



Department  
of Energy &  
Climate Change

## Information Request

Smart Metering Implementation Programme:

*Availability of technologies for provisioning Home Area Network (HAN) connectivity to electricity and gas metering equipment, communications hub and in-home devices in cases where a 2.4GHz ZigBee wireless HAN will not work effectively.*

1 March 2013

- 1. INFORMATION REQUEST ..... 3
  - 1.1. INTRODUCTION..... 3
    - 1.1.1. Purpose ..... 3
    - 1.1.2. Instructions to respondents..... 3
    - 1.1.3. Outline of the Problem..... 3
  - 1.2. QUESTIONS..... 4
    - 1.2.1. Technology overview and architecture ..... 4
    - 1.2.2. Communication protocols ..... 4
    - 1.2.3. Hardware ..... 4
    - 1.2.4. Installation and commissioning ..... 5
    - 1.2.5. Solution limitations ..... 5
    - 1.2.6. Costs and timescales ..... 5
    - 1.2.7. Technology Trial..... 5
- 2. APPENDICES ..... 6
  - 2.1. APPENDIX: CHARACTERISATION REPORT ..... 6
    - 2.1.1. Survey Details..... 6
    - 2.1.2. Characterisation Tests..... 6
  - 2.2. APPENDIX: WIRELESS HAN ARCHITECTURE..... 6
- 3. GLOSSARY..... 8

# 1. Information Request

## 1.1. Introduction

### 1.1.1. Purpose

This Information Request (IR) has been issued by the Department of Energy and Climate Change (DECC) Smart Metering Implementation Programme (SMIP) to assess the availability of technologies for provisioning Home Area Network (HAN) connectivity to electricity and gas metering equipment, communications hub and in-home devices in cases where a 2.4GHz ZigBee wireless HAN will not work effectively. *Appendix: Wireless HAN Architecture* describes the HAN topology based on 2.4GHz ZigBee wireless technology without repeaters.

Following evaluation of the IR responses, DECC will determine if the selection of suitable technologies needs to be further informed through a technology field trial.

In the event that DECC determines that a specific technology trial is required in order to define specific HAN technology options then such a trial will be run as a separate exercise, participation in which would be subject to a future notification and selection process.

DECC may use the responses to this IR, together with the results from any technology trials subsequently performed, in its analysis of potential HAN technologies and the ultimate selection of one or more preferred technologies. Respondents should note that the process referred to above relates to the selection of technologies and is not intended in any way to determine the preferred provider(s) for any such technology.

Responses may include a mix of wired and wireless technologies. Consideration should be given to suggesting technical solutions that would minimise the requirements to install communications equipment within the building infrastructure, except at the meter locations and within the consumer's property.

### 1.1.2. Instructions to respondents

Deadline for submission of responses

Responses should be submitted by 15 April 2013.

### 1.1.3. Outline of the Problem

HAN Topology

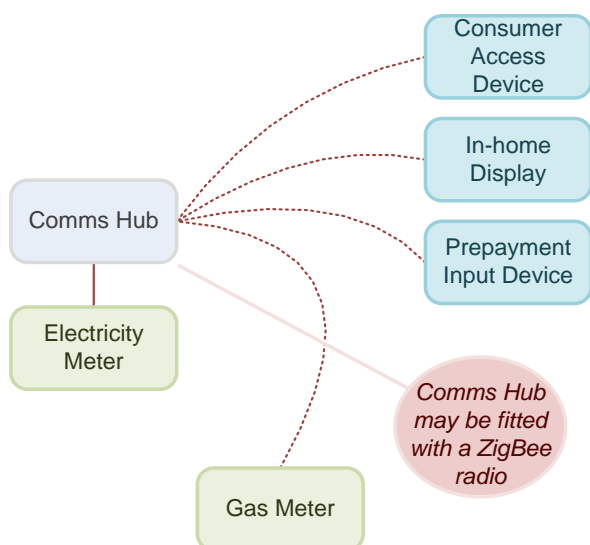


Figure 1: HAN Topology

Figure 1 above is a schematic diagram of a Home Area Network connecting a communications hub to an electricity meter, gas meter, and various in-home devices. The electricity meter is in close proximity to the communications hub, and will always be able to communicate. The communications hub will incorporate a ZigBee radio, and act as a ZigBee co-ordinator. This may be incorporated into Wired HAN solutions, or an alternative interface may be specified for integration into the communications hub. It is always situated close to the electricity meter. In some cases the communications hub may be out of ZigBee radio range of the gas meter, whilst in other cases the communications hub may be out of ZigBee radio range of the property where in-home devices may be used.

According to a study performed by DECC, in up to 5% of GB properties, the gas meter and/or in-home devices will be out of range of communications hub radios operating in the 2.4GHz or 868MHz band rising to 30% for 2.4GHz only. This includes around 350,000 flats situated in high-rise buildings (defined as greater than 6 storeys).

To ensure that all GB consumers can benefit from smart metering, DECC is seeking to identify HAN technologies to complement the wireless HAN option(s) to be specified in the Smart Metering Equipment Technical Specifications (SMETS). DECC welcomes any information on alternative approaches which address the challenge of providing connectivity between distant communications hubs and in-home devices / gas meters.

To assist respondents, DECC will provide a characterisation report providing survey details and measurements taken in a number of buildings identified where a wired HAN solution, hybrid wired/RF solution or RF solution using RF repeaters could be deployed. Tests are in progress at the time of writing, and this report will be available from this Web site by 26 March 2013. The scope of this report is detailed in *2.1, Appendix: Characterisation Report* below.

## 1.2. Questions

### 1.2.1. Technology overview and architecture

1. Please identify a technology or technologies which address the connectivity challenge described above.
2. Please describe the technology(ies) in detail, including diagrams to illustrate the likely network infrastructure. The description should demonstrate how the technology(ies) can be applied in the different network conditions that may be encountered in GB.
3. Describe how the technology could be integrated into a wired HAN smart metering solution, indicating the different products that would need to be provided to form a reliable HAN between smart metering equipment.

### 1.2.2. Communication protocols

4. Detail the communication protocols that are supported by or offered by the technology(ies), and how they would facilitate communications between the communications hub and gas meter / in-home devices including IHD, PPMID and CAD. Please:
  - present the protocol layers, and compliance to international standards;
  - describe the level of support for open standards; and
  - describe any use of proprietary protocols required to achieve an end-to-end communications solution.

### 1.2.3. Hardware

5. Detail the hardware components required to implement a solution based on the technologies. Please:
  - list compliance to international standards, and identify components which are not standards-compliant; and
  - estimate the average power consumption of solutions based on the technology(ies), when deployed in a smart metering system.

#### 1.2.4. Installation and commissioning

6. Outline the installation and commissioning steps in deploying a solution based on the technology(ies) in a high-rise building. Please:
  - estimate the time required to complete an installation; and
  - detail the time required inside a consumer's property.

#### 1.2.5. Solution limitations

Note that each Home Area Network is expected to exchange data between a metering device and an in-home display once every 10s, in addition to less-frequent communications between different devices. Solutions based on ZigBee 2.4GHz typically require a bandwidth of at least 3000bit/s.

Based on the characterisation report provided by DECC, and assuming that high-rise buildings can have up to 250 flats:

7. Estimate the maximum number of properties that can be supported on a single network.
8. What is the network bandwidth?
9. Describe the susceptibility to interference of the technology(ies).
10. Reliability and resilience. Please:
  - describe how the technology(ies) could achieve resilience to poor network conditions; and
  - describe how crosstalk could affect the technology(ies).
11. Detail any other relevant limitations of the technology(ies), which may restrict where a solution based on such technology(ies) may be deployed to provide a reliable network.

#### 1.2.6. Maturity

12. Provide evidence as to the maturity of the technologies proposed.

#### 1.2.7. Costs and timescales

13. Estimate the additional equipment costs to integrate the technology into smart metering equipment.
14. Estimate the timescales to develop commercial solutions (if not already offered in the market).

#### 1.2.8. Technology Trial

15. Would a technology trial would be required to further evaluate the suitability of the proposed HAN technologies?

## 2. Appendices

### 2.1. Appendix: Characterisation Report

Energy UK are in the process of performing building characterisation tests, to inform wired HAN technology providers of network conditions that may be encountered in some of the more difficult cases that may be encountered in GB, that would fall into the scope of buildings where a wired HAN would be provisioned.

The report will include survey details of up to 10 high-rise buildings, and results from characterisation tests performed within these buildings.

The following information will be contained in the report for each building:

#### 2.1.1. Survey Details

Building topology:

- Number of apartments, apartment size, number of floors, number of apartments on each floor.
- Relative location of electricity and gas meters.

Building wiring:

- Cable trunking, distribution of phases, cable lengths, cable junctions.

Meter rooms:

- Layout of meters.
- Number of meters that have been relocated to apartments.

Apartments:

- Types of fuses / circuit breakers fitted.

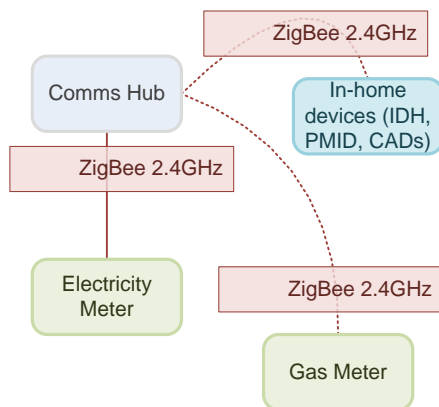
#### 2.1.2. Characterisation Tests

The following tests will be performed between the meter location and apartments located closest to the meter room, furthest from the meter room, and mid-point from the meter room:

- Impedance (meter  $\leftrightarrow$  apartment).
- Insertion loss (meter  $\leftrightarrow$  apartment).
- Channel noise (meter + apartment).
- Cross talk (in the meter room / between apartments).

### 2.2. Appendix: Wireless HAN Architecture

The Smart Metering Implementation Programme (SMIP) defines the HAN interconnections between Smart Metering Equipment according to the following architecture:



**Figure 2: HAN Topology (2.4GHz ZigBee)**

In the diagram above, the electricity meter is in close proximity to the communications hub. The communications hub is expected to be located within ZigBee radio range of the electricity meter.

Where the gas meter is within radio range of the electricity meter / communications hub, it can utilise ZigBee communications directly with the communications hub. Gas meters are required to communicate at 30 minute intervals.

Where in-home devices are within radio range of the electricity meter / communications hub, they can utilise ZigBee communications directly with the communications hub. It is assumed that in-home devices will be network end devices, and will not perform any routing of network traffic. In-home devices may communicate at 10s intervals.

### 3. Glossary

CAD	Consumer Access Device
DECC	Department of Energy and Climate Change
HAN	Home Area Network
IHD	In-Home Display
IR	Information Request
PLC	Power Line Carrier
PPMID	Prepayment Interface Device
SMIP	Smart Metering Implementation Programme