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PRODUCT REQUIREMENTS FOR
SMART METERING SYSTEMS
PART 5: IN-HOME DISPLAY

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PRODUCT REQUIREMENTS FOR SMART METERING SYSTEMS - PART 5: IN-HOME DISPLAY

INTRODUCTION

This document describes the British Gas smart meter system requirements for phase 3 of the smart metering trial using information captured from various sources including discussions with some manufacturers and phases 1 and 2 of the trial. This document is expected to change as phase 3 of the trial progresses. This document concentrates on requirements for the in-home display unit.

This document is part of a series of specifications as follows:

- Part 1: General System Architecture;
- Part 2: Gas meter;
- Part 3: Electricity meter;
- Part 4: Telecommunications hub;
- Part 5: In-home display (this document).

This document should be read in conjunction with all other documents in this series and shall be read in conjunction with Part 1: General System Architecture.

1. SCOPE

- 1.1 This document defines the minimum British Gas technical requirements for in-home display (IHD) units used in conjunction with other elements of a smart metering system.
- 1.2 An in-home display unit is a device that displays information relating to the smart metering system. Examples of such information include energy consumption, energy usage patterns and messages from the supplier. It is also a convenient means by which consumers can interact with the smart metering system; e.g., pre-payment/PAYG operations. It is intended to be positioned remotely from other smart metering components; e.g., in a kitchen or hall.

2. REFERENCES

- 2.1 This suite of documents makes references to the documents listed in Appendix A of Part 1: General System Architecture. Unless otherwise specified, the latest edition of the documents applies, including all amendments.

3. DEFINITIONS

- 3.1 The requirements and definitions applying to this document are listed in Appendix B of Part 1: General System Architecture.

4. DESIGN AND MATERIALS

- 4.1 The IHD should meet the basic requirements of BS EN 60950-1 Information technology equipment — Safety —Part 1: General requirements or equivalent Standard.

Note 1: There may be no specific construction Standards that are directly applicable to IHD as they are technologically a recent development.

- 4.2 The IHD shall be suitable for use within a domestic environment.

5. SAFETY

5.1 General requirements

- 5.1.1 Components shall be designed so as not to present a hazard to any person including the installer and the consumer. There shall be no sharp edges, points or gaps that may cause injury during installation, maintenance or normal day to day operation by the consumer.
- 5.1.2 The IHD shall have all parts and connectors that may rise to above 50V relative to earth, insulated and protected such as to prevent inadvertent contact by the installer or consumer.

6. ENVIRONMENT

- 6.1 This section imposes additional requirements to those described in Part 1: General System Architecture: Environment.

6.2 Temperature and humidity

- 6.2.1 The IHD shall be designed to operate within the temperature range -25 °C and +55 °C.

6.3 Ingress protection

- 6.3.1 The IHD shall be so constructed to provide the degree of protection, as a minimum, of IP52 in accordance with BS EN 60529.

7. POWER SUPPLY AND BATTERY

7.1 Mains power

- 7.1.1 The IHD shall be powered from the mains via a mains plug.
- 7.1.2 The IHD should include alternative power inputs, e.g. (mini-)USB ports (for power only).
- 7.1.3 The IHD shall operate at low voltage with an external transformer built into the plug.

7.2 Re-chargeable Back-up batteries

- 7.2.1 The IHD shall include optional battery power as backup to enable operation when mains power is unavailable for up to 72 hours.
- 7.2.2 The IHD shall provide a battery life indicator and a warning message when 10% life is remaining in the batteries.
- 7.2.3 Back-up batteries should be rechargeable and should have a service life equal to that of the IHD or be replaceable.

- 7.2.4 For replaceable batteries, reverse polarity protection from incorrect battery insertion shall be included.
- 7.2.5 Back-up batteries shall be leak resistant.
- 7.2.6 Batteries shall be integral and exchangeable safely without access to any other part of the IHD

8. FUNCTIONALITY

- 8.1 The IHD shall be capable of communicating with the communication hub via the HAN. Where applicable, it should also be capable of communicating directly with the gas meter and electricity meter.

Note: Due to the battery considerations of gas meters, it is unlikely that the IHD will communicate directly with a gas meter; it is expected that the comms hub will act as a temporary store of gas meter data. This restriction will not apply to the electricity meter and thus direct communication is a possibility.

- 8.2 The IHD shall receive and display messages from the head-end system and return Y/N responses and/or clear messages as required.
- 8.3 The IHD should be capable of responding in real time to remote commands.
- 8.4 The IHD shall perform all its communications within the HAN using secure, encrypted protocols; see also Part 1: General System Architecture: Security.
- 8.5 Vend Codes can be entered via the IHD when the meter is operating in prepayment/PAYG mode.
- 8.6 The IHD shall display any exception messages from the smart meter system relating to incorrect entry of vend codes when operating in pre-payment/PAYG mode.
- 8.7 A warning message shall be generated by the smart meter system and replicated on the IHD, as appropriate, that there shall be a limited number of further attempts of entering a vend code before the IHD is temporarily locked.
- 8.8 Time periods where the IHD is locked following repeated failed attempts to enter a vend code shall be configurable.
- 8.9 Excessive attempts to try to enter information that is used in conjunction with payment shall generate a tamper alert.
- 8.10 The IHD shall function correctly with one or more (up to 6) meters present in the smart meter system.

Note 1: There exists the possibility that local generation of electricity may utilise a second smart electricity meter.

- 8.11 The IHD shall update its information from the meters as often as is reasonably practicable, but with due consideration of battery life of a gas meter. Notwithstanding this, the updates should be at least every 30 minutes for gas and 5 seconds or fewer for electricity.
- 8.12 Within the restrictions described in clause 8.11, the IHD shall always reproduce the readings and messages on the gas and electricity meters.

- 8.13 The IHD shall generate an audible sound and/or visual message when a configurable percentage of the load limit has been exceeded and it shall be possible for the consumer to mute the sound.

Note Also see Part 3: Electricity meters: Load Management.

- 8.14 The IHD should enable a consumer to configure their own load limit warning threshold, below the configurable percentage specified in clause 8.13, which shall enable an additional audible sound and/or visual message to be generated.
- 8.15 The sounds and/or visual messages described in clauses 8.13 and 8.14 shall always be reactivated every time a new load limiting event is initiated.
- 8.16 The IHD shall be capable of providing a secure consumer interface to enable pre-payment/PAYG functionality to be achieved without the consumer interacting directly with the meters. This interface shall exactly reproduce the pre-payment/PAYG functionality of meters (including the display of meters' messages) as described in Part 1: General System Architecture: Pre-Payment.
- 8.17 The IHD should be capable of allowing a consumer to authorise debiting a credit/debit card previously registered with British Gas to add credit to an e-wallet held in the core systems (if appropriate).
- 8.18 The IHD shall be capable of providing a means of displaying all the tariff information (i.e. including rate and tier information) used to generate the consumer's bill as described in Part 1: General System Architecture: Tariffs and Pricing.
- 8.19 The IHD should be capable of means of displaying all appropriate events, as per the configurable rules, generated by gas and electricity meters as described Part 1: General System Architecture: Alerts: Faults, Tamperers and Exceptions.
- 8.20 The IHD should be capable of recognising different classes of messages and being configurable to treat each class differently. In particular, one message class should allow the message to be automatically removed post a configurable expiry date.

Note: A message that informs the consumer that they are about to run out of credit would not be removed from the display, but a "Happy Christmas" message may be removed after, for example, two days.

- 8.21 For some classes of message (see clause 8.20), the IHD shall be capable of accepting a consumer interaction (e.g. button push) that confirms the acceptance of a message. Until the acceptance of the message by the consumer, it shall be held in memory and "Unread message" or similar shall be displayed.
- 8.22 Certain classes of message shall be password/PIN protectable. Examples of messages that should be password/PIN protected are (but not limited to):
- a) Availability of a new bill;
 - b) Payment history and details;
 - c) Warnings of impending mode switch (e.g. credit to pre-pay).

Examples of messages that should not be password protected are (but not limited to):

- a) Seasons' greetings;

- b) Special offers;
- c) Global warning of possible power cuts;
- d) Tariff rate changes.

8.23 The IHD should support the resetting/replacement of the IHD password/PIN to access messages (see clause 8.22)

8.24 The IHD shall be able to store messages in advance of their being displayed. They shall also store the date when the message is to become visible and until that time the message shall remain invisible.

Note: This allows a message associated with a change in rate to remain invisible until the rate change becomes effective.

8.25 The IHD should be capable of receiving, storing and updating details of the metering system, payment and supplier information as follows:

- a) IHD details serial number, model number, firmware reference number;
- b) Meter details meter serial number, MPAN/MPRN;
- c) Comms hub details serial number, model number, firmware reference number, HAN /PAN number it is paired with;
- d) British Gas details and customer service contact details;
- e) Meter(s) mode(s) of operation;
- f) Consumer Payment Scheme;
- g) Payment dates;
- h) Credit and debit transaction history for at least the last five transactions;
- i) Account balance for pre-payment;
- j) The three types of debt, with associated debt register, remaining debt, recovery rate and time, and totalised debt;
- k) Warnings when credit is running low and a top-up payment is required (pre-payment);
- l) Payment due dates (credit);
- m) Payment card reference number for Pay As You Go (PAYG) consumers.
- n) Gross generation data from generation meters.

8.26 The IHD shall be capable of determining the signal strength of the HAN to which it is joined.

8.27 Where the signal strength is determined to be of a quality too poor to allow reliable communications, it shall display warning messages (e.g.: "Attempts to vend may not be successful") together with instructions for the consumer to try the IHD at a different location.

8.28 The IHD shall be capable of full recovery and re-joining automatically with the rest of the smart metering system following the loss of power and/or loss of communications.

8.29 The IHD shall include the facility to show the current local time which shall be synchronised to the other smart metering system components.

8.30 The IHD should be capable of communicating with meters produced by other manufacturers.

9. DISPLAYS

- 9.1 The display shall default to the English language.
- 9.2 A variant of the IHD is one that should default to the Welsh language. The default language shall be configurable locally or remotely by authorised personnel. Other languages may be considered with the written agreement of British Gas.
- 9.3 All displays shall be clear to read and easy to understand and:
- a) Have dimensions of alpha numeric characters of, at least, 4.95 mm x 2.4 mm (height x width);
 - b) Be possible to be read clearly and correctly, within an angle of 45° horizontally, and 22° vertically, from normal to the window.
- 9.4 The display should have a method of improving visibility in poor lighting conditions e.g. a backlight. In the interests of battery life, any such methods should incorporate features to limit the drain on the battery.
- 9.5 As a minimum, the IHD shall display:
- a) A configurable, default message that includes British Gas contact details including phone number and email address;
 - b) A configurable branding logo. The default logo shall be British Gas;
 - c) A means by which a consumer may determine their current energy usage history for both gas and electricity;

Note: This can be by means of simple bar graphs on the alpha-numeric display, and/or by the use of additional red/green LEDs etc.
 - d) Current mode of meter operation (see Part 1 :General System Architecture: “Modes of operation”);
 - e) The status of the shut-off mechanism in the gas and electricity meters.
- 9.6 The IHD shall also be able to display:
- a) Tariff information including rates, tiers and standing charges where appropriate;
 - b) For electricity meters, real time energy cost (expressed as pence per hour at current rate of use/export);
 - c) For gas meters, an estimate of the real time energy cost. This shall take into account:
 - 1) An estimate, stored locally, of the calorific value (CV) of the gas;
 - 2) An estimate, stored locally, of the PTZ conversion factor;
 - 3) The CV value and PTZ conversion factor estimates should be updateable remotely by authorised personnel;
 - 4) The estimating process, for the energy cost, should reduce events of estimation by synchronising values of CV and PTZ conversion factor with head-end systems;
 - 5) A conversion factor for the calculation to kWh.

Note: The estimate of the final bill as displayed on the IHD is not to be confused with the actual bill which will be calculated in the supplier's head-end

system using industry accepted methods of calculating overall CV for the billing period.

- d) Current average, daily/weekly/monthly/quarterly rate of consumption, net export, and gross generation (assuming a generation meter is part of the HAN);
- e) Any debt information e.g. outstanding debts, emergency credit, managed debt (energy & non-energy) balance and recovery rate, number of weeks to clear debt, etc.;
- f) For pre-payment/PAYG consumers, the amount of time remaining before credit runs out, at current energy usage plus any debt recovery;
- g) For pre-payment/PAYG consumers, the current account balance (e.g. how much credit is available);
- h) Consumption profiles of varied frequencies (e.g. daily, weekly, monthly quarterly, yearly);
- i) CO2 emissions profile – configurable per fuel;
- j) Consumer messages from British Gas. The requirements for the display and user interactions of these messages are as follows:
 - 1) The display shall have sufficient characters to allow an initial 82 character message to be displayed without the need for scrolling.
 - 2) The IHD shall provide means by which a consumer can acknowledge the receipt of such messages;
 - 3) Acknowledgements shall take the form of Yes/No/Clear responses that should be returned to British Gas via the WAN;
 - 4) The IHD shall store the last five messages. Where a message requires a response it shall remain indefinitely until a response has been given.

Note: Also see clause 8.21.

- k) The load limiting status i.e. active/inactive, irrespective of the current being drawn;
- l) The energy being drawn as a percentage or fraction of the load limit setting;

Note: Also see clauses 8.13 and 8.14.

- m) The current energy export rate;
- n) The cumulative energy export value;
- o) Gross generation, and individual generation meter export rates, and total estimated cost saved from generation (daily, weekly, monthly, quarterly, billing period to date).
- p) Ambient air temperature within the consumer's home.
- q) An estimate or projection of the next bill in £'s based on daily consumption and billing period for each fuel type, and for dual fuel consumption.
- r) Spend to date since the last bill and average billing period cost.
- s) Profiling of cost data including cost saving from generation.

Note: Cost saving estimates for generation shall be derived from a single rate value updateable locally or remotely by authorised personnel.

- t) The status of the gas meter valve and instructions on how to reset the valve once the load limiting event (i.e. credit added) has been resolved.

- u) When operating in pre-payment/PAYG mode, the IHD shall show a live credit balance from each fuel type.
 - v) When the electricity meter is exporting in mode, the IHD shall show live credit generation.
- 9.7 In the case where meters are in credit mode, the IHD shall display the following messages as received from the head-end as appropriate; including the following:
- a) Payment due date;
 - b) Payment overdue;
 - c) Warnings that the supply may be terminated, or the meter may switch modes to pre-payment, if payment is not forthcoming;
 - d) Payment accepted and confirmed;
 - e) Warning that the payment transaction has failed.
- 9.8 In the case where the meters are being used in Pre-Pay mode but the IHD does not accept payments, the IHD shall display acknowledgment that a consumer has added to their credit, the date, and payment value.
- 9.9 In all cases the IHD should be capable of displaying payment history including dates and payment/credit amounts, for the last five payments.
- 9.10 Where consumption history profiles are displayed, it should be possible for the IHD to store and display at least the last 14 months of consumption history for both gas and electricity. The option shall be available to compare the current billing period with the previous two periods.
- 9.11 Where consumption history profiles are displayed, it shall be possible for the IHD to store and display the history over different time periods down to at least 30 minute intervals, (for the previous seven days.)
- 9.12 The IHD shall display costs which include the current VAT rate.
- Note: When displaying items that have varying rates of VAT, the IHD shall show the true cost, VAT amount/percentage, and total cost.*
- 9.13 The IHD shall display costs using the correct currency symbol (£ or €).
- 9.14 It shall be possible for authorised personnel to remotely change the currency symbol between £ and €.
- 9.15 Where too much information is required to be accessed during a consumer interaction, the display should have a means of easy navigation through any messages.
- 9.16 The IHD shall show the next price and an estimate when it shall be invoked based on current consumption and the resulting new price of energy consumption e.g. cost per hour at current consumption rate.
- 9.17 The IHD shall include functionality to show gas safety information such as gas emergency procedures and gas emergency phone number in the event of a gas leak.
- 9.18 The IHD shall include basic safety and user instructions for restoration of supply after an interrupt period.

10. DATA STORAGE AND MEMORY

10.1 General

- 10.1.1 The data shall be retained over the temperature range -25 °C to +55 °C.
- 10.1.2 The memory shall be capable of being read from, and written to, over the temperature range of -25 °C to +55 °C.
- 10.1.3 Where the data is continually being updated, the data storage shall operate on an over-write FIFO principle.
- 10.1.4 The following data held in memory shall be accessible, both locally and remotely, by authorised personnel:
 - a) Asset data;
 - b) Hardware and firmware (including Zigbee etc.) version numbers;
 - c) Configurable items;
 - d) Serial number;
 - e) Install code;
 - f) MAC address
 - g) Manufacturer and product names.
- 10.1.5 All data, except the IHD's serial number, MAC address and install code shall be capable of being reset by authorised personnel or automatically reset when the IHD "pairs" with other components upon commissioning and installation.

10.2 Storage

- 10.2.1 The IHD shall incorporate on-board memory that, as a minimum, shall be of sufficient size to store the following:
 - a) The list of information given in clause 8.25;
 - b) The currently operating firmware of the IHD, if applicable;
 - c) A copy of all current register readings of the gas and electricity meters;
 - d) All un-cleared messages;
 - e) The most recent five messages excluding cleared messages;
 - f) Alerts generated by the IHD;
 - g) HAN signal strengths; see clause 8.27;
 - h) Low battery warning(s) and associated date(s);
 - i) Event information relating to tampers, faults or alerts including multiple attempts to enter information that is used in conjunction with payment;
 - j) Time and date stamp for each event record;
 - k) IHD details:
 - 1) Serial number;
 - 2) MAC address;

- 3) MPRN/MPAN
- 4) Install code;
- 5) Supplier information.

11. DATA COMMUNICATIONS

11.1 General

11.2 The IHD shall be Zigbee (2.4GHz) Smart Energy Certified, be developed in line with the Smart Energy Profile and any private extensions necessary to support British Gas functional requirements.

11.3

12. EMC

12.1 This section shall be read in conjunction with Part 1: General System Architecture: EMC.

12.2 The following lists the influence quantities that shall be applied to the IHD:

- a) Voltage transients on signal lines (if applicable):
 - 1) The IHD shall be tested in accordance with BS EN 61000-4-4 (or equivalent) level 3;
- b) Electrostatic discharges:
 - 1) The IHD shall be tested in accordance with BS EN 61000-4-2 (or equivalent) using 10 contact discharges at severity level 3 (6 kV) at intervals of 10 s to each of:
 - i) The conductive surfaces;
 - ii) A horizontal and;
 - iii) A vertical coupling plane.
 - 2) The IHD shall be tested in accordance with BS EN 61000-4-2 (or equivalent) using 10 air discharges at severity level 3 (8 kV) at intervals of 10 s to insulating surfaces. During the test, the inlet boss of the IHD shall be connected to the ground plane used during the test;
- c) Radio frequency electromagnetic fields:
 - 1) The IHD shall be tested in accordance with test level 3 of BS EN 61000-4-3 (or equivalent).
- d) Conducted radio frequency electromagnetic fields on signal lines (if applicable):
 - 1) The IHD shall be tested in accordance with class 2 of BS EN 61000-4-6 (or equivalent);
- e) Surges on signal lines (if applicable):
 - 1) The IHD shall be tested in accordance with class 1 of BS EN 61000-4-5 (or equivalent);
- f) Power frequency magnetic fields:

- 1) The IHD shall be subjected to test level 3 of BS EN 61000-4-8 (or equivalent) for 15 minutes;
 - g) Pulse magnetic field immunity test:
 - 1) The IHD shall be subjected to test level 3 of BS EN 61000-4-9 (or equivalent) for 15 minutes.
 - h) Any other quantity likely to influence in a significant way the operation of the IHD.
- 12.3 The IHD shall meet the radio interference suppression requirements of BS EN 55022 (or equivalent), class B.
- 12.4 Any radio transmitting devices shall comply with the appropriate ETSI test Standards as appropriate, including, but not limited to:
- a) EN 300 328
 - b) EN 301 511
 - c) EN 301 489-01
 - d) EN 301 489-07
 - e) EN 301 489-17
 - f) EN 301 489-24
 - g) EN 301 908-01
 - h) EN 301 908-02

And British Standards:

- i) BS EN 50360
- j) BS EN 50371

And, Council and European Parliament recommendation:

- k) 1999/519/EC

ENDNOTES

History

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Working draft	March 2009
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Key changes

Section	Amendments
	New document

Comments

Comments and queries regarding the technical content of this product requirement document should be directed to:

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