Statement on authorising high duty cycle Network Relay Points

870 to 873 MHz

Statement

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About this document

This statement authorises high 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. Introducing licensing for NRPs will assist the early development of emerging Internet of Things (IoT) and machine-to-machine (M2M) uses.

To assist and promote growth and innovation in the IoT and M2M as early as possible, we are making licences available, which will permit the holders to install and use these devices in the 870 - 873 MHz band.

Non-exclusive licences will available from 12 January 2015.

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Section 1

Summary and introduction

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

1.2 To assist and promote growth and innovation in M2M and the IoT as early as possible we are making licences available that will permit the holders to install and use high duty cycle Network Relay Points (referred to as "HDC NRPs" throughout the rest of this statement) with duty cycles between 2.5% and 10%, in the 870-873 MHz portion of the 870-876 MHz band. These NRPs will share spectrum access with lower duty cycle NRPs and with SRDs that are already authorised in this spectrum under the current licence exemption.

1.3 Permitting HDC NRPs as early as possible should be of benefit to consumers. It should make it easier and less costly for firms to deliver new services using M2M and IoT networks where these need to connect with equipment that cannot easily be reached with higher frequencies.

1.4 We will authorise HDC NRPs using non-exclusive network licences, but we will not limit the number of these licences and we will not limit the number of HDC NRPs that can be deployed in a network.

1.5 Holders of these licences will be required to use an effective interference mitigation method in HDC NRPs, but we have chosen not to mandate a specific method.

1.6 Licensees may choose to implement the interference protocol specified in the European Telecommunications Standards Institute (ETSI) standard for Short Range Devices (SRDs) (EN 303 204) or an alternative method which is at least as effective as this.

1.7 Licensees may find it beneficial to co-ordinate the use of the 870-873 MHz band between themselves to avoid interference between networks, but we are not mandating that they do so. They may choose to use a code of practice for coordination, but we will not propose a specific one nor will we coordinate NRPs for licensees. We will require that licensees maintain a record of where they deploy HDC NRPs. These records must be made available to Ofcom on request.

1.8 The fee for a licence will be £75 payable every year. The fee is fixed per licence and does not depend on the number of NRPs deployed or the number of deployment locations. This product is subject to fees that are reflective of our costs and fees might change.

1.9 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 HDC NRPs may also become more certain over the coming year or two. Therefore, we expect to review how we licence networks using HDC NRPs in 2016 to take account of those developments. This review could result in changes to how we authorise M2M and IoT networks using HDC NRP devices in the future.

1.10 In summary, we have decided to create a network licence, available on application, that permits the holder to use HDC NRPs (of between 2.5% and 10%) in the 870-873

MHz portion of the 870-876 MHz band. The network licences will require the licensees to:

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

Remainder of this document

1.11 In the remainder of this document we:

- provide the context for our decision to authorise networks using HDC NRPs in the 870-873 MHz band and provide the legal framework for authorising spectrum use in section 2;
- summarise and analyse the responses to our consultation and provide our conclusions in section 3;
- set out the conditions for the licence in section 4. A copy of the Licence is set out in Annex 1; and
- outline our timetable for the remaining steps in our process in section 5.

Section 2

Context

The Internet of Things and Network Relay Points

2.1 The Internet of Things is set to enable large numbers of previously unconnected devices to communicate and share data with one another. This new connectivity has the potential to deliver significant benefits across a range of sectors, including healthcare, transport and energy applications. For example, in the energy sector the IoT has the potential to both reduce costs for consumers and the energy suppliers, and reduce environmental impacts through better management of scarce natural resources.

2.2 Radio spectrum will play an important role in enabling the IoT, given the need to support a potentially significant number of wireless connections. Our strategy is therefore to enable citizens and consumers to benefit as quickly as possible by providing both licensed and licence exempt access to a broad range of spectrum bands for the IoT and M2M applications. In line with this strategy we published a Call for Input in July 2014[1], which sought views on whether we should be more proactive; for example, in identifying and making available key frequency bands, or in helping to drive technical standards.

2.3 Earlier this year we released the 870-876 MHz and 915-921 MHz bands for licence exempt Short Range Devices (SRDs), so adding to the lower-frequency spectrum that is already suitable for M2M applications and the IoT. This was implemented through an amendment to the Wireless Telegraphy (Exemption and Amendment) Regulations 2010 on 27th June 2014 in accordance with the decision in our Statement published on 2 April 2014.

2.4 One type of device permitted in the 870-873 MHz frequency range is a Network Relay Point. 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.

2.5 The regulations we have already implemented 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. To consider how NRPs with higher duty cycles (up to 10%) might be authorised we published a consultation in September 2014. This document sets out our decision based on our consideration of the responses to that consultation.

Legal framework

2.6 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.

[1] http://stakeholders.ofcom.org.uk/consultations/iot/

2.7 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.

2.8 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 licence.

2.9 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.

2.10 The terms of the licence will require licensees to provide Ofcom with information on deployment of devices. Ofcom will keep under review whether publication of any information would facilitate the exercise of our functions. Any such publication would be the subject of a future decision.

The citizen and/or consumer interest

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

2.12 In carrying out our duties under section 3 of the Communications Act 2003 Ofcom must also have regard to the desirability of encouraging investment and innovation in relevant markets.

Impact assessment

2.13 The analysis presented in section 3 of our consultation[2], as updated in 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 and decisions 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

2.14 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 decisions that we are announcing with this statement and the approach we are taking to the licensing of HDC 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

2.15 Ofcom consulted on a range of proposals including exempting SRDs using the 870-876 MHz band from requiring individual licences in the document Decision to make Wireless Telegraphy Exemption Regulations 2014 update http://stakeholders.ofcom.org.uk/binaries/consultations/proposal-wireless-telegraphy-exemption-2014/statement/2014update.pdf

2.16 The Regulations, which are now in force, can be found on the Ofcom website at: http://www.legislation.gov.uk/uksi/2014/1484/made/data.pdf 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/

[2] See section 3 of http://stakeholders.ofcom.org.uk/consultations/870-915/

Section 3

Responses to our consultation

3.1 In this section we summarise the responses from stakeholders to the questions we asked in our consultation and set out our views on these responses. The questions all relate to factors that affect how we choose to authorise HDC NRPs.

3.2 We received seven responses[3] to our consultation. Overall, all the responses supported permitting HDC NRPs with a duty cycle between 2.5% and 10% in the 870-873 MHz band by licensing these, but there are different views on the licensing conditions for this.

3.3 Our summary of stakeholder's comments and our views on these are given below grouped into questions relating to:

- the density of NRP deployments in M2M and IoT networks and whether the density of deployment should be controlled;
- interference mitigation methods and politeness protocols in HDC NRPs; and
- our proposal to authorise spectrum for HDC NRPs using non-exclusive, network licences and the specific terms and conditions of these licences.

Density of NRP deployments in M2M and IoT networks

3.4 Understanding the density and number of HDC NRPs that are likely to be deployed and how interference will be managed are important factors to consider. We therefore asked stakeholders:

- for evidence on the potential density of HDC NRP deployments and whether this density is likely to exceed 10 NRPs / km^2 ;
- for evidence that networks may fail if the aggregate density of HDC NRPs reaches or exceeds 10 NRPs / km^2 ; and
- whether it would be practical and sufficient to manage the risk of some networks failing by exchanging HDC NRP deployment information between licensees and developing and using an industry-managed code of practice.

Density of deployment

3.5 BT, SSN (UK) Ltd, DTC (UK) Ltd and Synaptic said that the number of HDC NRPs likely to be deployed will be less than 10 NRPs / km^2 and offered reasons and evidence to support this. For example, Synaptic said that the largest Apella system deployed has an NRP density of $8.3x10^{-3}$ / km^2. This is more than one thousand times less than 10 NRPs / km^2.

3.6 SSN (UK) Ltd, DTC (UK) Ltd and Synaptic agreed that HDC NRP density is self-limiting and gave various reasons for this. DTC (UK) Ltd said that heavy shadowing, or severe path losses in dense urban environments, will limit the number of

[3] All the responses are available on our website at http://stakeholders.ofcom.org.uk/consultations/network-relay-points/?showResponses=true

reachable end devices and increase the density of HDC NRPs needed for networks to be commercially viable. In this case, DTC (UK) Ltd said, the number of end devices per NRP would be reduced and a corresponding reduction in the traffic load via the NRP would be seen, reducing pro rata the interference potential of such NRP deployments.

3.7 Mr Gilliver said that the consideration appeared to be have been given only to interference between NRPs (either within a network or between networks); he commented that the potential for interference to users in other adjacent bands, did not seem to have been considered.

3.8 All the responses, except for that of Mr Gilliver, which concerns interference to users of other bands, are broadly consistent and support the assumptions used by the CEPT.

Managing interference between networks

3.9 There were mixed views on whether developing and using an industry-managed code of practice and inter-operator coordination would be practical and sufficient to manage the risk of some networks failing,

3.10 SSN (UK) Ltd disagrees with the necessity for exchanging deployment information. They claim that such a scheme is likely to be bureaucratic and unworkable and commented that Ofcom would not have the resources to manage this. They also think that a code of practice would also be unnecessary because the polite spectrum access techniques envisaged in the ETSI standard (EN 303 204) will protect the band.

3.11 DTC believes that it will not be necessary to require inter-network coordination of NRP devices. DTC believes that it will be more beneficial to ensure the maximum effectiveness of the politeness protocols which will follow initial deployments. DTC believes benefits will be obtained by good uniform distribution of end devices over the available spectrum, coupled with adaptive behaviour to avoid unsuitable or heavily loaded channels in favour of less loaded spectrum. This behaviour should be inherent in all devices, end SRD devices as well as infrastructure devices, obviating the need for coordination between operators DTC says.

3.12 Synaptic points to the simulations reported in ECC report 200 (specifically in Table 41 on page 79) which show that, without power control or frequency planning and with a vulnerable portable alarm receiver, a density of 10 NRPs / km^2 is viable. Synaptic said that simulations did not allow for any of the politeness protocols and included a strong mix of interference sources other than the NRPs. Running these simulations again with a higher NRP density will show a “tragedy of the commons” alluded to by our consultation. Synaptic said that it is, however, important that organisations licenced to operate NRPs are able to report on their locations if requested so that this density can be policed.

3.13 Synaptic said that they would be happy to participate actively in the development and operation of an industry managed code of practice. On top of the regulations already in place for this band and those additional measures proposed for HDC NRPs, they said that the main additional points for a code of practice should be: (1) monitoring the total density of HDC NRPs deployed in an area, (2) collecting evidence of harmful interference and (3) appeal to Ofcom to limit the number of licensees if necessary or tighten the licence conditions if necessary. Synaptic think that such a code of practice

would provide more reassurance to end customers considering deploying mission critical applications in this spectrum.

Our views

3.14 Our view remains that the density and number of HDC NRPs that are likely to be deployed is important. However, no evidence has been provided that the studies by CEPT[4] have significantly underestimated the likely density of deployment. The evidence generally supports CEPT's assumption that the nature of smart metering, smart grid and Metropolitan Machine to Machine applications means that HDC NRPs[5] may be deployed in low densities of less than 10 devices / km^2 in aggregate.

3.15 Nonetheless the development of services using this band is still at a very early stage and, therefore, our intention is to review the authorisation regime for networks in the 870-783 MHz band during 2016 in light of experience and new information on potential deployment scenarios. This review may look at whether there is any new evidence suggesting that the number of networks using HDC NRPs needs to be limited through regulatory means in order to manage interference. (e.g., through an award of a limited number of licences[6]), or whether we should support a non-regulatory method of managing interference such as an industry code of practice.

Interference mitigation methods and politeness protocols in higher duty cycle NRPs

3.16 We asked whether the protocol for interference mitigation called Clear Channel Assessment (CAA) 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.

Effectiveness of politeness protocols

3.17 SSN (UK) Ltd, DTC (UK) Ltd, Synaptic and BT plc agree that CCA is effective at managing interference and using the spectrum efficiently. However, DTC (UK) Ltd believes that CCA alone is only a partial solution and that manufacturers must be free to innovate and find better ways to use the scarce spectral resource. Synaptic said that Transmit Power Control (TPC) and CCA do not apply to the parts of an NRP's transmissions which the manufacturer can show to be broadcast, but apply only to unicast transmissions.

3.18 BT plc is concerned that the threshold level of Clear Channel Assessment (CCA) is insufficient to protect other uses and users of the spectrum and said that consideration should be given to tightening the CCA threshold. BT suggested that a more appropriate value might be 10dB below the receiver sensitivity limit, i.e. -101 dBm. A similar concern was expressed by Mr Gilliver who said that there might be scope for a requirement that the receiver (or, more precisely, receiver/aerial combination) used for CCA be more sensitive than that used for actual communication or, if the same receiver/aerial combination, be obliged to have a lower threshold.

[4] For CEPT Report 200 see: http://www.erodocdb.dk/Docs/doc98/official/pdf/ECCREP200.PDF
[5] CEPT Report 200 refers to these devices as Network Access Points.
[6] 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.

Costs of political protocols

3.19 We also asked for views on the costs and benefits of adding effective mitigation protocols such as Clear Channel Assessment to HDC NRPs.

3.20 BT did not think CCA was an overhead because the 870-873 MHz band is shared, so some form of interference mitigation should be applied. SSN (UK) Ltd expressed a similar view that there should not be any additional cost burden on products to meet these conditions apart from the necessary software to exploit the facilities provided by the radio hardware and its associated firmware. Mr Gilliver thought that such costs should work out at quite a low incremental cost per node.

3.21 DTC said that the choice of CCA duration took into account contributions from leading semiconductor vendors on the technical aspects of the detection process. These contributions, in turn, took account of practical device implementations to ensure that parts available to product manufacturers would be able to meet the requirements of the Harmonised Standard.

3.22 Synaptic said that it had considered adding TPC and CCA to their NRP design for operation in this band. Both are feasible, they said, and should not be expensive to implement. However, they think that NRPs do not have to have identical transmit and receive frequencies and TPC and CCA do not apply to the parts of an NRPs transmissions which the manufacturer can show to be broadcast, but only to unicast transmissions.

Our views

3.23 Our proposals are aligned with the harmonised and approved ETSI standard that has been subject to public consultation. This standard is based on the analysis presented by ECC Report 200, which was also publically consulted on prior to its adoption.

3.24 We think that the evidence offered for a threshold level that is different to that adopted by ETSI and the ECC is insufficient for us to deviate from the threshold adopted by these international organisations. However, we will review the effectiveness of interference mitigation techniques in 2016 if there is evidence that these are not effective.

3.25 We note that CCA may not be the only effective method to mitigate interference:

- between HDC NRPs in the same network;
- between HDC NRPs of different networks;
- between HDC NRPs and SRDs in the 870-873 MHz band; or
- between HDC NRPs and other, adjacent, spectrum users.

3.26 We think that licensees should be able to choose whether to implement the CCA interference protocol specified in the ETSI standard for SRDs, EN 303 204 or to develop alternate mitigation methods if CCA is not pertinent to their network design, for example in the very narrowband Apella NRPs highlighted in Synaptic's response.

3.27 However, where licensees choose to implement an alternative mitigation method we will expect this to be at least as effective as the CCA protocol specified in the standard for SRDs (EN 303 204). The use of alternative methods not set out in the

harmonised standard needs to follow the R&TTE Directive framework for compliance purposes.

3.28 We will therefore require that HDC NRPs include the CCA interference mitigation method specified in the standard for SRDs (EN 303 204) or a method that is at least as effective as the CCA protocol, but we have chosen not to mandate a specific one.

Authorising spectrum for NRPs

3.29 Our final two questions were on whether stakeholders agreed with our proposals to authorise spectrum for HDC NRPs using non-exclusive, network licences available on demand and on the licence conditions we had proposed for HDC NRPs.

Licensing approach and timing

3.30 The majority of responses supported our proposed licensing approach and making network licences available as soon as possible. Only Mr Gilliver advised against licensing now, preferring us to wait until the European standards process had been finalised. SSN (UK) Ltd stated a preference to make licences available now so that the UK can lead the way and set the agenda across Europe on the use on this band.

Restricting access to licences

3.31 SSN (UK) Ltd requested that access to licences be restricted in order that they are not abused. They suggested that Ofcom might insist that licensed entities achieve a set of (minimal) conditions for being awarded a licence, such as a turnover of £100k.

Licence conditions

3.32 There was overall support for the proposed licence conditions for HDC NRPs, with comments limited to the following points:

- **Ability to trade licences.** DTC and SSN (UK) Ltd did not agree that the licences granted should be tradable.
- **Publication of HDC NRP deployment data.** Mr Gilliver suggested operators should be required the make the information on NRP locations, operating frequencies and transmission power of NRPs openly available to the public via the Ofcom website, preferably in a common format. Additionally Mr Gilliver suggested that a clause be inserted in the licence to demand the shutdown of any given node within 24 to 36 hours.
- **Power limit.** SSN (UK) Ltd advised that the power limit should be 500 mW e.r.p and not 500 mW e.i.r.p. as stated in the consultation.
- **Density limit.** Senaptic proposed that a maximum limit to density of NRPs to 1 / km^2 be added to the licence.

Our views

<u>Licensing approach and timing</u>

3.33 Radio spectrum will play an important role in enabling the IoT, given the need to support a potentially significant number of wireless connections. Our strategy is therefore to enable citizens and consumers to benefit as quickly as possible by

providing both licensed and licence exempt access to a broad range of spectrum bands for the IoT and M2M applications.

3.34 Stakeholders agreed with our approach to authorising HDC NRPs via network licences and therefore we will adopt that approach for the reasons set out in our consultation.

3.35 The relevant Harmonised Standard EN 303 204 was published on 30 October 2014 and is likely to be cited in the Official Journal of the EU early in 2015. Further, the concept of HDC NRP authorisation is already detailed in the European recommendation for SRD, ERC Rec 70-03 (Annex 2). A revision of this recommendation, giving further options for authorisation, has been drafted and is under public consultation ending 9 December 2014.

3.36 As highlighted in our consultation and by SSN (UK) Ltd., there are a number of benefits for the UK by going ahead now and we believe that the work in both CEPT and ETSI is sufficiently mature for us to proceed with little risk to citizens and consumers if we do so.

Licence conditions

Restricting access to licences

3.37 We have powers under the Communications Act to restrict access to licences, and to set specific conditions before granting a licence, if we need to do so for the purpose of securing efficient use of the spectrum. However, these conditions would need to be objectively justifiable, non-discriminatory, proportionate and transparent.

3.38 If the politeness protocol adopted specified in EN 303 204 by ETSI is effective, as has been argued by stakeholders, no further restrictions on who should be granted a licence is needed. We therefore see no justification to restrict access to network licences on spectrum efficiency grounds.

Publication of NRP deployment data

3.39 As we indicated in paragraphs 3.11 to 3.12 of our consultation, if licensees publish their NRP deployment data this could help them mitigate risks of interference to their networks. However, since the density of HDC NRPs likely to be deployed in the near future is likely to be low, we have concluded that there is no need to require operators to publish this data at this stage. Ofcom has powers to request information that will enable us to monitor the use of the spectrum and individuals or companies wishing to carry out studies are free to approach licensees.

Ability to trade licences

3.40 Most licences issued by Ofcom are tradable and we have concluded that these network licences should be. However, the ability to trade a licence does not enable a change of use.

3.41 Making these licences tradable in the event of a company takeover or merger, for example, will make it easier to transfer a licence from one licensee to another. The licences may be transferred to the new company without the need for the licensee to cancel and reapply for a new licence (and subsequently having to pay a licence fee).

Ability to require that equipment be switched off

3.42 Ofcom has powers under the Wireless Telegraphy Act and in the licence to require that devices are switched off if they are causing interference. It is unclear under what other circumstances we would wish that equipment be switched off. Given we already have powers in line with our spectrum management duties we do not believe that an additional clause to the licence is required.

Power limit

3.43 We are grateful to SSN (UK) Ltd for highlighting the technical error in our draft licence. We have amended the power limit to be 500 mW e.r.p.

Limiting density

3.44 We do not accept the proposal made by Synaptic to limit the maximum density of HDC NRPs to 1 NRP / km^2 as we consider the inclusion of a limit in the licence to be unnecessary at this time.

3.45 The evidence generally supports CEPT's assumption that HDC NRPs may be deployed in low densities of less than 10 devices / km^2 in aggregate across all users. However, we do not think it necessary or desirable to limit the density of deployment by any one licensee when the market is still at a very early stage of development.

3.46 It is uncertain how many networks utilising HDC NRPs will ultimately get deployed, and exactly what these networks will look like. However, as noted above, we intend to review the authorisation regime for Networks in the 870-783 MHz band during 2016. If necessary, this review will be able to consider whether new evidence suggests that the density of HDC NRPs needs to be limited through regulatory means.

Section 4

Licence conditions

4.1 This section sets out the licence conditions for the network licence. A copy of the Licence is set out in Annex 1. 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 will not limit the number of network licences. 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.

Territorial extent

4.4 The licence will authorise the Licensee to establish, install and use the Radio Equipment in that covers the whole of the UK, Isle of Man and Channel Islands.

Permitted frequencies

4.5 HDC NRPs will be licensed to use the 870-873 MHz frequency range. This is the same range available to lower duty cycle NRPs under the existing licence exemption regulations.

Technical parameters

4.6 The technical parameters of the licence are in line with ECC Report 200[7]. Licences will be available for Networks with HDC NRPs having:

- duty cycles exceeding 2.5% but not exceeding 10%;

[7] http://www.erodocdb.dk/docs/doc98/official/pdf/ECCRep200.pdf

- effective radiated power (e.r.p.) ≤ 500 mW;
- Adaptive Power Control (APC); and
- channel spacing ≤200 kHz.

4.7 A requirement of the licence is that equipment cannot cause interference to other users. We believe that this can be best achieved through the use of Clear Channel Assessment (CCA) or alternative politeness protocols that manage interference effectively, but we are not mandating this as this will be covered by the Harmonised Standard.

4.8 The full details are set out in draft IR2095[8] which is currently going through the notification process with the EU. We expect this to be finalised on 7th January 2015. Accordingly, licensees will have to use equipment that implements CCA or equivalent.

Licence duration, fee and revocation notice period

4.9 The licence has no end date but has an annual payment interval. 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 HDC NRPs deployed or the number of deployment locations.

4.10 We recently consulted on the framework that Ofcom would follow when setting cost based fees. We published our statement[9] 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 setting the fee 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.

4.11 The licence will be subject to a 2 year minimum notice period for revocation due to spectrum management reasons. We do not expect to give notice before 2016 when we intend to vary out a review of these licensing arrangements (as discussed in section 4).

Trading

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

Record keeping and information provision

4.13 The licence will require the Network Licensee to maintain accurate records of the deployment of HDC NRPs and to provide these to Ofcom upon request.

[8] http://stakeholders.ofcom.org.uk/binaries/spectrum/spectrum-policy-area/spectrum-management/research-guidelines-tech-info/interface-requirements/IR_2095_high_duty_cycle_NRP.pdf
[9] http://stakeholders.ofcom.org.uk/consultations/short-range-devices/statement/

4.14 Information on Network licensees will be published on Ofcom's UK Wireless Telegraphy Register (WTR)[10] so that licensees can identify each other.

Other licence requirements

4.15 The general terms and conditions of the licence will closely follow those of our other licences set out in the "Wireless Telegraphy General Licence Conditions Booklet"[11] published February 2006. A copy of the licence can be found in Annex 1 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 the radio equipment, or any part thereof.

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

Section 5

Next Steps

5.1 Ofcom has submitted proposals to the European Commission for a new national Interface Requirement (IR 2095) in line with the requirements of the ETSI standard EN 303 204 parts 1 and 2 for HDC NRPs. We anticipate that the standstill period for this proposal will end on 12th January 2015. Licences will be available from that date.

5.2 Applications for licences will be accepted on line at: http://licensing.ofcom.org.uk/radiocommunication-licences/licensed-short-range/.

Future review of authorisation

5.3 As noted in section 4, we intend to review the authorisation regime for Networks in the 870-783 MHz band. This future review may look at whether there:

- is further practical evidence on the actual density of HDC NRP deployments and the effectiveness of interference mitigation techniques;
- are any arrangements for co-ordination between network operators, whether they are beneficial and if there is a need for introducing or strengthening arrangements for coordination (e.g. through mandating a coordination procedure); and
- is any evidence suggesting that the number of networks or HDC NRPs needs to be limited through regulatory means in order to manage interference (eg. through an award of a limited number of licences[12]) or whether we should support a non-regulatory method of managing interference.

5.4 We currently expect to review the authorisation of HDC NRPs during 2016. The precise timing of the review will depend on how quickly the demand for HDC 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. It is also possible that Europe may consider the case for and against exempting HDC NRPs in this timeframe[13]. We will engage in these discussions in light of the same experience and evidence that we intend to inform our own review in 2016.

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

[12] 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.

[13] At present, Recommendation 70-03 (see Table 2 in http://www.erodocdb.dk/docs/doc98/official/pdf/rec7003e.pdf) states that network relay points should be individually licensed.

Annex 1

Licence terms and conditions

High Duty Cycle Network Relay Points (HDC NRPs)

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.[14]

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 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

[14] 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

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 (High 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.r.p.

The maximum permitted e.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.r.p." means the effective 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 2

Glossary

APC Adaptive Power Control.

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.

E.I.R.P Equivalent Isotropic Radiated Power

E.R.P Effective Radiated Power. This is the product of the power supplied to the antenna and the antenna gain in a given direction.

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).

HDC NRP High Duty Cycle Network Relay Point. Used in some networks to connect individual consumer devices together and to connect consumer devices to networks. They have a duty cycle of between 2.5% and 10%

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.