCS such that its switching calendar – and all other relevant parameters, including tariff – are set to operate in the manner that is agreed with the customer. If the smart installation is replacing an Economy 7 'white meter' and a Teleswitch, this might involve setting a two rate tariff and a calendar with a 7 hour period during which the heating load is switched on. The configuration will need to include the randomised offset parameter. Consideration will need to be given to the accuracy of time and the type of tariff offered to the consumer during the period where there is no DCC WAN.

¹⁰ The term ALCS is used to refer to both internal ALCS within a meter or HCALCS unless specific differences are identified.

- ‘Install and leave smart’: suppliers can install either a variant meter with internal ALCS or a standard SMETS electricity meter with HCALCS and use commands downloaded via a HHT to configure the ALCS calendar and other configuration parameters. Consideration will need to be given to the accuracy of time and the type of tariff offered to the consumer during the period where there is no DCC WAN.
41. Boost buttons – which are an option for the meter – can be operated with an internal ALCS or, if the HAN is operational, with an HCALCS.
 42. Where there is HAN connectivity, if WAN service is lost after install, the supplier can modify ALCS settings using an HHT.
 43. There is a risk of clock drift where over time the clock in the meter diverges from actual time. The extent of clock drift will depend on its accuracy but meter manufacturers have indicated that drift should be less than 10 seconds per month and this can be checked with the manufacturer for a given meter model type. In normal operation (WAN available), the meter will synchronise its clock once a day with the comms hub, which accesses accurate UTC time from the WAN network. If the adjustment is over 10 seconds an alert is sent to the supplier. The implications of clock drift become more significant the longer the WAN is unavailable. However this situation is similar to legacy arrangements where clock-switched loads and multi-rate meters are reliant on visual checks and manual adjustments to their internal clocks.

Outage reporting

44. In a no-WAN situation, power outage (and restore) alerts will not be sent to DCC for onward transmission to suppliers and network operators. Alerts triggered during a no-WAN period¹¹ will be held on the comms hub until WAN service is re-established¹². At this point alerts will be transferred to DCC for onward transmission to suppliers and network operators. It should also be noted that power outage alerts will be generated each time that an installer power cycles a comms hub, for example to initiate the joining of a HHT to the HAN via the ZigBee Interpan. Where the comms hub has been power cycled (but power to the meter has not been interrupted) there will not be a matched ‘power restore’ for every ‘power outage’ alert.
45. In no-WAN situations where a HHT has been used (and the comms hub has been power cycled), network operators will receive ‘false’ power outage alerts when the WAN service is restored. Suppliers and network operators will need to develop processes to validate alerts, possibly involving:
 - Comparison of the time stamp on the alert with current time to identify delayed alerts which might have arisen because WAN service was unavailable at the time of the power outage

¹¹ Note this applies to all alerts not just power outage alerts: for example tamper detection, billing reads, voltage alerts.

¹² Alerts may also be transferred to DCC by connecting a HHT to the HAN and then transmitting the alerts to DCC once they have been downloaded from the HHT.

- Retrieving entries from the device log to determine whether there was a power outage to the electricity meter (SR6.13 Read Event Log)
- Reviewing the DCC's incident log to determine whether there were known WAN issues that might have affected the relevant comms hub

Tariff updates

46. In normal operations suppliers will update tariffs on meters by sending SR 1.1 Update Import Tariff or SR1.2 Update Price for either immediate or future-dated execution. The tariff update, generally accompanied by an update to prices, will be used in calculating the value of energy consumed, as displayed on the meter and the IHD. In the case of meters in prepay mode, the tariff and price will be used to calculate the Meter Balance which, when it passes set thresholds, will cause the energy supply to be disabled.
47. Where there is HAN connectivity, in a no-WAN situation the tariff and price parameters may be updated by use of a HHT. Without such an update, consumers will receive inaccurate information about the value of the energy they are consuming. If the no-WAN situation is longer-term suppliers will need to consider whether to load tariff information onto the meter (or to leave these parameters null) and how to communicate this to the customer.
48. Consideration will need to be given to the accuracy of time and the type of tariff offered to the consumer during the period where there is no DCC WAN.