Consultation on authorising higher duty cycle Network Relay Points

870 to 873 MHz

Consultation

Publication date: 2 September 2014

Closing Date for Responses: 14 October 2014

About this document

This consultation sets out proposals for authorising higher duty cycle Network Relay Points (NRPs) in the 870-873 MHz spectrum band.

NRPs are used in some networks to connect individual consumer devices together and to connect them to networks. This consultation seeks views on making it as simple as possible for stakeholders to set up and use wireless networks which need these NRPs and want to use this spectrum band.

Introducing licensing for NRPs will assist the early development of the emerging Internet of Things (IoT) and machine-to-machine communications. We believe this consultation will be of interest to the community of network and technology firms that are seeking to exploit the IoT. It is also likely to be of interest to stakeholders planning to manufacture or use short range devices in the 870-873 MHz band.

The consultation closes on 14th October 2014.

Contents

Section 1

Introduction

Spectrum for enabling growth and innovation in IoT applications

1.1 Enabling growth and innovation in Machine-to-Machine (M2M) and Internet of Things (IoT) applications is one of the priorities set out in Ofcom's Spectrum Management Strategy statement[1].

1.2 Short range IoT and M2M applications already use licence exempt spectrum. For example the 2.4 GHz Wi-Fi band is being used to link smart meters to energy consumption indicators in the home. However, at relatively high frequencies like those used for Wi-Fi, it can be difficult for short range applications to reach some indoor locations in homes and businesses.

1.3 Use of lower frequencies, particularly below 1 GHz, can make it easier for short range applications like M2M and metropolitan mesh machine (M3M) networking to reach those indoor locations that cannot be reached using the higher frequency bands. Earlier this year Ofcom released the 870-876 MHz and 915-921 MHz bands for licence exempt short range devices (SRDs) adding to the lower-frequency spectrum bands that can now be used for licence exempt SRDs, IoT and M2M applications. This was implemented through an amendment to the Wireless Telegraphy (Exemption and Amendment) Regulations 2010 ('2010 Regulations') on 27th June 2014 in accordance with the decision in our Statement published on 2 April 2014 (the '870/915 Statement')[2].

Network Relay Points

1.4 One type of device now permitted in these bands is a Network Relay Point (NRP). NRPs are used in some networks to connect individual consumer devices together and to connect consumer devices to networks. They aggregate and concentrate data from consumer devices and need to talk and listen to these. NRPs will therefore be more active than consumer devices. The ratio of talk to listen time is referred to as duty cycle.

1.5 The amended regulations enable NRPs with a duty cycle up to 2.5% to use the 870-873 MHz frequency range, but they do not permit NRPs with higher duty cycle values than this.[3]

1.6 Over half of the stakeholders who responded to our December 2013 consultation[4] highlighted the need to provide access to spectrum for higher duty cycle NRPs. These NRPs, designed with a duty cycle of up to 10%, will be more active than those currently permitted under Ofcom's SRD regulations. Some stakeholders said that use of higher duty cycle NRPs would reduce the cost of deploying new services

[1] http://stakeholders.ofcom.org.uk/consultations/spectrum-management-strategy/statement/
[2] http://stakeholders.ofcom.org.uk/consultations/proposal-wireless-telegraphy-exemption-2014/statement/
[3] See IR 2030, Page 81, Table: http://stakeholders.ofcom.org.uk/binaries/spectrum/spectrum-policy-area/spectrum-management/research-guidelines-tech-info/interface-requirements/IR_2030-june2014.pdf
[4] http://stakeholders.ofcom.org.uk/binaries/consultations/870-915/summary/870-915_condoc.pdf

to consumers because fewer NRPs will be needed in IoT, M2M and M3M networks. In our April 2014 Statement[5] we said we would bring forward detailed proposals for authorising higher duty cycle NRPs. Accordingly, the purpose of this consultation is to set out proposals to authorise the use of higher duty cycle NRPs (up to 10%) in the 870-873 MHz range.

1.7 Ofcom believes that if we permit higher duty cycle NRPs in the 870-873 MHz band these will need effective interference mitigation protocols. Without such protocols the benefits from increased scope for innovation from SRDs in the 870-873 MHz band may be reduced or lost. Therefore we have continued to support the European standardisation process for SRDs and the development of protocols[6] that could allow higher duty cycle NRPs to be permitted in the 870-873 MHz band alongside other SRD uses.

1.8 In mid-June 2014 the European Telecommunications Standards Institute (ETSI) agreed that the draft European standard for SRDs[7] should be released for consultation. This standard includes politeness protocols for higher duty cycle NRPs in the 870-873 MHz band.

1.9 Ofcom believes that that the timescales for ETSI and the Conference of European Posts and Telecommunication Administrations (CEPT) to conclude on a pan-European regulatory solution for these NRPs could be slower than the pace of change in the UK. This means that the potential benefits of early adoption of some IoT, M2M services and for M3M networks in the UK may not be realised if we wait for Europe to conclude.

1.10 In summary, the proposal set out in this document is to create a network licence, available on application, that permits the holder to use higher duty cycle NRPs (of between 2.5% and 10%) in the 870-873 MHz portion of the 870-876 MHz band (sharing spectrum access with lower duty cycle NRPs and with SRDs that are already authorised in this spectrum under the current licence exemption). The network licences would require the licensees to:

- keep records of where they deploy higher duty cycle NRPs; and
- ensure that higher duty cycle NRPs use effective politeness protocols.

1.11 We anticipate that Europe is likely to reach final conclusions on a pan-European regulatory solution for these NRPs by 2016. The demand for spectrum for higher duty cycle NRPs may also become more concrete over the coming year or two. Therefore, we are proposing to review the authorisation approach in 2016 to take account of those developments. This review could result in changes to how we authorise these devices.

1.12 We invite views on these proposals. This consultation closes on 14th October 2014.

[5] http://stakeholders.ofcom.org.uk/consultations/short-range-devices/statement/
[6] See: http://stakeholders.ofcom.org.uk/market-data-research/other/technology-research/research/exempt/polprot/
[7] EN 303 204 Parts 1 and 2

Impact assessment

1.13 The analysis presented in section 3 this document represents an impact assessment, as defined in section 7 of the Communications Act (2003). Impact assessments provide a valuable way of assessing different options for regulation and showing why the preferred option was chosen. They form part of best-practice policy-making. This is reflected in section 7 of the Act, which means that generally we have to carry out impact assessments where our proposals would be likely to have a significant effect on businesses or the general public or when there is a major change in our activities. However, as a matter of policy, we are committed to carrying out and publishing impact assessments in relation to the great majority of our policy decisions. For further information about our approach to impact assessments, see the guidelines "Better policy-making: Ofcom's approach to impact assessment".

Equality impact assessment

1.14 Ofcom is required by statute to assess the potential impact of all our functions, policies, projects and practices on race, disability and gender equality. Equality Impact Assessments (EIAs) also assist us in making sure that we are meeting our principal duty of furthering the interests of citizens and consumers regardless of their background or identity. It is not apparent to us that the outcome of our proposed approach for the licensing of higher duty cycle NRPs using the 870-873 MHz band is likely to have any particular impact on race, disability or gender equality. Specifically, we do not envisage the impact of any outcome to be to the detriment of any group of society.

Further information

1.15 Ofcom consulted on a range of proposals including exempting SRDs using the 870-876 MHz band from requiring individual licences in the document "Wireless Telegraphy Licence Exemption – Amending the Wireless Telegraphy (Exemption) Regulations 2003" available on the Ofcom website at: http://www.ofcom.org.uk/consult/condocs/wtexemption/.

1.16 The Regulations, which are now in force, can be found on the Ofcom website at: http://www.ofcom.org.uk/radiocomms/isu/licence_exempt/regulations/

1.17 Further background information on the 870-876 MHz and 915-921 MHz bands is available at http://stakeholders.ofcom.org.uk/consultations/short-range-devices/statement/ and http://stakeholders.ofcom.org.uk/consultations/870-915/

Remainder of this document

1.18 In the remainder of this document we:

- provide the legal framework for authorising spectrum use and outline the relevant European processes, which are the context for this consultation, in section 2;
- describe and analyse the range of licensing options available to us to authorise the use of higher duty cycle NRPs in section 3;
- set out our proposed licence conditions for the licence in section 4. A draft copy of the proposed Licence is set out in Annex 5; and

- outline our timetable for the remaining steps in our process in section 5.

Section 2

Context

Legal framework

2.1 Ofcom is responsible for authorising civil use of the radio spectrum and achieves this by granting wireless telegraphy licences under the Wireless Telegraphy Act 2006 (the 'WT Act') and by making regulations exempting users of particular equipment from the requirement to hold such a licence. When considering issuing a licence we must comply with the provisions set out in section 8 of the WT Act.

2.2 Under section 8(4) of the WT Act, we have to make regulations to exempt equipment (as opposed to issuing a licence) if its installation or use is not likely to:

- involve undue interference with wireless telegraphy;
- have an adverse effect on technical quality of service;
- lead to inefficient use of the part of the electromagnetic spectrum available for wireless telegraphy;
- endanger safety of life;
- prejudice the promotion of social, regional or territorial cohesion; or
- prejudice the promotion of cultural and linguistic diversity and media pluralism.

2.3 If these conditions do not apply then section 9(1) of the WT Act gives us the power to grant wireless telegraphy licences subject to such terms as we think fit. This broad discretion is, however, subject to the rule that we must impose only those terms that we are satisfied are objectively justifiable in relation to the networks and services to which they relate, not unduly discriminatory and proportionate and transparent as to what they are intended to achieve (see Section 9(7)). Section 8B and 8C outline the restrictions on us issuing an exclusive[8] licence.

2.4 Section 12 of the WT Act permits Ofcom to charge fees for wireless telegraphy licences, subject to certain specified exemptions relating to licences granted in accordance with auction regulations made under section 14 of the WT Act. Under Article 13 of the Authorisation Directive, any fees imposed for rights of use of radio frequencies must reflect the need to ensure the optimal use of the resources. Such fees must be objectively justifiable, transparent, non-discriminatory and proportionate in relation to their intended purpose and take into account the objectives set out in Article 8 of the Framework Directive.

The citizen and/or consumer interest

2.5 Ofcom's principal duty under section 3 of the Communications Act 2003[9] is to further the interests of citizens in relation to communications matters; and of

[8] As defined in section 8B(6) of the WT Act
[9] http://www.legislation.gov.uk/ukpga/2003/21/section/3

consumers in relevant markets, where appropriate by promoting competition. Ofcom takes account of the impact of its decisions upon both citizen and consumer interests in the markets we regulate. Ofcom must, in particular, secure the optimal use for wireless telegraphy of spectrum and have regard to the principle under which all regulatory activities should be targeted only at cases in which action is needed.

2.6 In addition, under section 3(4), Ofcom must have regard to the desirability of encouraging investment and innovation in relevant markets as well as to further the interests of citizens and consumers.

European progress

2.7 Ofcom's statement[10] in April 2014 provided a detailed update of the progress of European compatibility studies for SRDs (see Reports 189[11] and 200[12]) and the development in ETSI of a European harmonised standard for SRDs using the 870-876 MHz and 915-921 MHz bands. Since then the ETSI Technical Committee for Electromagnetic Compatibility and Radio Matters (TC ERM) has agreed that the draft European harmonised standard for network-based SRD equipment in the 870-876 MHz frequency range with power levels ranging up to 500 mW[13], (EN 303 204 parts 1 and 2), should be sent for public enquiry. This draft standard includes a requirement that higher duty cycle NRPs have a politeness protocol[14] called 'clear channel assessment' to determine whether a channel is available for use or not.

2.8 The process for commenting and voting on the draft standard is open to any UK stakeholders who are registered with the relevant Committee of the British Standards Institute (BSI). UK stakeholders can comment on the draft standard during the public enquiry phase until 12th September 2014. If there are conflicting comments from different stakeholders, the UK convenor appointed by BSI may decide to hold a comment resolution meeting. In Europe the final close date for ETSI TC ERM to receive comments from the UK from BSI is 10th October 2014. We understand that ETSI plans to publish its standard in April 2015.

[10] See Annex 2 of http://stakeholders.ofcom.org.uk/binaries/consultations/870-915/statement/statement.pdf

[11] http://www.erodocdb.dk/Docs/doc98/official/pdf/ECCREP189.PDF

[12] http://www.google.co.uk/url?sa=t&rct=j&q=&esrc=s&frm=1&source=web&cd=1&cad=rja&uact=8&ved=0CCIQFjAA&url=http%3A%2F%2Fwww.cept.org%2Ffiles%2F1051%2FTools%2520and%2520Services%2FPublic%2520Consultations%2F2013%2FDraft%2520ECC%2520Report%2520200.docx&ei=XxDJU-m1KvHa0QXFgYHwAQ&usg=AFQjCNGC6dLnBoJaAotpcSqvjPRh196Big&bvm=bv.71198958,d.d2k

[13] http://www.etsi.org/deliver/etsi_en/303200_303299/30320402/01.01.00_20/en_30320402v010100a.pdf

[14] See draft EN 303 204, section 8.3

Section 3

Options for Authorisation

Introduction

3.1 In this section we consider the case for proceeding with authorisation of higher duty cycle NRPs and the choice of most appropriate authorisation method. We begin with a short discussion of some key factors that affect authorisation. We then consider:

- Whether to authorise higher duty cycle NRPs now (i.e. at the earliest opportunity, as opposed to waiting until the European regulatory position has been finalised);
- The most appropriate method of authorisation; and
- The implications for future review of this authorisation method.

3.2 Ofcom's objective when exploring these questions is to identify the authorisation option that secures the benefits from new IoT, M2M and M3M for citizens and consumers as quickly as possible, whilst ensuring that the spectrum is used in the most efficient way.

Factors affecting authorisation

3.3 IoT, M2M and M3M services and networks supporting these are only just starting to emerge. Ofcom is therefore uncertain how the demand for spectrum for these networks is likely to grow. However, Ofcom does recognise that stakeholders may want to exploit the IoT as soon as possible. Licensing higher duty cycle NRPs before a pan-European regulatory solution is finalised could help stakeholders do this.

3.4 A number of factors are relevant to the choice of authorisation arrangement for higher duty cycle NRPs. These include:

- how many networks are likely to be deployed with higher duty cycle NRPs, how many NRPs may be needed in each network and their density of deployment
- whether networks will be national, regional or opportunistic in the way they are planned and deployed
- whether politeness protocols (such as Clear Channel Assessment) will:
    - allow multiple IoT, M2M and M3M networks to compete effectively if higher duty cycle NRPs are deployed in large numbers
    - be effective at controlling interference to other IoT, M2M and M3M networks
    - whether some SRD uses might avoid the 870-873 MHz band for other parts of the radio spectrum if higher duty cycle NRPs are deployed in large numbers.

3.5 Further stakeholder input is welcome on these factors, particularly on the issues set out in questions 1 to 6 below.

Density of Network and NRP deployment

3.6 The density and number of Network Relay Points that are likely to be deployed could have important implications for how access to spectrum is authorised.

3.7 CEPT Report 200[15] says that the nature of smart metering, smart grid and M3M applications means that NRPs[16] may be deployed by professional organisations in low densities of around 10 devices per square kilometre outdoors. The Report also indicates that this density of deployment should be ensured by regulatory means.

3.8 If the density assumption made by the CEPT of 10 NRPs/ km^2 is reached or exceeded there could be many thousands of NRPs deployed in the UK. If this were the case, individual licensing of higher duty cycle NRPs is likely to be burdensome and to the detriment of innovation.

3.9 If the aggregate deployment density of high duty cycle NRPs *within* a network was to exceed 10 NRPs/ km^2, the CEPT and ETSI studies suggest that intra-network interference can be managed by the network operator concerned.

3.10 However, if the aggregate density of NRPs deployed in *different* networks reaches or exceeds 10 NRPs/ km^2 there may be a risk of some SRD devices and networks failing because of an increase in radio interference, resulting in a 'tragedy of the commons'. As a result the benefits from innovation in the 870-873 MHz band may be reduced or lost.

3.11 One way to avoid this outcome may be to limit the density of NRPs or the number of networks deployed. However, this would add considerable complexity to the authorisation mechanism. In any case, network operators may be able to manage this risk themselves by exchanging information on the deployment of higher duty cycle NRPs and developing and using an industry code of practice for coordinating NRP deployments (also see paragraphs 3.42-3.44 below). In addition, the use of effective politeness protocols, such as Clear Channel Assessment, will also be important and is discussed further below.

3.12 We there would welcome the views of stakeholders on density and number of Network Relay Points that are likely to be deployed and how interference between networks might be managed through the exchange of information on NRP deployments.

Question 1. Do you have any evidence to inform Ofcom's view on the potential density of higher duty cycle (up to 10%) NRPs deployments, whether this is likely to exceed 10 NRPs/ km^2 and the total number of higher duty cycle NRPs that might be deployed?

[15] For CEPT Report 200 see: http://www.google.co.uk/url?sa=t&rct=j&q=&esrc=s&frm=1&source=web&cd=1&cad=rja&uact=8&ved=0CCIQFjAA&url=http%3A%2F%2Fwww.cept.org%2Ffiles%2F1051%2FTools%2520and%2520Services%2FPublic%2520Consultations%2F2013%2FDraft%2520ECC%2520Report%2520200.docx&ei=XxDJU-m1KvHa0QXFgYHwAQ&usg=AFQjCNGC6dLnBoJaAotpcSqvjPRh196Big&bvm=bv.71198958,d.d2k

[16] CEPT Report 200 refers to these devices as Network Access Points.

Question 2. Do you have a view on how intra-network interference caused by NRPs deployed in large numbers within a network will be managed?

Question 3. Do you have any evidence that networks may fail if the aggregate density of higher duty cycle NRPs reaches or exceeds 10 NRPs/ km^2?

Question 4. Do you have any views on whether exchanging NRP deployment information between licensees and developing and using an industry-managed code of practice would be practical and sufficient to manage the risk of some networks failing?

Politeness protocols

3.13 The use of effective interference mitigation protocols by higher duty cycle NRPs is an important factor to consider when deciding on authorisation arrangements. The adoption of politeness protocols has the potential to reduce the risk of interference between NRPs and between NRPs and other SRDs. Indeed, we think it sensible that an authorisation regime mandates the adoption of politeness protocols for this reason.

3.14 In order to make maximum use of the available channels for higher duty cycle NRPs, ETSI has proposed a requirement[17] that these devices use a protocol that makes them listen for other uses of the spectrum before talking and adaptively change channel if necessary. The particular protocol proposed for the ETSI standard is referred to as Clear Channel Assessment (CCA). Before transmitting, a device implementing CCA will sense a channel for a short interval of time (at least the clear channel assessment interval) to determine if it is free. If the average level of the radio noise in the channel over the interval is below a specified threshold[18] the NRP device transmits. If the average level is above the threshold, the CCA protocol defers transmission to a later time.

3.15 ETSI has opened the enquiry phase for the new standard, including the CCA protocol and we are keen to understand what stakeholders think of ETSI's proposals to mandate CCA. We note, however, that it is possible that other protocols and methods for ensuring politeness (aside from CCA) might be developed in due course that might also be suitable. If so, we consider that the authorisation regime should not close down the possibility of deploying NRPs on this basis. The ETSI enquiry phase closes in October and we should be able to take account of the results of this enquiry phase before specifying the requirement for a politeness protocol in our decision on authorisation regime (which we expect to make around the end of this year, depending on the responses to this consultation).

Question 5. Do you think CCA as defined by ETSI will be an effective protocol for (a) managing interference between networks? (b) managing interference to short range devices using the 870-873 MHz band?

Question 6. Do you have a view on the costs and benefits of adding effective mitigation protocols such as Clear Channel Assessment to higher duty cycle NRPs?

[17] See Draft ETSI EN 303 204-1 V1.1.0 (2014-06)
[18] The (kTB) threshold specified is -91dBm plus 10 dB. E.g. -81 dBm.

Case for authorising higher duty cycle NRPs now

3.16 In our April 14 Statement[19] we said that there is sufficient evidence for us to consider a license arrangement for these devices now. This view was based on the extent of industry effort being put into the new ETSI standards to accommodate NRPs and the demand for NRPs expressed in consultation responses.

3.17 Representations from industry suggest that the use of higher duty cycle NRPs could reduce costs of deploying IoT and make it more feasible to develop and deploy IoT, M2M and M3M-based services. From this perspective, the authorisation of higher duty cycle NRPs is likely to be consistent with our duties and functions under the Communications Act 2003.

3.18 The risk associated with authorising higher duty cycle NRPs is that their deployment might lead to interference between different IoT networks and interference to other SRDs authorised under the Wireless Telegraphy (Exemption and Amendment) Regulations 2010 ('2010 Regulations').

3.19 The recent work on these issues in CEPT and ETSI now provides a degree of confidence that it will be possible to deploy higher duty cycle NRPs, at least to some density level, without creating undue risks of interference between networks. In particular, the CEPT work indicates that deployments up to densities of 10 / km^2 should be feasible. The more recent work on the inclusion of a politeness protocol in work on the ETSI standard, if carried through to conclusion as we anticipate, should increase the ability of different NRP networks to operate alongside each other. We also note that NRP network deployment is likely to be self-limiting – if it becomes more difficult for NRPs to operate effectively as their density of deployment increases, then operators are unlikely to increase deployment density further. These considerations are also likely to provide adequate protection for other SRDs - this is because NRPs with a duty cycle of up to 10% would be likely to experience problems before SRDs with a duty cycle of 2.5% or less and, as noted above, the deployment of NRPs is likely to be self-limiting at the density where they start to suffer interference.

3.20 We therefore consider that, in principle, it is appropriate to authorise higher duty cycle NRPs. There is, however, a separate question as to whether it would be better to authorise their use now (i.e. at the earliest opportunity following this consultation process) or whether to wait until the ETSI standards are in place and, potentially, until there was a European requirement to authorise higher duty cycle NRPs. If a requirement were to be developed we think it would not happen until 2016 `as there are a number of steps that would need to be taken including:

- ETSI developing the harmonised standard EN 303 204 for Network Based SRD 870-876 MHz, (including NRPs) and this being approved and positively voted for;
- amending the CEPT's SRD Recommendation (70-03) to include higher duty cycle NRPs; and

[19] http://stakeholders.ofcom.org.uk/binaries/consultations/short-range-devices/statement/statement.pdf

- the European Commission considering a mandatory change to the harmonisation Decision[20] for SRDs.

3.21 The case for waiting until Europe has mandated a harmonised approach for higher duty cycle NRPs is that it would ensure that authorised use in the UK would be in line with the rest of Europe. This could avoid the risk of stakeholders incurring added costs in the event that there was a significant change to the technical specifications (and that the UK had to change the initial authorisation regime to come into compliance).

3.22 The dis-benefit of waiting for Europe to develop a harmonised approach for higher duty cycle NRPs is that this would delay the potential to roll out of these devices in the UK until then. Moreover, there has not yet been any formal indication at this stage that the Commission will develop a mandatory harmonisation measure (although we would not expect it to do so before the relevant ETSI standard is in place).

3.23 In weighing up these competing considerations we judge that the ETSI standard has now reached a stable position. We also note that, if there were to be pressure to change aspects of the draft standard, then this would become apparent through the ETSI enquiry phase which will complete before a new UK authorisation regime could be put in place anyway. In addition, we would expect any subsequent European mandatory harmonisation measure to be based on the ETSI standard. Accordingly, we consider that the risks are small of the technical aspects of a UK authorisation regime being out of step with a subsequent European harmonisation measure. Nonetheless, operators will need to weigh up the benefits of deploying networks early against the risk that the technical aspects of the UK authorisation regime changes in the future to align with a European harmonisation measure. We believe that operators are likely to be better placed to make this judgement (on the timing of deployment) than Ofcom.

3.24 Furthermore, as noted above, the risk of interference between NRPs depends on how the market develops (density of deployments by different operators) and on the effectiveness of politeness protocols that are developed. IoT, M2M and M3M services and networks supporting these are only just starting to emerge. Ofcom is therefore uncertain how the demand for spectrum for these networks is likely to grow. We will be better able to make more informed judgements on these matters in light of experience with actual deployments, something which will only be possible once an authorisation regime is in place to allow deployments to take place.

3.25 On balance, we consider there is a good case to proceed now with authorisation of higher duty cycle NRPs. However, the above discussion also points to the desirability of reviewing the initial authorisation regime in light of experience from real deployments and in light of European regulatory developments (see paragraphs 3.45 - 3.47 below).

Authorisation options

3.26 The options for authorising high duty cycle NRPs relate to :

- The choice between licence exemption or creation of a new licence type; and

[20] The European Commission has provided guidance on mandatory harmonisation of SRDs in the 870-876 MHz band in the 6th update of EC Decision 2006/771/EC.

- the nature of the licensing regime, which can be divided into the following choices:
    - licensing of individual NRPs v. licensing of a network of NRPs; and
    - whether or not to limit the number of licences available.
- other requirements on authorised users (coordination between NRPs).

Licence exemption v. new licence type?

3.27 If there was little or no risk of interference from deployments of higher duty cycle NRPs then we would licence exempt their use. This would minimise the regulatory burden for operators (as well as for Ofcom) and would be consistent with our duty to licence exempt spectrum use in these circumstances. It is possible that the development of appropriate politeness protocols, and experience from actual deployments, may make it possible to create a licence exempt regime in the future. However, we cannot be confident on the basis of current information that this would be the case. Indeed, it is possible to envisage an alternative scenario in which a more restrictive authorisation regime was necessary (for example, to limit the aggregate density of high duty cycle NRP deployments).

3.28 If we were to licence exempt higher duty cycle NRPs now this decision might be difficult to reverse in practice if subsequent experience indicated that we needed to move to an licenced approach (e.g. in order to limit density of deployment or enable coordination between different networks). For example, we may not know who had deployed NRPs or have access to information about how many, and where they had been deployed.

3.29 In contrast, a licensing regime for higher duty cycle NRPs would make it easier to adapt the authorisation arrangements if justified in light of experience of the impact on other spectrum users (either to tighten the arrangements if needed or, alternatively, to move to a more permissive, licence exempt regime). It would also provide us with a mechanism to gather information on deployments to help us assess the risk of interference both between networks deploying higher duty cycle NRPs and to other SRD uses of the 870-873 MHz band. As discussed above, we do not yet know what the aggregate density of NRPs deployed in different networks will be, and there may remain a risk that Ofcom may have to limit the number of NRPs or the number of licensed networks in future.

3.30 Although an initial authorisation would seek to ensure that the technical conditions are aligned as far as possible with those expected to be used by the rest of Europe, a risk would remain of Ofcom having to change aspects of its authorisation approach and/or technical specifications in light of any European decision, potentially after equipment has been placed on the market and brought into use.

3.31 We therefore believe that a licensed approach, which could provide greater ability to manage interference and more flexibility to modify arrangements in light of experience and in light of European regulatory developments, is more suitable at this moment in time.

Nature of licensing regime

3.32 There are a number of options for licensing NRPs which are defined by the choices set out below.

Individual vs network licensing approach?

3.33 An individual approach to licensing would mean that each NRP would require a licence. This approach would mean that Ofcom's licensing system would hold accurate and up to date information on the location of all licensed NRPs. This would help to identify NRPs if they caused interference to other spectrum users.[21]

3.34 As discussed in paragraph 3.8 there is the potential for there to be many thousands of NRPs deployed in the UK. This suggests that individually licensing higher duty cycle NRPs could be burdensome and potentially involve significant administrative costs.[22] Moreover, it would take longer to implement and so delay NRP deployment to the detriment of innovation.

3.35 The alternative is a network licence which authorises the licence holder to deploy higher duty cycle NRPs subject to the conditions of that licence, one of which would be an obligation on the licensee to keep accurate records of its NRP locations and to provide this information to Ofcom on request. This requirement would mean that the relevant information on NRP location can still be obtained in order to help investigate interference issues and to inform our assessment of the actual deployments in the context of a future review of the authorisation regime.

3.36 Accordingly, we propose to adopt a network licence approach.

Limited or unlimited number of network licences?

3.37 There could be case to limit the number of network licences, and / or to limit the density of deployment by individual licensees, in order to limit the overall density of NRP deployment. Limitations of this nature could help to limit the risk of interference that might be associated with high density of NRP deployment. This could be done by:

- giving exclusive access to one network in each area (region) of the UK; or
- limiting the number of network licences permitting access in any given region, possibly with a limit on the density of deployment by each network operator in addition.

3.38 The alternative would be to place no limit on the number of licences granted. Under this (unlimited, shared spectrum access) approach, licences would be available on demand and there would be no limit on the number of licences. All licensees would have equal rights to access spectrum in any part of the UK.

3.39 If we were to limit the number of licences in one of the ways set out in paragraph 3.37 above then, if there of potential demand for more licences than we make available, we would need to assign these licences through a competitive award process, for example an auction. However, it would be time consuming and costly to design and hold a competitive award process. It would delay significantly the potential to roll out new services and so hinder the development of new IoT, M2M

[21] It would also make it easier to coordinate between different networks if we were to adopt an Ofcom led coordination approach (however, we are not proposing this approach – see paragraphs 3.42-3.44).
[22] Note that Ofcom aims to recover its costs when authorising WT Act licences. See http://stakeholders.ofcom.org.uk/consultations/cbfframework/statement

and M3M services. This option is therefore unsuitable in this case. Moreover, we think that granting exclusive, or limited, access should not be necessary if ETSI's work on politeness protocols is successful.

3.40 In contrast, a shared access approach in which network licences are available on demand could be implemented quickly. Significantly, we consider this approach is feasible if effective interference mitigation protocols are added to higher duty cycle NRPs as we propose above.

3.41 For broadly similar reasons, we do not consider it desirable to limit the density of deployment by any individual licensee (at least, not as part of the initial authorisation approach). If we did so there is a risk that we might set a limit that is tighter than it needs to be and so constrains deployments unnecessarily. As noted above, we think that the politeness protocol will facilitate coexistence between different networks and that NRP deployment will be self-limiting to some extent. We think a better approach would be to place no restriction on the permitted density of NRP deployment at this stage and to monitor experience of any interference, if it happens, as real networks are deployed. We could then introduce some limitations if needed as part of a future review if the authorisation arrangements.

Coordination for NRPs

3.42 For a number of licences that Ofcom issues we coordinate the deployment of equipment in order to ensure that there is no undue interference between users. For this approach to work for networks deploying higher duty cycle NRPs Ofcom would need to technically coordinate each individual NRP deployment prior to authorising it use. This would impose costs on licensees and on Ofcom and could delay the availability of licences.

3.43 An alternative would be to require licensees to adhere to a coordination procedure. The procedure could either be developed by Ofcom or by interested stakeholders. This would take time to set up, although the time needed to establish such arrangements and implement them would be minimised if they were developed by stakeholders.

3.44 Given that IoT, M2M and M3M technologies are at an early stage in their evolution, and that interference may not be an issue until NRP deployment densities reach or exceed 10 NRPs/ km^2, mandatory coordination arrangements may not be an appropriate condition of licences at this point in time. In addition, we expect that licensees will, in any case, have an incentive to coordinate deployments between themselves if there is a reciprocal risk of interference between their networks. However, as part of any future review, a decision could be taken to vary the licence conditions in order to include such a provision, for example if voluntary industry self-coordination were to prove ineffective.

Future review of authorisation

3.45 We have noted in several places that we would need to review an initial authorisation regime of the type outlined above. This future review may look at whether there:

- is further practical evidence on the actual density of NRP deployments and the effectiveness of interference mitigation techniques that may support moving to a licence exemption (it is also possible that the UK is mandated to exempt these devices as a result of a European Commission Decision);

- are any arrangements for co-ordination between network operators, whether they are beneficial and if they need strengthening (e.g. through mandating a coordination procedure); and

- is any evidence suggesting that the number of networks or NRPs needs to be limited through regulatory means in order to manage interference (eg. through an award of a limited number of licences[23]).

3.46 We would expect to consider reviewing the authorisation of higher duty cycle NRPs during 2016. The precise timing would depend on how quickly the demand for higher duty cycle NRPs becomes concrete, the progress of European compatibility studies and the development of the European harmonised standard (EN 303 204 parts 1 and 2) for SRDs using the 870-876 MHz and 915-921 MHz bands.

3.47 We would expect to update stakeholders on our plans for this future review nearer the time.

Our proposals

3.48 We have reviewed the demand for access to spectrum for higher duty cycle NRPs and considered the options for authorising this. We consider that there is a need to provide access to spectrum for higher duty cycle NRPs as soon as possible.

3.49 Ofcom proposes that, at this point in time, high duty cycle NRPs should be licensed using non-exclusive network licences. We also propose that non-exclusive network licences should be made available on demand with no limit on the number of licences initially. All licensees should have equal (spectrum access) rights with no limit to the number of higher duty cycle NRPs that they can use. However, we propose that licensees should be required to maintain records of the locations of higher duty cycle NRPs and to make these records available to Ofcom on request.

3.50 Licensees may find it beneficial to co-ordinate the use of the 870-873 MHz band between themselves in order not to interfere with each other and resolve network interference issues, although we are not proposing a regulatory requirement to do so at present.

3.51 We believe that the above proposals would allow Ofcom to adapt the authorisation approach quickly should European harmonisation result in a requirement that higher duty cycle NRPs are exempted from individual licensing. Equally, Ofcom could move to a more restrictive licensing regime (even to exclusive licensing) should this prove necessary.

3.52 Stakeholders intending to apply for licences on the above basis would need to bear in mind that:

- the European regulatory framework for higher duty cycle NRPs is likely to develop. Ofcom's licensing arrangement may have to change as a consequence;

- Ofcom will review the licensing arrangement for higher duty cycle NRPs in a few years' time (probably 2016); and

[23] In which case we would need to give a notice of revocation to existing licensees who would then have the opportunity to participate in the award process. In these circumstances we would expect to give a minimum of 2 years' notice.

- Ofcom may, in light of that review, alter the authorisation arrangements and specify further requirements for use of higher duty cycle NRPs in the 870-873 MHz band to avoid interference between radiocommunication services.

3.53 Section 4 of this document sets out our proposals for the detailed terms and conditions of the network licences we are proposing.

Question 7. Do you agree with our proposals to authorise spectrum for NRPs using non-exclusive, network licences available on demand?

Section 4

Proposed licence conditions

4.1 This section sets out our proposed licence conditions for the NRP network licence. A draft copy of the proposed Licence is set out in Annex 5. This section covers the:

- number of licences Ofcom will issue
- geographical rights of those licences
- frequency of operation
- technical parameters
- Licence duration, fees and revocation notice period
- trading
- record keeping and information provision and
- other provisions.

Limitation on licence numbers

4.2 Ofcom is not proposing to limit the number of network licences. So competing networks will be able to deploy in the same areas and share the same spectrum in the 870-873 MHz band.

4.3 The licences will be issued on a non-protection non-interference basis. Therefore users of this equipment cannot cause interference to other users and they will have no protection against other authorised users of the radio spectrum.

4.4 Licensees may wish to consider whether setting up a mechanism for coordinating NRP deployments between themselves (e.g. industry coordination procedure) may be something that they would wish to pursue. As set out in Section 3, it is possible that Ofcom may introduce a mandatory requirement for coordination .as a consequence of the review envisaged for 2016.

Territorial extent

4.5 We propose that the Licence should authorise the Licensee to establish, install and use the Radio Equipment in the that covers the whole of the UK, Isle of Man and Channel Islands (subject to the Island authorities' agreement).

Permitted frequencies

4.6 NRPs with higher duty cycle (up to 10%) would be licensed to use the 870-873 MHz frequency range (the same range available to lower duty cycle NRPs under the existing licence exemption regulations).

Technical parameters

4.7 Our proposals for technical parameters are in line with ECC Report 200. We are proposing to offer network licences for Metropolitan/ Rural Infrastructure Networks with exemption for NRPs having:

- duty cycles exceeding 2.5% but not exceeding 10%
- equivalent isotropically radiated power (e.i.r.p.) ≤ 500 mW
- Adaptive Power Control (APC)
- channel spacing ≤200 kHz and
- Clear Channel Assessment (CCA) or alternative politeness protocols that manage interference effectively implemented.

4.8 The full details are set out in draft IR2095.

Licence duration, fee and revocation notice period

4.9 We are proposing that the licence has no end date but has an annual payment interval.

4.10 We are proposing that the licence has a fee of £75 payable every year. This is in line with similar licence products issued by Ofcom. The fee is fixed per licence and does not depend on the number of NRPs deployed or the number of deployment locations.

4.11 We recently consulted on the framework that Ofcom would follow when setting cost based fees. We published our statement[24] on 17 March 2014. As this is a new licence product we have limited information relating to the cost of its administration. Consequently, we are proposing to set fees in line with other similar light licence products which have comparable administrative processes. However, as set out in our March statement, we will be reviewing the licence charges for these types of licences in the future and as a result of this review the fees for this product may change. In line with Ofcom policy any proposed changes to these charges would be subject to consultation.

4.12 The licence will be subject to a 2 year minimum notice period for revocation and the earliest that we currently expect to give this would be in 2016. We are proposing a reduced notice period given the ongoing process in Europe. This will enable us to make any necessary changes to move to a licence-exempt licensing regime, or potentially to limit the number of licenses in the future if our future review concludes that this is appropriate (see section 5).

Trading

4.13 We propose that the rights of use can be transferred to another user. In order to permit trading, we need to first make trading regulations. We will do this at the next

[24] http://stakeholders.ofcom.org.uk/consultations/short-range-devices/statement/

opportunity that arises. Trading will not be permitted until such regulations are in place.

Record keeping and information provision

4.14 We are also proposing to require Network Licensees to maintain accurate records of the deployment of higher duty cycle NRPs and that such records should be provided to Ofcom upon request.

4.15 Information on Network licensees will be published on Ofcom's UK Wireless Telegraphy Register (WTR)[25] so that licensees can identify each other.

Other licence requirements

4.16 The general terms and conditions of the licence will closely follow that of our other licences set out in the "Wireless Telegraphy General Licence Conditions Booklet"[26] published February 2006. A copy of the draft licence can be found in Annex 6 of this document. It sets out the following conditions:

- licence term, variation and revocation process
- how changes to the licence will be managed
- licence fees and their payment
- the ability of Ofcom employees to access and inspect equipment and
- powers for Ofcom to require the modification, restriction and closedown of equipment.

Question 8. Do you agree with the proposed licence conditions for higher duty cycle NRPs?

[25] See http://spectruminfo.ofcom.org.uk/spectrumInfo/licences
[26] http://licensing.ofcom.org.uk/binaries/spectrum/regulations-technical-reference/General_Licence_Conditions.pdf

Section 5

Next Steps

5.1 This consultation closes on 14th October 2014. Subject to our consideration of the responses to this consultation, we expect to publish our statement by the end of the year and licences to become available shortly after.

5.2 Ofcom will, in the coming few days, submit proposals to the European Commission for a new national Interface Requirement (IR 2095) [27] in line with the requirements of the ETSI standard EN 303 204 parts 1 and 2 for higher duty cycle NRPs. A draft of this new IR is published alongside this consultation.[28]

[27] Interface Requirements for radio equipment provide a link between the requirements of the R&TTE Directive (http://ec.europa.eu/enterprise/sectors/rtte/index_en.htm) and the way that spectrum is used nationally. They describe the minimum technical specifications that are necessary to avoid interference between radiocommunication services. Radio equipment must meet these minimum technical specifications in order to be licensed or exempted from licensing.

[28] http://stakeholders.ofcom.org.uk/spectrum/technical/interface-requirements/draft_ir/

Annex 1

Responding to this consultation

How to respond

A1.1 Ofcom invites written views and comments on the issues raised in this document, to be made **by 5pm on 14th October 2014**.

A1.2 Ofcom strongly prefers to receive responses using the online web form at http://stakeholders.ofcom.org.uk/consultations/network-relay-points/howtorespond/form, as this helps us to process the responses quickly and efficiently. We would also be grateful if you could assist us by completing a response cover sheet (see Annex 3), to indicate whether or not there are confidentiality issues. This response coversheet is incorporated into the online web form questionnaire.

A1.3 For larger consultation responses - particularly those with supporting charts, tables or other data - please email stephen.jones@ofcom.org.uk attaching your response in Microsoft Word format, together with a consultation response coversheet.

A1.4 Responses may alternatively be posted or faxed to the address below, marked with the title of the consultation.

Stephen Jones
Floor 03.105
Spectrum Policy Group
Riverside House
2A Southwark Bridge Road
London SE1 9HA

Fax: 020 7981 3333

A1.5 Note that we do not need a hard copy in addition to an electronic version. Ofcom will acknowledge receipt of responses if they are submitted using the online web form but not otherwise.

A1.6 It would be helpful if your response could include direct answers to the questions asked in this document, which are listed together at Annex X. It would also help if you can explain why you hold your views and how Ofcom's proposals would impact on you.

Further information

A1.7 If you want to discuss the issues and questions raised in this consultation, or need advice on the appropriate form of response, please contact Stephen Jones on 020 728 4524

Confidentiality

A1.8 We believe it is important for everyone interested in an issue to see the views expressed by consultation respondents. We will therefore usually publish all responses on our website, www.ofcom.org.uk, ideally on receipt. If you think your

response should be kept confidential, can you please specify what part or whether all of your response should be kept confidential, and specify why. Please also place such parts in a separate annex.

A1.9 If someone asks us to keep part or all of a response confidential, we will treat this request seriously and will try to respect this. But sometimes we will need to publish all responses, including those that are marked as confidential, in order to meet legal obligations.

A1.10 Please also note that copyright and all other intellectual property in responses will be assumed to be licensed to Ofcom to use. Ofcom's approach on intellectual property rights is explained further on its website at http://www.ofcom.org.uk/about/accoun/disclaimer/

Next steps

A1.11 Following the end of the consultation period, Ofcom intends to publish a statement by the end of 2014.

A1.12 Please note that you can register to receive free mail Updates alerting you to the publications of relevant Ofcom documents. For more details please see: http://www.ofcom.org.uk/static/subscribe/select_list.htm

Ofcom's consultation processes

A1.13 Ofcom seeks to ensure that responding to a consultation is easy as possible. For more information please see our consultation principles in Annex 2.

A1.14 If you have any comments or suggestions on how Ofcom conducts its consultations, please call our consultation helpdesk on 020 7981 3003 or e-mail us at consult@ofcom.org.uk . We would particularly welcome thoughts on how Ofcom could more effectively seek the views of those groups or individuals, such as small businesses or particular types of residential consumers, who are less likely to give their opinions through a formal consultation.

A1.15 If you would like to discuss these issues or Ofcom's consultation processes more generally you can alternatively contact Graham Howell, Secretary to the Corporation, who is Ofcom's consultation champion:

Graham Howell
Ofcom
Riverside House
2a Southwark Bridge Road
London SE1 9HA

Tel: 020 7981 3601

Email Graham.Howell@ofcom.org.uk

Annex 2

Ofcom's consultation principles

A2.1 Ofcom has published the following seven principles that it will follow for each public written consultation:

Before the consultation

A2.2 Where possible, we will hold informal talks with people and organisations before announcing a big consultation to find out whether we are thinking in the right direction. If we do not have enough time to do this, we will hold an open meeting to explain our proposals shortly after announcing the consultation.

During the consultation

A2.3 We will be clear about who we are consulting, why, on what questions and for how long.

A2.4 We will make the consultation document as short and simple as possible with a summary of no more than two pages. We will try to make it as easy as possible to give us a written response. If the consultation is complicated, we may provide a shortened Plain English Guide for smaller organisations or individuals who would otherwise not be able to spare the time to share their views.

A2.5 We will consult for up to 10 weeks depending on the potential impact of our proposals.

A2.6 A person within Ofcom will be in charge of making sure we follow our own guidelines and reach out to the largest number of people and organisations interested in the outcome of our decisions. Ofcom's 'Consultation Champion' will also be the main person to contact with views on the way we run our consultations.

A2.7 If we are not able to follow one of these principles, we will explain why.

After the consultation

A2.8 We think it is important for everyone interested in an issue to see the views of others during a consultation. We would usually publish all the responses we have received on our website. In our statement, we will give reasons for our decisions and will give an account of how the views of those concerned helped shape those decisions.

Annex 3

Consultation response cover sheet

A3.1 In the interests of transparency and good regulatory practice, we will publish all consultation responses in full on our website, www.ofcom.org.uk.

A3.2 We have produced a coversheet for responses (see below) and would be very grateful if you could send one with your response (this is incorporated into the online web form if you respond in this way). This will speed up our processing of responses, and help to maintain confidentiality where appropriate.

A3.3 The quality of consultation can be enhanced by publishing responses before the consultation period closes. In particular, this can help those individuals and organisations with limited resources or familiarity with the issues to respond in a more informed way. Therefore Ofcom would encourage respondents to complete their coversheet in a way that allows Ofcom to publish their responses upon receipt, rather than waiting until the consultation period has ended.

A3.4 We strongly prefer to receive responses via the online web form which incorporates the coversheet. If you are responding via email, post or fax you can download an electronic copy of this coversheet in Word or RTF format from the 'Consultations' section of our website at www.ofcom.org.uk/consult/.

A3.5 Please put any parts of your response you consider should be kept confidential in a separate annex to your response and include your reasons why this part of your response should not be published. This can include information such as your personal background and experience. If you want your name, address, other contact details, or job title to remain confidential, please provide them in your cover sheet only, so that we don't have to edit your response.

Cover sheet for response to an Ofcom consultation

BASIC DETAILS

Consultation title:

To (Ofcom contact):

Name of respondent:

Representing (self or organisation/s):

Address (if not received by email):

CONFIDENTIALITY

Please tick below what part of your response you consider is confidential, giving your reasons why

Nothing ☐

Whole response ☐

Part of the response ☐

Name/contact details/job title ☐

Organisation ☐

If there is no separate annex, which parts?

If you want part of your response, your name or your organisation not to be published, can Ofcom still publish a reference to the contents of your response (including, for any confidential parts, a general summary that does not disclose the specific information or enable you to be identified)?

DECLARATION

I confirm that the correspondence supplied with this cover sheet is a formal consultation response that Ofcom can publish. However, in supplying this response, I understand that Ofcom may need to publish all responses, including those which are marked as confidential, in order to meet legal obligations. If I have sent my response by email, Ofcom can disregard any standard e-mail text about not disclosing email contents and attachments.

Ofcom seeks to publish responses on receipt. If your response is non-confidential (in whole or in part), and you would prefer us to publish your response only once the consultation has ended, please tick here. ☐

Name

Signed (if hard copy)

Annex 4

Consultation questions

Density of Network and NRP deployment

A4.1 Responses to these questions would be welcomed to inform our views.

Question 1. Do you have any evidence to inform Ofcom's view on the density of higher duty cycle (up to 10%) NRPs deployments, whether this is likely to exceed 10 NRPs/ km2 and the total number of higher duty cycle NRPs that might be deployed?

Question 2. Do you have a view on how intra-network interference caused by NRPs deployed in large numbers within a network will be managed?

Question 3. Do you have any evidence that networks may fail if the aggregate density of higher duty cycle NRPs reaches or exceeds 10 NRPs/ km^2?

Question 4.Do you have any views on whether exchanging NRP deployment information between licensees and developing and using an industry-managed code of practice would be practical and sufficient to manage the risk of some networks failing?

Clear Channel Assessment

A4.2 Responses to these questions would be welcomed to inform our views.

Question 5.Do you think CCA as defined by ETSI will be an effective protocol for (a) managing interference between networks? (b) managing interference to short range devices using the 870-873 MHz band?

Question 6. Do you have a view on the costs and benefits of adding effective mitigation protocols such as Clear Channel Assessment to higher duty cycle NRPs?

Authorisation options and analysis

Question 7. Do you agree with our proposals to authorise spectrum for NRPs using non-exclusive, network licences available on demand?

Proposed Licence conditions

Question 8. Do you agree with the proposed licence conditions for higher duty cycle NRPs?

Annex 5

Proposed licence conditions for the NRP network licence

Fixed Wireless Access: Higher Duty Cycle Network Relay Points (NRP)

Sector/class/product Fixed Wireless Access / Higher Duty Cycle Network Relay Points (NRP)

Licence number

Licensee

Licensee address

Licence first issue date

Licence version date

Payment interval 1 year

1. This Licence is issued by the Office of Communications ("Ofcom") on <date> and replaces any previous authority granted in respect of the service subject to this Licence by Ofcom or the Secretary of State.

2. This Licence authorises <name> (the "Licensee") to establish, install and use radio transmitting and receiving stations and/or radio apparatus as described in the schedule (the "Radio Equipment") subject to the terms set out below.

3. Licence term

This Licence shall continue in force until revoked by Ofcom in accordance with paragraph 4 below or surrendered by the Licensee.

4. Licence variation and revocation

Pursuant to schedule 1, paragraph 8 of the Wireless Telegraphy Act 2006 (the "Act"), Ofcom may not vary or revoke this Licence under schedule 1, paragraph 6 of the Act except:

a) at the request of, or with the consent of, the Licensee;

b) if there has been a breach of a term of this Licence;

c) in accordance with schedule 1, paragraph 8(5) of the Act;

d) if it appears to Ofcom to be necessary or expedient for the purposes of complying with a direction by the Secretary of State given to Ofcom under section 5 of the Act or section 5 of the Communications Act 2003; or

e) for reasons related to the management of the radio spectrum. This power may only be exercised after at least [twenty-four (24)] months' notice is given in writing to the Licensee.

Ofcom may only revoke or vary this Licence by notification in writing to the Licensee and in accordance with schedule 1, paragraphs 6 and 7 of the Act.

5. Changes

The Licence may not be transferred.[29]

The Licensee must give Ofcom prior notice in writing of any proposed change to the Licensee's name and address from that recorded in the Licence.

6. Fees

The Licensee shall pay Ofcom the relevant sums as provided in section 12 of the 2006 Act and the Regulations made there under:

a) on or before the date of issue of the Licence; and

b) on or before the payment date shown on the Licence for subsequent payments or such other dates or dates as shall be notified in writing to the Licensee, in accordance with those regulations and any relevant terms, provisions and limitations of the Licence.

7. Radio Equipment use

The Licensee must ensure that the Radio Equipment is constructed, established, installed and used only in accordance with the provisions specified in the schedules to this Licence. Any proposal to amend any detail specified in the schedule to this Licence must be agreed with Ofcom in advance and implemented only after this Licence has been varied or reissued accordingly.

The Licensee must ensure that the Radio Equipment is operated in compliance with the terms of this Licence and is used only by persons who have been authorised in writing by the Licensee to do so and that such persons are made aware of, and of the requirement to comply with, the terms of this Licence.

8. Access and inspection

The Licensee shall permit a person authorised by Ofcom:

a) to have access to the Radio Equipment; and

b) to inspect this Licence and to inspect, examine and test the Radio Equipment at any and all reasonable times or, when in the opinion of that person an urgent

[29] The transfer of rights and obligations arising by virtue of this Licence may however be authorised in accordance with regulations made by Ofcom under powers conferred by section 30 of the Act

situation exists, at any time to ensure the Radio Equipment is being used in accordance with the terms of this Licence.

9. Modification, restriction and closedown

A person authorised by Ofcom may require any of the radio stations or radio apparatus that comprise the Radio Equipment to be modified or restricted in use or temporarily or permanently closed down immediately if in the opinion of the person authorised by Ofcom:

a) a breach of a term of this Licence has occurred; and/or

b) the use of the Radio Equipment is causing or contributing to undue interference to the use of other authorised radio equipment.

Ofcom may require any of the radio stations or radio apparatus that comprise the Radio Equipment to be modified or restricted in use or temporarily closed down either immediately or on the expiry of such period as may be specified in the event of a national or local state of emergency being declared. Ofcom may only exercise this power after a written notice is served on the Licensee or a general notice applicable to holders of a named class of Licence is published.

10. Special conditions

During the period that this Licence remains in force and for 6 months thereafter, the Licensee shall compile and maintain accurate records of the following details relating to the Radio Equipment:

a) The postal address; or

b) National Grid Reference (to 10 metres resolution).

c) The Licensee shall inform Ofcom of the address of the premises at which this Licence and the information detailed at sub-paragraph (a) above shall be kept.

The Licensee shall submit to Ofcom copies of the records detailed in sub-paragraph (a) above at such intervals as Ofcom shall notify to the Licensee.

The Licensee shall, upon request, supply Ofcom or any person authorised on their behalf with the name and address of any subscribing customers of the Network, or require its agents to provide such information on its behalf.

11. Interpretation

In this Licence:

a) the establishment, installation and use of the Radio Equipment shall be interpreted as establishment or use of wireless telegraphy stations and installation or use of wireless telegraphy apparatus as specified in section 8 of the Act;

b) the expression "interference" shall have the meaning given by section 115 of the Act; and

c) the expressions “wireless telegraphy apparatus” and “wireless telegraphy station” shall have the meanings given by section 117 of the Act.

The schedule to this Licence forms part of this Licence together with any subsequent schedules that Ofcom may issue as a variation to this Licence at a later date.

The Interpretation Act 1978 shall apply to this Licence as it applies to an Act of Parliament.

ISSUED BY OFCOM

Wireless Access (Higher Duty Cycle Network Relay Points)

SCHEDULE 1 TO LICENCE NUMBER: [licence number]

1. Description of Radio Equipment licensed

The Radio Equipment means any radio transmitting and receiving stations and/or any radio apparatus that transmits in accordance with the requirements of paragraphs 2 and 3 of this schedule.

2. Purpose of the radio equipment

The Radio Equipment shall form part of an area network for the purpose of data acquisition.

Use of the radio equipment shall be in accordance with the following Interface Requirement:

IR 2095.

3. Special conditions relating to the operation of the Radio Equipment

The Licensee shall ensure that the Radio Equipment is operated on a non-interference and non-protected basis; and

Airborne use not permitted.

4. Permitted frequencies

The Radio Equipment must only transmit and/or receive on the following frequencies:

870 – 873 MHz

5. Maximum permissible e.i.r.p.

The maximum permitted E.I.R.P. for the Radio Equipment is 500 mW.

6. Geographical boundaries

The Licence authorises the Licensee to establish, install and use the Radio Equipment in the United Kingdom, Isle Man and Channel Islands.

7. Interpretation

In this schedule:

"e.i.r.p." means the equivalent isotropically radiated power. This is the product of the power supplied to the antenna and the antenna gain in a given direction relative to an isotropic antenna (absolute or isotropic gain);

“non-interference, non-protected” means that no harmful interference may be caused to any radiocommunication services that are entitled to protection and that no claim may be made

for protection of these devices against harmful interference originating from authorised radiocommunication services.

Annex 6

Glossary

CCA Clear Channel Assessment. A protocol for listening for other uses of the spectrum before talking and adaptively change channel if necessary.

CEPT European Conference of Postal and Telecommunications Administrations.

ECC Electronic Communications Committee.

EIRP Equivalent Isotropically Radiated Power. This is the product of the power supplied to the antenna and the antenna gain in a given direction relative to an isotropic antenna (absolute or isotropic gain).

ERM ETSI Technical Committee for Electromagnetic Compatibility and Radio Spectrum Matters.

ETSI European Telecommunications Standards Institute.

FM Frequency Management (CEPT WG FM is the frequency management working group of the CEPT).

IoT Internet of things. Refers to the interconnection [wirelessly] of uniquely identifiable embedded computing-like devices within the existing Internet infrastructure.

IR Interface requirement. These provide a link between the requirements of the R&TTE Directive and how spectrum is used nationally for radio equipment.

km Kilometres.

MHz Megahertz A measurement of frequency in the International System of Units (SI). It is defined as $1x10^6$ cycles per second.

M2M Machine to Machine.

M3M Metropolitan Mesh Machine Networking.

mW Milli-Watt**.** A derived unit of power in the International System of Units (SI). A Milli-Watt is $1x10^{-6}$ Watts.

NRP Network Relay Point. Used in some networks to connect individual consumer devices together and to connect consumer devices to networks. They aggregate and concentrate data from consumer devices and need to talk and listen to these.

PT Project Team.

SRD Short Range Devices.

TG Task Group.

UHF Ultra High Frequency. The part of the spectrum between 300 MHz and 3 GHz.