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**PRODUCT REQUIREMENTS FOR
SMART METERING SYSTEMS
PART 3: ELECTRICITY METERS**

MARCH 2010

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PRODUCT REQUIREMENTS FOR SMART METERING SYSTEMS - PART 3: ELECTRICITY METERS

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 electricity meters within a smart metering system.

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

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

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

1. SCOPE

- 1.1 This document defines the minimum British Gas product requirements for:
- a) A smart electricity meter, having single phase with a capacity not exceeding 100A;
 - b) Electricity consumption data capture, transmission, retention, display and query;
 - c) Reception and utilisation of external data and commands.

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. BRITISH LEGISLATION AND STANDARDS

- 4.1 Electricity meters shall be stamped in accordance with the Electricity Act 1989, Schedule 7. The Measuring Instruments (Active Electrical Energy Meters) Regulations 2006 (SI No. 1679:2006) implements MID in Great Britain. Under the SI 1679:2006 all new meter designs (and subsequent production of that type) are required to be conformity assessed by a notified body, designated by an EU Member state, to ensure it meets the requirements of MID. All meters conforming to MID shall bear the "M" and "CE" markings plus the identification number of the notified body that dealt with the conformity assessment.

Note: Also see clause 9.4.2.

- 4.2 The manufacture shall provide written proof from a Notified Body, acceptable to Ofgem/NMO, of meters passing these assessments.

Note: This provides evidence that meters meet the essential requirements of the Measuring Instruments Directive, as implemented by UK law.

- 4.3 Electricity meters shall meet the requirements of BS 7856 and, BS EN 50470 or BS EN 61036.

Note: BS EN 61036 is applicable to older Ofgem approved meters.

- 4.4 Electricity meters shall, at least, meet the accuracy requirements Class B as defined in BS EN 50470 or class 1 in BS EN 61036 if Ofgem approved.

5. SAFETY

5.1 General requirements

- 5.1.1 Electricity meters shall have all electrical parts and terminal connectors (e.g. power supply terminals, plugs and sockets etc.) inaccessible and/or insulated and protected such as to prevent inadvertent contact by the installer or consumer. Electricity meters shall be manufactured to conform to protective class II as defined in BS EN 50470.

- 5.1.2 Where a consumer's electricity supply has been interrupted by the meter, any faults within the smart metering system shall not cause the restoration of the supply.

- 5.1.3 Electricity meters shall not be capable of restoring a consumer's supply following an interruption by the meter without the local intervention of the consumer; see section 10.

Note 1: Methods of interrupting the consumer's supply are described in section 10.

- 5.1.4 Where a loss of supply has occurred for reasons outside of the control of the meter (e.g. network power failure or removal of the house service fuse) the meter shall retain the setting of the shut-off device prior to the supply loss, when the supply is restored.

5.2 Intrinsic safety requirements

- 5.2.1 If the electricity meter is directly wired to the gas meter, it shall meet, as a minimum, the requirements for use in a hazardous area classification zone 2 (ATEX category 3) as defined in BS EN 60079-10-1.

Note: This clause applies, independent of the distance between the electricity meter and the gas meter, to any circuitry within an electricity meter that is wired directly to the gas meter.

6. GENERAL REQUIREMENTS

- 6.1 Electricity meters shall have a rating of 100 Amperes.
- 6.2 Electricity meters shall be capable of passing 120% of its thermal rating continuously.
- 6.3 Electricity meters shall measure, record and totalise electricity consumption in kWh.
- 6.4 Electricity meters shall measure both import and export energy.
- 6.5 Electricity meters should incorporate four quadrant measurement and measure and record voltage, current and maximum demand in a given period (Hourly, daily, monthly, quarterly, yearly maximum demand).
- 6.6 Electricity meters shall support interruption of the electricity supply using an internal shut-off mechanism; see section 9.5.7. This shut-off may occur in various circumstances including switching modes (see Part 1: General System Architecture: Mode of Operation) and during pre-payment/PAYG operations (see Part 1: General System Architecture: Installation, Commissioning and Decommissioning), and for use as over current management (see section 12).
- 6.7 Electricity meters and any components that may be mounted on the electricity meter shall be compatible with typical meter housings and typical meter tails found in Great Britain. The meter's dimensions should be:
- width < 135mm, height < 125mm and depth < 125mm.
- 6.8 **Labels**
- 6.8.1 In addition to the labelling information as described in Part 1: General System Architecture, electricity meter labels shall also be provided that give the following information:
- a) Smart Meter Variant Code;
 - b) Current Rating;
 - c) Voltage Rating;
 - d) Frequency Rating;
 - e) Number of Phases;
 - f) Instructions describing the correct procedure for restoring the supply; e.g. including information to ensure appliances are turned off etc.
- 6.9 **Colour**
- 6.10 The colour of the electricity meter cases should be neutral; e.g.: white, cream, light grey etc. and be with the written agreement of British Gas.
- 6.11 **Meter terminals**
- 6.12 Cage clamps shall not be used as the means of securing meter tails to the terminals.

7. ENVIRONMENT

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

7.2 Temperature and humidity

7.2.1 Electricity meters, shall be suitable for use over the temperature range -25 °C and +55 °C and relative air humidity between 30% and 100% condensing.

7.3 Ingress protection

7.3.1 Electricity meters shall be so constructed such that the collection of water is prevented and should provide the degree of protection equivalent to, as a minimum, IP52 in accordance with BS EN 60529.

Note: Lower IP ratings may be used in conjunction with additional means of avoiding the build up of water or condensation within the electricity meters. These methods are to be with the written agreement of British Gas.

8. BACK-UP BATTERIES

8.1 Electricity meters shall include back-up batteries, or similar as appropriate, to maintain low level functionality (e.g. real time clocks) during temporary power losses. Also see Part 1: General System Architecture: Real Time Clocks.

8.2 Back-up batteries shall have a service life the same as the electricity meter.

8.3 Batteries shall be leak resistant.

9. DISPLAYS

9.1 All meter displays shall default to the English language. Other languages such as Welsh may be considered with the written agreement of British Gas.

9.2 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.

9.3 All displays should have a method of improving visibility in poor lighting conditions and shall be backlit. The display backlight shall be capable of configuration:

- a) To operate or not;
- b) To turn off after a configurable duration.

9.4 Metrologically controlled display

9.4.1 Electricity meters shall incorporate a clear and unambiguous display that provides a totalised cumulative reading of consumption accessible without tools that that serves as the basis for the price to pay; this shall be in units of kWh.

9.4.2 This display shall be 'certification' sealed and access to the display shall not be possible without breaking the seal. All other modules of the meter shall not be behind this metrological seal.

Note: Not including other modules behind the metrological seal allows unimpeded access for any future maintenance or upgrades. Such access may be prevented by other seals under the control of Meter Operators (MOPs), British Gas etc.

9.4.3 All metrologically controlled cumulative registers shall not be capable of being reset.

9.4.4 Where the metrological display is also used for other purposes (see clause 9.5) then its default condition shall be showing the most recent cumulative consumption. Where a consumer has ceased interacting with the meter the display shall return to showing the default condition within 30 seconds of the last consumer interaction except in the condition detailed in clause 9.5.6.

9.4.5 The display shall incorporate a facility to check that it is working correctly (e.g. by demonstrating that all pixels can be blanked and displayed).

9.4.6 Decimal points shall be clear and unambiguous and numbers following the decimal point shall be clearly identifiable (e.g. by a different colour, background etc.).

9.4.7 The display of electricity consumption shall have a minimum of 6 numerical characters and the last 1 numerical character shall be a decimal place indicating 100 Wh, e.g.99999.0 and display leading zeros. Additional numbers shall be included after the decimal place to aid commissioning (i.e. indicating 10 Wh and 1Wh), but these should be capable of being blanked for normal use.

9.4.8 The metrological display should be fully functional over the temperature range -25 °C to +55 °C.

9.5 Meter displays

9.5.1 In addition to the metrological display, the meter shall display other information. This can be by utilising the metrologically controlled display for other functions or using a separate display.

9.5.2 Where only one display is used for all functions (i.e. the metrologically controlled display and other functions) the display shall meet the requirements of clause 9.4.4.

9.5.3 The meter display shall be used to provide a means to enable pre-payment/PAYG functionality as described in Part 1: General System Architecture: Pre Payment, to be achieved.

9.5.4 The meter display shall, as a minimum, display:

- a) A means by which a consumer may determine their current electricity usage;
- b) Current mode of operation (see Part 1: General System Architecture: Mode of Operation);
- c) The status of the supply shut-off mechanism;
- d) The consumer's tariff, tariff name and tariff version;
- e) For pre-payment/PAYG consumers, any additional billing information; e.g.:
 - 1) Emergency credit;
 - 2) Managed debt:
 - i) Energy & non-energy debts;

- ii) Recovery amount;
 - iii) Recovery frequency.
 - 3) The amount of time left before credit runs out at current energy usage;
 - 4) The current account balance; e.g. how much credit is available.
 - f) An indication of whether the meter is importing or exporting;
 - g) Current import rate or export rate
 - h) Current gross generation rate (if generation meters are part of HAN)
 - i) The load limit against the current energy consumption.
- 9.5.5 The meter shall provide means by which a consumer can acknowledge meter generated messages which shall take the form of Yes/No/Clear responses.

Note: These transactions will be mimicked on the IHD.

- 9.5.6 Where a meter system generated message requires a response it shall remain indefinitely until a response has been given.
- 9.5.7 Where too much information is required to be accessed during a consumer interaction, this shall be displayed by means of easily scrolling through the information.

10. INTERRUPT AND RESTORE CAPABILITY

- 10.1 This section shall be read in conjunction with Part 1: General System Architecture: Interrupt and Restore Capability.
- 10.2 An electricity meter shall be capable of remote interrupt of the consumer's electricity supply and provide for the remote enabling of the electricity supply through the use of a contactor or in-line switch; also see clauses 5.1.3 and 10.4.

Note: Such operation would include the consumer running out of credit on a meter operating in pre-payment/PAYG mode, or a specific disable instruction from authorised personnel.

- 10.3 All of the meter's functionality (other than the allowance of electricity to pass) shall operate as normal, irrespective of whether the contactor or in-line switch is opened or closed.

Note: This is to allow authorised personnel to change the mode of operation, monitor alarms, download meter readings etc.

- 10.4 The closing of the contactor or in-line switch shall be inhibited by the use of an interlock. It shall require direct operation (e.g., by pressing a button) to deactivate the interlock following the receipt and acknowledgment, by the meter, of an enabling command.

11. EXPORT CAPABILITY

- 11.1 The electricity meter shall support 48 Time of Use (TOU) export registers storing measured exported energy in kWh.
- 11.2 The meter shall be capable of storing pricing information for exported energy (see Part 1: Tariffs).
- 11.3 Export energy and pricing information shall be made available for use by the IHD.

- 11.4 The meter shall display total generation as a total exported value, and current rate of export, if a generation meter is part of the HAN.

12. LOAD MANAGEMENT

12.1 Peak Load Management

- 12.1.1 The electricity meter shall be capable of limiting electricity to the consumer in both credit and pre-payment/PAYG modes.
- 12.1.2 The electricity meter shall provide a facility to limit total load to a configurable current rating above which the supply to the consumer shall be interrupted
- 12.1.3 The load limit should be configurable to be active for times of day, days of week, months of year, and special days.
- 12.1.4 The load limit functionality can be used as a rule within the meter instead of disconnection.
- 12.1.5 When load limiting is inactive, it shall not be possible for load limiting to occur.
- Note: It may be possible for manufacturers to include an overload protection device as part of the meter to prevent engineer call outs for blown main service fuses.*
- 12.1.6 The meter shall display the load limiting status i.e. active/inactive, irrespective of the current being drawn.
- 12.1.7 The meter shall display the current being drawn as a percentage or fraction of the load limit setting when load limiting is active.
- 12.1.8 The load limiting capability shall be configurable locally and remotely by authorised personnel.
- 12.1.9 The load limiting capability shall be capable of being overridden under configurable rules that are updateable locally and remotely by authorised personnel; e.g. in the case of a vulnerable consumer.
- 12.1.10 Meters 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.
- 12.1.11 The sound and/or visual message described in clause 12.1.10 shall always be reactivated every time a new load limiting event is initiated.

- 12.1.12 The load limiting functionality should proceed as follows:

- a) If configurable current limit warning is exceed, generate a warning as described in clause 12.1.10 until current drops below warning limit or current increases to load limit;
- b) If configurable current load limit is exceeded:
 - 1) Generate a different non mutable audible sound and/or visual message continuously for a configurable time period for whichever occurs first:
 - i) After which the supply is interrupted and the warnings cease; or
 - ii) Until the consumption drops below the configurable limit.

12.1.13 Consumers shall be able to restore the supply locally following interruption caused by exceeding the load limit.

12.2 Switched Loads

12.2.1 The meter should support the ability to switch a load which shall be used to control an external contactor via an auxiliary switch.

12.2.2 The meter shall support the capability to control at least one load to be switched in conjunction with any combination of Time of Use (ToU) Register's boundaries (on/off times).

12.2.3 The meter should measure consumption of at least two switched loads independently.

13. DATA STORAGE AND MEMORY

13.1 General

13.1.1 The memory shall be non-volatile meaning that during the loss of power to the memory it shall have a minimum retention time equal to that of the operational design life of the meter over the temperature ranges as specified in 7.2.

13.1.2 The memory shall be capable of being read from, and written to, over the temperature range specified in section 7.2.

13.1.3 Where the data is continually being updated, the data storage shall operate on an over-write First In First Out (FIFO) principle.

13.1.4 All data held in memory shall be accessible, both locally and remotely, by authorised personnel.

13.1.5 All data, with the exception of the cumulative meter reading and serial numbers should be capable of being individually reset by authorised personnel. Such an action shall only be possible with the use of a password and the action shall generate an event flag in the meter.

Note: Some resetting is likely to be required during the life of the meter; e.g. a change of supplier.

13.2 Meters

13.2.1 The electricity meter shall incorporate on-board memory that, as a minimum, shall be of sufficient size to store the following:

- a) The currently operating firmware of the meters together with the previous version, if applicable;
- b) The current meter readings (considered part of the metrological functionality; see section 4);
- c) Time period interval data (e.g. 30 minute intervals) continuously for 120 days;

Note: British Gas wish to investigate various time periods (e.g. down to one minute) but it is also understood that shorter time periods will require an increased resolution in the recording of consumption.

- d) A configurable number of days of daily meter reads taken at a set time of day; and
- e) A minimum of 120 days of daily totalised consumptions at each rate based on the daily reads; and

- f) A minimum of 120 days of daily meter export reads taken at the same time of day as the daily meter reads;
Note: 180 days is preferable
- g) A minimum of 3 months of continuous half hourly interval data for both total imported and total exported energy;
- h) Voltage, current and four quadrant measurement information over configurable time periods;
- i) The most recent 40 meter events in the fault log;
- j) The most recent 40 meter events in the tamper log;
- k) Maximum demand in a given period (Daily, monthly, quarterly, yearly maximum demand) based on half hourly consumption readings;
- l) Time and date stamp for each data item;
- m) Meter details:
 - 1) Serial number;
 - 2) Smart Meter Variant Code;
 - 3) MAC address;
 - 4) MPAN;
 - 5) Install code;
 - 6) Electricity Supplier information.
 - 7) Pre-payment/PAYG PAN

14. DATA COMMUNICATIONS

14.1 General

14.1.1 The electricity meter shall communicate to the comms hub and the IHD using Zigbee (2.4GHz) and communicate using the Smart Energy Profile (SEP) and any private extensions necessary to support our functional requirements.

14.1.2 Where devices and modules used for the purpose of communications are contained within the electricity meter, they should be self contained, identifiable, and allow for their removal and replacement by authorised personnel without de-energising the meter.

Note: This is to allow for the upgrading of the communications parts of the system, without changing the meter, in the event of new technologies becoming available in the future.

14.1.3 The electricity meter should be capable of responding in real time to remote commands.

14.2 Communications to Hand Held Terminal (HHT)

14.2.1 The meter shall be configurable locally using a HHT via the comms hub. Such local interrogation should be via Zigbee or a local programming port; e.g. an optical port – often known as an IEC port – as specified in BS EN 62056-21.

14.2.2 The meter shall be configurable locally without the use of a HHT by authorised personnel.

15. EMC

- 15.1 This section shall be read in conjunction with Part 1: EMC.
- 15.2 The following lists the influence quantities specific to electricity meters:
- a) Voltage dips and short interruptions:
 - 1) Electricity meters shall be tested in accordance with BS EN 50470 (or equivalent) as appropriate.
 - b) Voltage transients on supply lines and/or signal lines:
 - 1) Electricity meters shall be tested in accordance with BS EN 50470.
 - c) Electrostatic discharges:
 - 1) Electricity meters shall be tested in accordance with BS EN 50470.
 - d) Radio frequency electromagnetic fields:
 - 1) Electricity meters shall be tested in accordance with BS EN 50470.
 - e) Conducted radio frequency electromagnetic fields on supply lines and/or signal lines:
 - 1) Electricity meters shall be tested in accordance with BS EN 50470.
 - f) Surges on supply lines and/or signal lines:
 - 1) Electricity meters shall be tested in accordance with BS EN 50470.
 - g) Voltage variation:
 - 1) Electricity meters shall be tested in accordance with BS EN 50470.
 - h) Mains frequency variation:
 - 1) Electricity meters shall be tested in accordance with BS EN 50470.
 - i) Power frequency magnetic fields:
 - 1) Electricity meters shall be tested in accordance with BS EN 50470.
 - j) Pulse magnetic field immunity test:
 - 1) Components shall be subjected to test level 3 of BS EN 61000-4-9 (or equivalent) for 15 minutes.
 - k) High intensity, static magnetic fields:
 - 1) A magnet of diameter 25mm and field strength of at least 6000 gauss at the surface of the magnet shall be applied to all faces of any component that directly relates to the billing process;
 - l) Any other quantity likely to influence in a significant way the accuracy of the electricity meter.
- 15.3 The electricity meter shall meet the radio interference suppression requirements of BS EN 55022 (or equivalent), class B.
- 15.4 Any radio transmitting devices (e.g. to the HAN) shall comply with the appropriate ETSI test Standard.

ENDNOTES

History

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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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