Department of Energy & Climate Change

Consultation on Home Area Network (HAN) Solutions: Implementation of 868MHz and Alternative HAN solutions

March 2015

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Any enquiries regarding this publication should be sent to us at smartmetering@decc.gsi.gov.uk.

Contents

General information

Purpose of this consultation:

This consultation seeks views on proposals relating to the implementation of the 868MHz ZigBee Smart Energy Profile (SEP) HAN solution and the alternative HAN solution for GB smart metering.

Issued: 24 March 2015

Respond by: 19 May 2015

Enquiries to:

Smart Metering Implementation Programme
Department of Energy & Climate Change
Orchard 3, Lower Ground Floor
1 Victoria Street
London, SW1H 0ET
Telephone: 0300 068 6659
Email: smartmetering@decc.gsi.gov.uk

Territorial extent:

This consultation applies to the gas and electricity markets in Great Britain. Responsibility for energy markets in Northern Ireland lies with the Northern Ireland Executive's Department of Enterprise, Trade and Investment.

How to respond:

Your response will be most useful if it is framed in direct response to the questions posed, though further comments and evidence are also welcome.

Responses to this consultation should be sent to smartmetering@decc.gsi.gov.uk no later than 19 May 2015.

Additional copies:

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Other versions of the document in Braille, large print or audio-cassette are available on request. This includes a Welsh version. Please contact us under the above details to request alternative versions.

Confidentiality and data protection:

Please note that DECC intends to publish the individual responses to this consultation on the GOV.UK website. This will include a list of names or organisations that responded but not people's names, addresses or other contact details. You should therefore let us know if you are not content for the response or any part of it to be published. If you indicate that you do not want your response published we will not publish it automatically but it could still be subject to information requests as detailed below.

Further, information provided in response to this consultation, including personal information, may be subject to publication or disclosure in accordance with the access to information legislation (primarily the Freedom of Information Act 2000, the Data Protection Act 1998 and the Environmental Information Regulations 2004).

If you do not want your individual response to be published on the website, or to otherwise be treated as confidential please say so clearly in writing when you send your response to the consultation. For the purposes of considering access to information requests it would be helpful if you could explain to us why you regard the information you have provided as confidential. If we receive a request for disclosure of the information we will take full account of your explanation, but we cannot give an assurance that confidentiality can be maintained in all circumstances. An automatic confidentiality disclaimer generated by your IT system will not, of itself, be regarded by us as a confidentiality request.

Quality assurance:

This consultation has been carried out in accordance with the Government's Consultation Principles.

If you have any complaints about the consultation process (as opposed to comments about the issues which are the subject of the consultation) please address them to:

DECC Consultation Co-ordinator
3 Whitehall Place
London SW1A 2AW
Email: consultation.coordinator@decc.gsi.gov.uk

1. Executive Summary and Introduction

Programme Introduction

1.1. The Government's vision is for every home and smaller business in Great Britain to have a smart meter. The rollout of smart meters by energy suppliers will play an important part in Britain's transition to a low-carbon economy, as well as help us meet some of the long-term challenges we face in ensuring an affordable, secure and sustainable energy supply.

1.2. Smart meters are the next generation of gas and electricity meters. They will offer a range of intelligent functions and provide consumers with more accurate information, bringing an end to estimated billing. Consumers will have near real-time information on their energy consumption to help them control and manage their energy use, save money and reduce emissions.

1.3. Energy suppliers are required to take all reasonable steps to install smart meters in GB domestic and smaller non-domestic premises by the end of 2020. A standard smart metering installation will in most instances include gas and electricity smart meters, an In-home Display (IHD) (for domestic premises), and a communications hub.

1.4. These devices will communicate with each other via a home area network (HAN), as defined by the Smart Metering Equipment Technical Specifications (SMETS). Suppliers are required to make consumption and tariff information available to the consumer via the HAN. This will allow consumers to see energy information on their in-home display, but will also allow them to link a range of other smart devices (consumer access devices (CADs)) to the HAN[1].

1.5. The 2.4GHz[2] ZigBee Smart Energy Profile HAN standard that is specified in the second version of the SMETS (SMETS2) and the Communications Hub Technical Specifications (CHTS)[3] is expected to be suitable for the communications links between all smart metering equipment in approximately 70% of GB premises without the need for range extending equipment[4].

Purpose of this Document

1.6. This consultation sets out proposals relating to the provision of the HAN in the premises that are unlikely to be served by the 2.4GHz HAN. In line with our overall technical strategy the HAN in these premises will be served by either an:

- **868MHz HAN solution[5]:** the Government concluded in its Response to the Second Version of the SMETS[6] that an 868MHz solution should be developed and

[1] For more information about how data from smart meters is expected to transform the market for energy services see: www.gov.uk/government/publications/smart-meters-smart-data-smart-growth.
[2] References to 2.4GHz in this document imply the 2400-2483.5MHz bandwidth
[3] The latest versions of SMETS2 and the CHTS are available at www.gov.uk/government/consultations/smart-metering-equipment-technical-specifications-second-version.
[4] Coverage information is taken from the Red M report www.gov.uk/government/publications/smart-meters-rf-survey.
[5] References to 868MHz in this document imply the 862-876MHz and 915-921MHz bandwidth.

introduced into the regulatory framework as soon as practicable – we noted that the 868MHz solution together with the 2.4GHz solution is expected to be capable of providing a HAN in approximately 95% of GB premises without the need for range-extending equipment. The GB smart metering industry, led by Energy UK and the Government, has been working with the ZigBee Alliance to develop an 868MHz solution suitable for use in GB smart metering; or an

- **Alternative HAN solution: '**Alternative HAN' is the generic name given to the solution(s) that will be needed to provide a HAN in up to 5% of premises that are unlikely to be served by either the 2.4GHz or 868MHz solutions without the use of range-extending equipment.

1.7. The Government has also published the Smart Metering Rollout Strategy[7], which provides further clarity on the roadmap for the period between DCC Live and completion of rollout. The availability of 868MHz and Alternation HAN solutions will be an important element of this strategy.

Summary of Proposals – 868MHz HAN solution

1.8. Chapter 2 sets out the key decision points, options and proposals relating to the implementation of the 868MHz ZigBee HAN solution in GB. The proposals are principally intended to protect and support the optimal use of the 868MHz bandwidth (there is less bandwidth available at 868MHz than at 2.4GHz) while maintaining coherence with the supplier-led rollout and the Programme's business case (including the need for device interoperability). These proposals follow work with industry over the last six months through a DECC chaired 868MHz HAN Solution sub-group to the Technical and Business Design Group (TBDG).

1.9. In summary the Government proposes that:

- the DCC should be required to provide a dual band (2.4GHz and 868MHz) communications hub, but not a single band 868MHz communications hub (it will still be required to provide a single band 2.4GHz communications hub);
- the import electricity meter should always be capable of using the 2.4GHz HAN solution (we do not intend to require the gas meter to always be capable of using 2.4GHz, therefore, energy suppliers could procure a single band 2.4GHz, single band 868MHz or dual band gas meter);
- energy suppliers should be required to take all reasonable steps to utilise the 2.4GHz HAN solution on the IHD they provide to consumers in preference to the 868MHz solution (which should only be used for the IHD where the 2.4GHz solution does not work);
- a dual band communications hub should be capable of supporting four high bandwidth (i.e. frequent communication of 10 seconds or better) links (to connect IHDs, CADs, etc., at the consumer's discretion);
- further work should be undertaken, including through evidence submitted to this consultation, to understand the costs and benefits of a high power 868MHz solution in comparison with low power 868MHz approaches before concluding on how these

[6] www.gov.uk/government/consultations/smart-metering-equipment-technical-specifications-second-version.
[7] www.gov.uk/government/consultations/smart-metering-rollout-strategy

should be utilised in GB smart metering. DECC also proposes to commission its own field trial to support this work.

1.10. The Government is using this consultation to gather comments and further evidence to support the final policy/ implementation decision-making process. When this consultation is complete, changes will be made to the SMETS, CHTS, Great Britain Companion Specification (GBCS) and wider regulatory framework to enact the implementation decisions taken.

Summary of Proposals – Alternative HAN

1.11. Chapter 3 sets out the key issues and options relating to the provision of an Alternative HAN solution. The proposals are based on work conducted with the HAN Strategy TBDG sub-group and interviews with a range of potential technology providers. A number of key findings emerged from this work:

- There is a range of different installation scenarios in which an Alternative HAN solution may be required;
- There is currently no single technology available that is suitable as the Alternative HAN solution in all of the installation scenarios that we have identified;
- Without co-ordination, interoperability and asset tracking issues are likely to surface and so increase the risk of asset-stranding of Alternative HAN solutions at change of supplier (as suppliers could each choose different and non-interoperable technologies);
- Without co-ordination, logistical issues are likely to surface, for example, suppliers and services providers could individually seek access to buildings, and multiple solutions may need to be installed in communal areas of buildings.

1.12. The Government proposes that provision of the Alternative HAN solution should be secured through a collective solution. The activities that should be considered as part of the collective solution include: surveying of buildings; technology selection; procurement of solutions; installation and maintenance of solutions; and service management and charging. We believe that there is a strong case for using an existing contracting, charging and governance vehicle; for example, under the Smart Energy Code (SEC) Company. Annex 4 sets out a possible delivery model for the collective solution. We invite views on this approach and alternative models.

1.13. Given that the rollout is supplier-led and that suppliers must provide a HAN in all premises, they are expected to play a central role in the development of the collective solution. The Government therefore proposes that energy suppliers should be required to work together under a suitable governance structure to help develop and deliver this collective solution. We also propose to require all energy suppliers to utilise the collective Alternative HAN solution. We invite views on these proposals and on any other changes to the regulatory framework that would be required to support delivery of the Alternative HAN collective solution.

2. 868MHz HAN Solution

The 868MHz HAN solution will significantly increase HAN coverage across GB premises compared to relying only on the 2.4GHz solution (from approximately 70% to 95%). This section sets out implementation options and proposals for the 868MHz solution.

Introduction

2.1. The research undertaken by Red M on behalf of DECC on the propagation of radio waves in GB buildings suggests that the 2.4GHz ZigBee Smart Energy Profile HAN standard that is specified in SMETS2 and CHTS will serve smart metering installations in approximately 70% of GB premises without the need for range-extending equipment[4]. In the remaining premises either the distance between the smart metering devices may be too great for 2.4GHz propagation or walls or other barriers may affect 2.4GHz signal propagation between the devices. The Government therefore concluded in its Response to the Consultation on the Second Version of the SMETS (January 2013) that an additional wireless solution at 868MHz should be developed and introduced into the regulatory framework to cost-effectively extend this coverage as soon as practicable. The Red M research suggests that an 868MHz solution (operating at low power (25mW)) should be capable of providing a HAN in approximately 95% of GB premises without the need for range-extending equipment.

2.2. Energy suppliers and device manufacturers have been working through the ZigBee Alliance to develop the 868MHz ZigBee Smart Energy Profile HAN standard. This standard is advancing well with the detailed requirements now being finalised in preparation for testing with prototype devices.

2.3. While GB market participants have played a central role in the development of the ZigBee 868MHz solution, ZigBee Smart Energy Profile is an international standard that builds in features and optionality that are likely to be attractive in other markets but are not needed as part of the GB solution. Therefore, as we have done for the 2.4GHz solution, we need to set out the implementation rules for the 868MHz solution specific to the GB smart metering implementation. These rules will typically be included in updated versions of the SMETS, CHTS and GBCS (the Government intends to make these changes according to the transitional governance arrangements of these documents). It is also possible that some changes will have to be made to the wider regulatory framework (for example, to energy suppliers' licence conditions or the SEC).

2.4. The following section sets out the key decision points, options and proposals relating to the implementation of the 868MHz ZigBee HAN solution in GB. These proposals have been developed in consultation with the 868MHz HAN Solution TBDG sub-group. This group includes representatives from energy suppliers, device manufacturers, the ZigBee Alliance and wider industry.

2.5. The proposals are principally intended to protect the business case and consumer experience by ensuring the 868MHz bandwidth (which is a limited resource compared to the bandwidth available at 2.4GHz[8]) is used efficiently, while maintaining coherence with the supplier-led rollout and the Programme's business case (including the need for device interoperability). The solution that the ZigBee Alliance is developing has been adapted to reflect the limitations of the 868MHz bandwidth, for example, it will utilise a shorter duty cycle than the regulated duty cycle to minimise interference risks[9].

2.6. The key areas where implementation decisions are needed are:

- Whether and how the 868MHz solution should be supported on each smart metering device: we had previously concluded that when the 868MHz solution was available suppliers would be able to choose the frequency at which each device operated (single band 2.4GHz, single band 868MHz or dual band; we assume the dual band communications hub will only be installed where a single band solution will not work, as the dual band communications hub is likely to cost more than a single band communications hub) through their procurement activity and ordering of communications hubs from the DCC;
- The numbers and types of links that the 868MHz solution should support: the CHTS (based on 2.4GHz) currently requires that the communications hub should be capable of supporting 24 high bandwidth links between smart metering devices on the HAN, this number of high bandwidth links cannot be supported by the 868MHz solution[10];
- Whether the 868MHz solution in GB should be high power capable: the emerging 868MHz ZigBee Smart Energy Profile HAN standard includes optional features to allow devices to incrementally increase the radio transmit power from 25mW to 500mW, which allows the signals to propagate further and so increase the range of the 868MHz solution. The high power solution includes active power control such that the device will always use the lowest transmit power needed to form communications links with other devices on the HAN. However, higher transmit power increases the risk of interference from neighbouring devices given that it propagates further and there is a limited number of high power channels.

Implementation Decisions

868MHz on the communications hub

2.7. The Government had anticipated that it would be possible to implement the 868MHz solution on the communications hub in a single band configuration (i.e. it would only support the 868MHz solution), or alongside the 2.4GHz solution as a dual band communications hub. However, during the early development of the ZigBee 868MHz specification ZigBee Alliance members indicated that they did not support the development of a single band 868MHz communications hub.

[8] 868MHz and 2.4GHz are licence exempt spectrum – any application can use the spectrum as long as it meets the appropriate Ofcom regulations.
[9] The 868MHz Solution TBDG Sub-group and an independent radio expert appointed by DECC has confirmed that the emerging 868MHz ZigBee solution is consistent with Ofcom's regulation for the licence exempt spectrum at 862-876 MHz and 915-921MHz.
[10] There are 49 low power channels, but only 13 high power channels in the 868MHz band.

2.8. ZigBee Alliance members argued that as the 868MHz bandwidth is limited, steps should be taken to protect it. They argued that foregoing a single band 868MHz communications hub could provide significant mitigation as it would allow 2.4GHz devices to be installed at each installation (if possible). In particular, they noted that this should mean that the link between the electricity meter and communications hub would be formed using the 2.4GHz solution as these devices will normally be co-located and so the 2.4GHz link should always work.

2.9. The ZigBee Alliance and energy suppliers also argued that the availability of the 2.4GHz solution on all communications hubs would be good for consumers as this will provide consumers with the option to connect 2.4GHz CADs to their smart metering system (although they may have to use repeaters in some instances to achieve this) as well as 868MHz CADs. They noted that this will allow more devices to be connected and probably give access to a wider range of CADs, as the 2.4GHz CADs market is global and therefore likely to be more vibrant than the 868MHz market (which is limited geographically due to differences in the availability and use of 868MHz bandwidth). Energy suppliers also claimed that the increased operational cost of handling an additional variant device (i.e. the single band 868MHz solution) would be significant.

2.10. The Government acknowledges that not requiring the DCC to provide a single band 868MHz communications hub has the potential to increase the equipment costs in certain scenarios – for example, where a dual band communications hub has to be installed in situations where a single band 2.4GHz communications hub does not achieve sufficient propagation and a 868MHz communications hub would have sufficed to achieve coverage.

2.11. However, we think these additional costs are finely balanced against the aforementioned consumer benefits of flexibility and bandwidth protection from a dual band communications hub and also potential development cost savings (i.e. as we will not require that an 868MHz electricity meter is developed) and operational efficiencies to suppliers (i.e. from not having to stock 868MHz electricity meter variants).

2.12. We therefore propose that the DCC should not be required to provide a single band 868MHz communications hub. Instead, in addition to the standard single band 2.4GHz communications hub, the DCC will be required to provide a dual band communications hub when such devices become available. We continue to be of the view that the deployment of a 2.4 GHz single band communications hub wherever possible (in terms of propagation) remains the most cost efficient approach.

2.13. The Government has been working with the DCC and wider industry to develop a plan as to when dual band communications hubs will be available. Important milestones will include: completion of the ZigBee 868MHz specifications; update and successful notification to the European Commission of the SMETS, CHTS and GBCS; product design and testing; consultation on communications hubs size and amendments to the communications hub support materials; product manufacture and delivery; etc.

2.14. Further work is needed to develop a detailed plan, but the DCC has suggested following initial work with its service providers and assuming that the ZigBee specification will be completed in late 2015, that the earliest timescale that dual band communications hubs are likely to be available is in the second half of 2017. Our assessment is that this would be compatible with current rollout plans of energy suppliers given that 70% of properties can be served with the existing 2.4 GHz solution. The Government has recently instructed the DCC to initiate its impact assessment

process with its service providers to provide a robust and time-bound delivery plan for dual band communications hubs.

Consultation Question	
1.	Do you agree that the DCC should be required to provide a dual band (2.4GHz and 868MHz) communications hub in addition to the single-band 2.4GHz communications hub, but not a single band 868MHz communications hub? Please provide evidence to support your response.

868MHz on the import electricity meter

2.15. There is currently no obvious use case for an 868MHz electricity meter as the electricity meter will always be co-located with the communications hub and so should not experience propagation problems. Furthermore, as a consequence of the recommendation not to pursue a single band 868MHz communications hub, any communications hub will always support the 2.4GHz solution.

2.16. The electricity meter is a high bandwidth device[11] and so if the communications link between it and the communications hub were formed using the 868MHz solution it would use a significant proportion of what is a limited resource when it is not necessary to do so (as 2.4GHz should always work for this link). We therefore propose to require, through the SMETS, that all smart electricity meters support the 2.4GHz solution – we believe that this will protect the 868MHz bandwidth as the link between electricity meters and communications hubs will very likely always use the 2.4GHz solution. The SMETS will not specifically bar the use of the 868MHz solution for electricity meters, as a use case for such devices may emerge, but there are likely to be commercial disincentives to its deployment as any electricity meters intended to use 868MHz would have to be dual band meters (as they must all be capable of supporting the 2.4GHz solution). Dual band meters are more expensive than single band.

2.17. This limitation would not apply to generation meters[12] as the SMETS only applies to import meters. It is possible that generation meters will need to utilise 868MHz to connect to the smart metering system as they can often be located away from the communications hub. As a consequence of clarifying the status of generation meters we will need to make some amendments to the existing versions of SMETS2 and CHTS. These changes are being progressed through the TBDG.

2.18. We do not propose similar limitations for the gas meter as there are use cases for 868MHz in gas meters (gas meters can often be distant from the communications hub) and in any case the connection between the gas meter and the communications hub would not utilise a high bandwidth link (as we understand that gas meters will be battery-powered and so they will only communicate every 30 minutes).

[11] High bandwidth devices are those with the ability to frequently communicate (for example, for the provision of real time information) such as electricity meters, IHDs, prepayment interface devices and CADs.
[12] A generation meter is one that is used to measure generation of electricity from an electricity generation source, for example from solar panels or a wind turbine.

Consultation Question	
2.	Do you agree that the import electricity meter should always be capable of operating using the 2.4GHz HAN solution? Please provide evidence to support your response.

868MHz on the mandated IHD

2.19. There are clear use cases for the 868MHz solution in IHDs as the IHD may be located away from the communications hub. However, as the connection between the IHD and the communications hub requires a high bandwidth link and there is limited bandwidth at 868MHz it is sensible that the 868MHz solution is only used for the IHD where necessary.

2.20. The Government therefore proposes to amend the SMETS to allow the IHD to utilise the 868MHz solution (including as a single band or dual band device), but to introduce an "all reasonable steps" requirement (in supply licence conditions or the SEC) on energy suppliers to utilise the 2.4GHz solution for IHDs where possible. The Government believes that this provides suppliers with the flexibility to meet installation scenarios while also protecting the 868MHz bandwidth from unnecessary use and so reducing the risk of interference issues.

Consultation Question	
3.	Do you agree that energy suppliers should be required to take all reasonable steps to utilise the 2.4GHz solution on IHDs where possible but that they should be permitted to use 868MHz where this is operationally necessary? Please provide evidence to support your response.

Number and type of high bandwidth links

2.21. The number of high bandwidth links that can be supported by the 868MHz solution is limited by the bandwidth available. Detailed analysis has been conducted by the ZigBee Alliance, device manufacturers and the Programme's independent radio frequency expert. There is strong consensus that four high bandwidth links can be supported by the 868MHz solution operating at low power (this number reduces when higher transmit powers are used due to increased propagation distance and fewer high power channels).

2.22. The Government has considered whether these links, or a subset of them, should be allocated to specific devices, for example to the IHD, CAD or Prepayment Interface Device (PPMID). While particular consideration was given to allocating one of the links to a CAD, as connection of a CAD is likely to be a consumer-led activity and could generate significant benefits, we do not think that it is necessary as ultimately the consumer will be able to control the devices that are connected to their smart metering system (the consumer must give their consent before devices are paired to the HAN). To support this flexibility and consumer choice, we propose to require through the

CHTS that the 868MHz solution provided on dual band communications hubs is capable of supporting four high bandwidth links, but not to specify which devices these links can be used for.

2.23. As part of these considerations, it was noted that as the 2.4GHz solution is proposed to always be provided on the communications hub, the consumer will also have the option of connecting CADs on the 2.4GHz bandwidth which has many more high bandwidth channels available. Given that the global market is much more developed for 2.4GHz devices (as 2.4GHz is utilised globally for these types of application, while 868MHz is not), it is likely that many more types of CAD will be available at this frequency.

Consultation Question	
4.	Do you agree that the 868MHz solution provided on dual band communications hubs should be capable of supporting four high bandwidth links? Please provide evidence to support your response.
5	Do you agree that we should not allocate these high bandwidth links to particular devices, for example CADs? Please provide evidence to support your response.

Use of low power and/ or high power

2.24. A number of market participants, particularly energy suppliers, have argued that the proposed high power capable 868MHz solution[13] should be utilised within GB smart metering, and as a minimum all dual band communications hubs should be high power capable (as this is needed if the smart metering system is to support the option for other devices to be high power).

2.25. High power should increase the number of premises that the 868MHz solution would support and thereby, in these cases, avoid the need to deploy an Alternative HAN solution. As such there is potential value from pursuing a high power 868MHz solution, but this has to be considered in conjunction with the cost impacts that arise from utilising the high power components – especially if they are deployed where not strictly necessary for propagation reasons. More significantly, the number of high bandwidth links that can be supported when using high power is significantly fewer than when using low power and excessive usage of high power risks creating interference in neighbouring premises.

2.26. The decision relating to the use of high power 868MHz is complex and the Government's ability to make the decision at this stage is limited by the evidence that is available. Variables requiring additional data are:

- The relative performance of the 868MHz solution at low and high powers – the RED M trial was conducted with low power equipment only and the number of difficult premises surveyed was low (however the Red M model suggests that low power 868MHz should achieve 95% coverage with potentially a small percentage uplift for high power);

[13] NB. The ZigBee solution uses adaptive power control so that it only uses a higher transmit power where necessary.

- The additional cost of implementing high power compared to low power in 868MHz devices – we have received some provisional estimates from device manufacturers but the estimated costs provided were variable (they suggested that providing high power would increase equipment costs, per device, by: £1-4 on the communications hub; £3-11 on the gas meter; and by £0.50-1.50 on the IHD);
- The additional operational costs of having high and low power device variants – energy suppliers and the DCC have stated that having multiple variants increases operational costs (production line, delivery, ordering system, training, installation time, etc.), but detailed cost evidence has not been provided.

2.27. Based on the evidence received to date we have conducted some modelling analysis on the likely costs using illustrative scenarios on possible coverage differences between the low and high power solutions in combination with the information about incremental equipment costs. This analysis is presented in Annex 1.

2.28. The results of the analysis are sensitive to changes in the assumptions about coverage and costs, so more detailed considerations are only possible once the evidence base about those two aspects has improved. However, the analysis suggests that:

- deploying high power 868MHz components in instances where not strictly necessary for coverage reasons (i.e. where either the 2.4GHz or the low power 868MHz solution would work), will always result in incremental (and arguably unnecessary) equipment costs.
- a larger difference between the coverage achieved by the high power solution and the coverage achieved by the low power solution will result in relatively smaller additional costs from deploying high power components in all 868MHz devices (vis-à-vis only deploying such components where it is necessary to increase coverage of the low power 868MHz solution) than would be the case in a scenario where the high power solution only increases coverage by a small amount.

2.29. The Government believes that the evidence needed to support a mandate for a high power solution, even if it is just limited to the dual band communications hub (devices connected to a smart metering system will only be able to use high power if the communications hub is high power capable), is not currently available. We note that requiring all dual band communications hubs to be high power 868MHz capable would remove the option for suppliers to reduce equipment costs by only ordering the more expensive high power variants for installation where they are needed for propagation reasons (the DCC charging methodology requires the DCC to levy a cost reflective explicit charge for variant communications hubs). We therefore ask stakeholders to provide further evidence to support our decision-making process.

2.30. The Government also intends to undertake a trial to provide further evidence of:

- the performance of low and high power 868MHz in low rise domestic multi-dwelling units (MDUs) and buildings that have been converted into MDUs;
- the number of high bandwidth links (that meet GB requirements – message size and 10 second updates) supported by the emerging ZigBee 868 solution at low and high power and at a range of deployment densities.

Consultation Question	
6.	Please provide evidence on the relative merits of pursuing the following 868MHz deployment options: (a) a low power only approach; (b) a mandate for high power capable dual band communications hubs only (leaving other devices to supplier choice); and (c) a mandate for high power on all devices. Please provide evidence to support your response – we are particularly interested in receiving information relating to the costs (equipment and operational) and benefits of the high power solution relative to the low power solution and to the likely impact of the high power solution on the limited bandwidth available at 868MHz.

Monitoring and oversight of the HAN solutions

2.31. The Government, working with a wide range of stakeholders, is currently playing a leading role in selecting the HAN standards to be utilised in GB smart metering and defining the technical specifications and implementation requirements associated with these standards. However as we move towards enduring governance arrangements, SEC parties and in particular energy suppliers will have a more central role in ensuring that the HAN standards utilised in GB smart metering and the associated technical requirements remain fit for purpose. There are existing requirements on the SEC Panel and the Technical Subcommittee (TSC) to review all the SEC requirements on a periodic basis and to propose improvements on an annual basis. As such the Government would expect that energy suppliers (who are responsible for providing the HAN in consumer premises), the SEC Panel and the TSC will monitor (from DCC Live) which HAN solutions are being provided in consumer premises and how they are performing, and will recommend changes to the technical specifications or associated implementation rules in order to optimise their performance such that consumer interests are protected.

Consultation Question	
7.	Do you agree that energy suppliers, the SEC Panel and the TSC should (from DCC Live) monitor which HAN solutions are being provided in consumer premises and how they are performing, and recommend changes to the technical specifications or associated implementation rules in order to optimise their performance such that consumer interests are protected? Are any changes to the SEC needed to provide for this? Please provide evidence to support your response.
8.	Are there any other steps that should be taken to protect the 868MHz bandwidth? Please provide evidence to support your response.

3. Alternative HAN Solution

Up to 5% of premises, including some MDUs and larger houses, are likely to require an Alternative HAN solution even after 868MHz becomes available. This section sets out proposals and further options relating to the provision of Alternative HAN solutions.

Introduction

3.1. An Alternative HAN solution will be required in premises where the communications links between smart metering devices cannot be formed (because the distance between the devices is too great or there are barriers affecting signal propagation between the devices) using the 2.4GHz or 868MHz HAN solutions, without the use of additional range-extending equipment. The Government's current assumption regarding the scale of the Alternative HAN solution is based on trials carried out by Red M, which suggested that the 2.4GHz and low power 868MHz solutions would serve approximately 95% of GB premises, leaving a gap of approximately 5% (Annex 2 provides a breakdown of the numbers and types of properties that are likely to require an Alternative HAN solution). As noted in Chapter 2, further trials are planned to test the performance of low and high power 868MHz solutions and so our understanding of the scale of the Alternative HAN issue could change.

3.2. The Government consulted on its approach to the Alternative HAN in the Consultation on HAN Installations in March 2014[1]. The Government concluded in November 2014 that changes should be made to the operational licence conditions to specify that the HAN suppliers are required to provide in consumers' premises must be a SMETS-compliant HAN. These changes are designed to ensure a consistent experience for consumers regardless of the type of property they have.

3.3. The amendments to the operational licence conditions are part of a wider set of changes that will be introduced in advance of the date when SMETS2 and the CHTS will be brought into legal force. This package is expected to be brought into legal force in advance of DCC Live.

3.4. In the November 2014 consultation response we recognised that the provision and maintenance of interoperable Alternative HAN solutions would require the cooperation of energy suppliers, technology providers and other industry parties. While we concluded that there was insufficient evidence to suggest that further regulatory intervention was needed to facilitate the development of the Alternative HAN solution, we agreed to work with industry to further explore the potential barriers to achieving 100% HAN coverage. As part of transitional governance arrangements, we therefore set up a Government-chaired sub-group to the TBDG – the HAN Strategy TBDG sub-group.

3.5. The sub-group has undertaken a structured review of the commercial, technological, logistical and regulatory issues and risks that exist at each stage in the Alternative HAN solution life-cycle and provided evidence on the different delivery models which could

be used to achieve an interoperable and cost effective solution to Alternative HAN provision that supports the Programme's business case.

3.6. The Government would like to take this opportunity to thank all parties who have contributed towards the work of the sub-group and all technology providers who provided evidence via the technology days.

Need for Multiple Alternative HAN Solutions

3.7. Within the subset of premises expected to require an Alternative HAN solution there are different types of buildings and device location configuration scenarios. The type of range-extending technology most suitable for each scenario could depend on a number of variables (for example, the fabric of the building, the distance between devices, the availability of a power supply, etc.). Annex 3 provides a summary of the likely types of Alternative HAN solutions.

3.8. To better understand whether there were technologies available to address each scenario, we invited potential technology providers to a series of technology days in December 2014. At these sessions technology providers were asked to describe potential solutions that would meet the GB requirements (compatibility with standard SMETS and CHTS equipment, positive consumer experience, provision of 10 second updates to IHDs, etc.) and to indicate when the solution would be available and how much it would cost.

3.9. Technology providers presented a number of potential Alternative HAN solutions that were at various stages of market readiness. They reported that some solutions were already available (for example, 2.4GHz ZigBee repeaters) while other technologies needed to be further developed and/or trialled in GB buildings before they were ready for mass deployment (for example, some solutions that used a building's existing wiring to extend the range of the HAN). Furthermore, many of the technology providers noted that far more complex communications issues have been solved in other markets and so technology should not be considered the main barrier. This view was shared by a number of other stakeholders, including energy suppliers. Energy suppliers and technology providers noted that the main barrier they faced was regulatory and commercial uncertainty (they claimed this uncertainty was limiting their ability to invest in technology trials).

3.10. Based on the evidence from the technology providers, the Government has concluded that there is currently no single technology solution available that is technologically and economically suitable as the Alternative HAN solution in all of the installation scenarios that comprise the 5% HAN coverage gap. We have therefore adopted the working assumption that a range of technologies will have to be selected to deliver an interoperable and cost effective Alternative HAN solution and that a decision on the appropriate technology for each installation scenario will also be needed.

3.11. Given that a range of technology solutions will be required, provision of individual solutions by energy suppliers could create significant interoperability issues and so increase the risk of asset-stranding at change of supplier (as suppliers could each choose different and non-interoperable technologies, and it may be difficult for asset providers to track and charge new suppliers for equipment). We also recognise that there are significant logistical challenges associated with installing HAN solutions in MDUs where landlords may be reluctant to accept the installation of multiple sets of

equipment by multiple suppliers at different times and to manage the associated maintenance requirements.

3.12. We therefore propose that the delivery model needs to ensure interoperability between each solution and the wider smart metering system, and that the impact on building managers, landlords and asset providers should be considered as part of the evaluation of options.

Consultation Question	
9.	Do you agree that there is currently no single technology solution available that is technologically and economically suitable as the Alternative HAN solution in all of the installation scenarios that comprise the 5% HAN coverage gap and that the focus should therefore be on ensuring interoperability between a range of solutions and the wider smart metering system? Please provide evidence to support your response.

Selection of the Alternative HAN Solutions

3.13. Taking our assumptions regarding the need for multiple solutions and the need for interoperability of solutions on change of supplier, we have considered a number of options for ensuring successful delivery of Alternative HAN solutions:

i. No new specifications and supplier-specific solutions

Individual suppliers would select, install and maintain the Alternative HAN solution (while complying with the wider smart metering requirements) to meet their rollout obligations.

ii. Common specifications for supplier-specific solutions

The Government or any SEC party would gather sufficient data and evidence to introduce one or more additional specifications into the regulatory framework. For example, requirements for a 'ZigBee repeater' could be added to the SMETS. Energy suppliers would then individually decide which SMETS-compliant Alternative HAN equipment to install as they would with a standard smart metering deployment.

iii. Collective solutions

An appointed body would deliver a collective Alternative HAN solution. This would consist of a range of activities including: surveying of buildings; technology selection; procurement of solutions; installation and maintenance of solutions; and service management and charging. Specifications could be developed as required by the appointed body or through the process described at (ii).

3.14. While the first option would provide flexibility to the market to install whatever technology was needed to extend the range of the SMETS HAN, it is likely to create a significant interoperability issue and so increase the risk of asset-stranding at change of supplier (as suppliers could each choose different and non-interoperable technologies). This could lead to a poor consumer experience and wasted investment. This option has been available to energy suppliers for several years and no significant progress has yet been made; choosing this option is therefore likely to increase the risk of continued inactivity.

3.15. Developing common specifications would facilitate interoperability and so reduce the stranding risk associated with the do-nothing option. However this model would not address the inefficiencies of a fragmented approach. Unlike the market for the smart meters that will be installed in all GB homes (more than 50 million meters), the market for Alternative HAN equipment is likely to be relatively small (our current assumption is that up to 1.5 million premises will require an Alternative HAN solution). If individual suppliers procured separately against specifications it is unlikely they would benefit from economies of scale.

3.16. Furthermore, this second option does not address the barriers to provision of shared solutions, which could be the most cost effective solution in many scenarios. Without supplier coordination, building owners and DNOs would also have to deal with multiple parties wishing to install equipment in communal spaces, which potentially creates inefficiency and access issues.

3.17. We therefore favour making regulatory provision for a collective solution (option iii) under which energy suppliers would be required to cooperate to determine which Alternative HAN technologies to employ and to install and operate them through a shared service arrangement. We believe that this should be suitably bounded to be limited to those aspects requiring a collective solution so as not to dilute the obligations on individual energy suppliers to continue to compete to provide the best service to their customers. In line with this principle, the scope of the collective solution would likely cover the installation of HAN solutions in common areas of MDUs which would be shared across multiple energy suppliers and the provision of interoperable Alternative HAN equipment for installation by energy suppliers, where needed, within the premises of their customers (for example, in large single dwellings).

3.18. This would require the establishment of a technical and logistical capability to:

- identify premises types requiring an Alternative HAN solution;
- select, procure and provide a range of solutions that would be interoperable with wider smart metering equipment;
- determine the suitability of procured equipment for specific premises;
- manage the service offered to energy suppliers; and
- allocate the costs appropriately.

3.19. Further work will be required to determine the optimal delivery model and its appropriate governance but the Government notes that the SEC Panel potentially provides appropriate structures. The Government has conducted initial thinking regarding a possible delivery model; this is presented in Annex 4. We invite views on this option and on alternative models.

Consultation Question	
10.	Do you agree that the most efficient way to deliver Alternative HAN solutions is an approach which provides a collective solution? Please provide evidence to support your response.
11.	Please provide comments on the possible (a) guiding principles, (b) activities, (c)

	contracting route and (d) charging model for the collective Alternative HAN solution described in Annex 4. Which other approaches should we consider and what are the relative merits of these alternative approaches? Please provide evidence to support your response.

Requirements on energy suppliers relating to the Alternative HAN Solution

3.20. Energy suppliers have expressed concerns, from a competition law perspective, about working together on the Alternative HAN solution. We envisage that energy suppliers will have a leading role in the development of a collective Alternative HAN solution. Therefore, we propose to introduce a requirement on energy suppliers to work together under a suitable governance structure to help develop and deliver an appropriate collective service for the timely and efficient provision of Alternative HAN solutions.

3.21. In order to make a shared service model operate effectively and efficiently it would be necessary to require all energy suppliers to adopt it in order to further reduce the risk of non-interoperable devices being installed and to prevent suppliers from gaining an unfair advantage by using solutions that they have not paid for. We propose to require that energy suppliers should only install Alternative HAN solutions that are provided through the collective solution. This requirement should also provide technology providers with increased confidence in the scale of the market that is available and so drive economies of scale cost reductions in the procurement.

3.22. Subject to consultation responses we will consult further on the implementation of the chosen approach.

Consultation Questions	
12.	Do you agree that energy suppliers should be subject to an obligation to work together to deliver a timely and efficient collective solution for Alternative HAN? Please provide evidence to support your response.
13.	Do you agree that energy suppliers should be required only to use Alternative HAN solutions that are supplied through the shared service approach? Please provide evidence to support your response.
14.	We would welcome views on any regulatory provisions that should be introduced to provide for the efficient delivery of an appropriate collective Alternative HAN solution? Please provide evidence to support your response.

4. Annex 1: Initial analysis on the costs of a high power 868MHz solution

4.1. We conducted some initial modelling analysis on the likely costs using illustrative scenarios on possible coverage differences between the low and high power solutions in combination with a range of incremental equipment costs.

4.2. The results of the modelling analysis are reflected in the tables below:

- Table 1 reflects the additional costs from deploying high power 868MHz components in the communications hub, gas meter and IHD under a scenario where the coverage boundary of 2.4GHz is 70%, the coverage boundary of low power 868MHz is 95% and the coverage boundary of high power 868MHz is 97%;
- Table 2 reflects the additional costs from deploying high power 868MHz components in the communications hub, gas meter and IHD under a scenario where the coverage boundary of 2.4GHz is 70%, the coverage boundary of low power 868MHz is 85% and the coverage boundary of high power 868MHz is 97%.

Table 1: Additional equipment costs where the high power 868MHz solution provides a small increase in coverage compared to the low power 868MHz solution (97% compared to 95%)

	HP only where necessary to improve coverage (95-97%)		HP wherever a 868MHz solution is necessary (70-97%)		HP everywhere except in the first 25% (25-97%)	
	low cost scenario	high cost scenario	low cost scenario	high cost scenario	low cost scenario	high cost scenario
Incremental communications hub costs (£m)	0.6	2.4	8.1	32.5	21.7	86.6
Incremental gas meter costs (£m)	1.8	6.6	24.4	89.3	65	238.2
Incremental IHD costs (£m)	0.3	0.9	4.1	12.2	10.8	32.5
Total incremental costs (£m)	**2.7**	**9.9**	**36.5**	**134**	**97.4**	**357.3**
Incremental cost per premise where coverage is extended (£)	4.5	16.5	60.8	222.8	192.6	594.0

Table 2: Additional equipment costs where the high power 868MHz solution provides a large increase in coverage compared to the low power 868MHz solution (97% compared to 85%)

	HP only where necessary to improve coverage (85-97%)		HP wherever 868MHz is necessary (70-97%)		HP everywhere except in the first 25% (25-97%)	
	low cost scenario	high cost scenario	low cost scenario	high cost scenario	low cost scenario	high cost scenario
Incremental communications hub costs (£m)	3.6	14.4	8.1	32.5	21.7	86.6
Incremental gas meter costs (£m)	10.8	39.7	24.4	89.3	65	238.2
Incremental IHD costs (£m)	1.8	5.4	4.1	12.2	10.8	32.5
Total incremental costs (£m)	**16.2**	**59.5**	**36.5**	**134**	**97.4**	**357.3**
Incremental cost per premise where coverage is extended (£)	4.5	16.5	10.1	37.1	27.0	99.0

5. Annex 2: Summary of the population of properties that are likely to require an Alternative HAN solution

5.1. The estimate that approximately 5% of premises will be served by an Alternative HAN solution; this roughly equates to 1.5 million premises. As outlined in this consultation, this estimate will be refined as more survey evidence is collected as part of any delivery model.

5.2. To provide more information about the type of metering configurations in these 1.5 million premises, and the types of building in which the premises are located, the HAN Strategy TBDG Sub-group submitted evidence to DECC which is summarised in the table below. Any premises where an alternative HAN solution will be required is likely to fall into one of the scenarios in this table. However, we expect some premises in the table (roughly 0.9 million of the 2.4 million - using the RED M assumptions) will be covered by the low power 868MHz (25mW) solution or even the 2.4GHz solution.

Table 3: Building types and meter scenarios where an Alternative HAN solution may be required

Potential wireless connectivity issues between…	Flats in converted buildings (mainly converted houses)	Purpose Built Compact Low rise[14]	Purpose Built Sprawling low rise[15]	Purpose Built Tenements[16]	Purpose Built 4 in-a-block[17]	Purpose Built High-rise[18]	TOTAL
…the IHD/CAD and electricity meter locations	552,241 premises (92,040 buildings	381,731 premises (19,087 buildings		6,246 premises (659 buildings)	10,491 premises (2,623 buildings)	51,606 premises (1,177 buildings)	1,002,315 premises (115,586 buildings)
…the gas meter and electricity meter location due to hard to reach internal gas meter	0 premises (0 buildings	37,829 premises (1,891 buildings		1,562 premises (165 buildings)	0 premises (0 buildings)	5,077 premises (109 buildings)	44,468 premises (2,165 buildings)
…the gas meter and electricity meter location due to hard to reach external gas meter	75,909 premises (12,652 buildings	247,609 premises (12,380 buildings		72,145 premises (7,615 buildings)	153,869 premises (38,467 buildings)	32,437 premises (630 buildings)	581,969 premises (71,744 buildings)
…the gas meter, electricity meter and IHD/CAD (gas meter located close to the IHD/CAD)	15,182 premises (2,530 buildings	65,341 premises (3,267 buildings		0 premises (0 buildings)	0 premises (0 buildings)	19,568 premises (432 buildings)	100,091 premises (6,229 buildings)
…the gas meter, electricity meter and IHD/CAD (gas meter located away from the IHD/CAD)	445,968 premises (74,328 buildings	196,024 premises (9,801 buildings		0 premises (0 buildings)	0 premises (0 buildings)	0 premises (0 buildings)	641,992 premises (84,129 buildings)
TOTAL	1,089,300 premises (181,550 buildings)	928,534 premises (46,426 buildings)		79,953 premises (8,439 buildings)	164,360 premises (41,090 buildings)	108,688 premises (2,348 buildings)	2,370,835 premises (279,853 buildings)

[14] Fewer than 5 storeys; fewer than 8 flats per stairwell per floor
[15] Fewer than 5 storeys; 8 or more flats per stairwell per floor
[16] (Scottish) A dwelling within a common block of two or more floors (commonly up to five storeys but may be higher in certain circumstances) where some or all of the flats have a shared or common vertical access. The selected dwelling need not share the access, but may be situated within the block with shared/common access (own door flat);
[17] (Scottish) Each flat in a block has its own independent access. Flats on the upper level have an internal or external stair.
[18] Five or more storeys.

6. Annex 3: Categorisation of Alternative HAN solutions

6.1. There are three important categorisations of Alternative HAN solutions:

- The way in which the solution uses technology to extend the range of the HAN;
- Whether the additional equipment provided as part of the solution uses range extension for a single HAN or for multiple HANs; and
- Whether all additional equipment to establish a HAN is located within the boundary of a consumer's premises (including out-buildings), and the consumer can grant permission to install the equipment.

Type of Range-extending technology

6.2. There are three ways in which range-extension can be provided:

- Bridging – an additional protocol is used to bridge between devices - taking a ZigBee message from one device and transporting it over an additional protocol to provide the ZigBee message to another device;
- Repeater - messages are received and retransmitted via an intermediate device – no additional protocols are used;
- A combination of both of the above.

Point-to-point versus Shared

6.3. A solution in which the additional equipment provides range extension for a single HAN is known as a point-to-point solution, while a solution in which the additional equipment provides range extension for more than one HAN is known as a shared solution.

Consumer realm versus communal

6.4. A solution where some equipment needs to be installed in communal areas (for example, in the stairwell of a block of flats) is known as a communal solution; a solution where the consumer can grant permission to install all required equipment is non-communal.

7. Annex 4: A potential approach to delivery of a collective Alternative HAN solution

Guiding Principles

7.1. There are many ways in which a collective solution could be delivered, but the Government believes that, as a minimum, the following outcomes (the 'Guiding Principles') should be delivered by any delivery model:

- achieve 100% coverage (i.e. the selected solutions should fill the gap where the 868MHz and 2.4GHz solutions will not work without additional equipment)
- be economically efficient (evaluated on end-to-end and full life-cycle basis);
- be Industry-owned with appropriate, non-discriminatory governance;
- not unnecessarily distort competition in the energy market;
- allow energy suppliers to meet their rollout obligations;
- not impact on the timely delivery of other programme milestones;
- ensure a consistent and positive consumer experience;
- be flexible and scalable to changes in the number of properties requiring an Alternative HAN solution;
- be transparent regarding costs of provision;
- encourage competition between technology providers to innovate, drive down costs and accelerate development of solutions; and
- meet the following technical requirements:
    - provide a SMETS HAN in the premises
    - utilise open standards where possible
    - be interoperable with SMETS and CHTS compliant equipment;
    - be capable of supporting 10 second updates to high bandwidth devices;
    - not compromise the end-to-end security model;
    - provide an energy efficient solution.

Activities to be provided as part of the solution

7.2. The collective solution is likely to be made up of several activities. The Government has worked with the HAN Strategy TBDG Sub-group to identify the activities that are likely to be common to any approach, which can broadly be split into three overarching packages:

- Surveying and database management:
    - Procurement of a service to develop a data base of building types requiring alternative HAN solutions and gather and collate information on building characteristics (for example, meter locations) and prevalence: this is a specialist activity and is likely to require significant insight into the potential

Alternative HAN solutions that are likely to be available as this may affect the data that needs to be collected,

- Management of Alternative HAN Provision:
    - Procurement of an Alternative HAN management service to:
        (A) Select the most appropriate technical solution for all premises identified in the survey;
        (B) Coordinate all relevant parties (e.g. Energy Suppliers, DNOs, building managers and landlords)
        (C) Commission delivery from the technology providers.
- Supply, installation and maintenance of a range of Alternative HAN solutions

7.3. The Government considers that these activities could be packaged into a single service or could be split across a number of services. A single integrated service may reduce the complexity of the management task for the body overseeing the procurement. However, it may not generate sufficient competitive pressures as only a few consortia are likely to be able to provide the full range of activities that the single service would not lead to best of breed suppliers for each service.

7.4. The surveying function, service management function and technical solutions will likely require very different skill sets. Splitting the procurements into separate services is likely to add to the complexity of the procurement task, but it is likely to generate increased competition as more organisations will be able to bid for the separate services according to their own expertise.

The contracting authority

7.5. A contracting authority would be required to undertake the procurement and to contract with service providers for the activities identified in the previous section. In order to fulfil the Guiding Principles this body will need to have or develop technical, financial, commercial, project management, legal and business expertise.

7.6. The body could be a new or an existing entity. We consider that the costs and timescales of setting up a new entity are likely to be considerable and there are, therefore, significant savings associated with using existing bodies such as SEC Panel (via the SEC Company) or the DCC.

7.7. The Government has also considered whether the DCC could act as the contracting authority. The DCC could call on resources to manage procurement and contracting activities and is subject to licence conditions to conduct any activities in an economically efficient manner. Provision of Alternative HAN services is, however, not directly related to the DCC's core services of providing and managing the WAN communications and data services. In addition, the Government's priority remains in ensuring that smart meters and communications hubs are available for DCC live.

7.8. The Government has considered the alternative option of obligating the SEC Panel (under joint DECC and Industry Governance) to undertake the procurement, contracting and operational oversight activities (via the SEC Company). This process would involve the development of requirements for each of the procurement lots followed by undertaking a tender exercise. A technical sub-group beneath the SEC Panel could work to develop requirements and to manage the evaluation process. Any decisions would need to be made by the SEC Panel which could allow greater transparency to the SEC Panel at different stages of solution delivery.

Charging

7.9. All energy suppliers are likely to supply premises that will require an Alternative HAN solution and such premises will be subject to change of supplier in the same way as any standard installation could be. We therefore believe it could be difficult and disproportionate to track and charge suppliers on an individual basis for their share of the costs of installing and using the Alternative HAN solution, an equation furthermore complicated as the cost of providing the Alternative HAN solution could be different across technologies and premises. In addition, cost-reflective charging could create a disincentive on suppliers to take on customers that will require what is likely to be a more expensive Alternative HAN solution. A possible approach to mitigate these risks would be to socialise the costs of the Alternative HAN solutions in a manner that is consistent with the approach for other smart metering central costs.

7.10. Socialisation of costs is, however, a significant step. Under such an approach it would be important to ensure that the correct incentives are in place to ensure that costs are kept under control and that Alternative HAN solutions are only provided where they are required.

Department of Energy & Climate Change
3 Whitehall Place
London SW1A 2HD
www.gov.uk/decc
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