



# EE application for licence variations in support of enhanced mobile communications for the emergency services

Statement

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## About this document

This document outlines Ofcom's decision in regards to two licence variation requests from EE Limited, which would enable the use of 4G technology and support the provision of enhanced mobile communications for the emergency services.

In 2015 EE signed a contract with the Home Office to provide mobile services for a new emergency services network based on its LTE network. To support this EE asked for:

- a variation of its Spectrum Access 2100 MHz licence to permit the use of LTE technology in the unpaired frequencies 1899.9 to 1909.9 MHz; and
- a variation of its Spectrum Access 800 MHz/2.6 GHz and 1800 MHz licences to permit the use of mobile transmit frequencies to connect additional temporary base stations to its network at powers up to 31 dBm e.i.r.p in the 800 MHz and 1800 MHz bands for use as gateways for the new emergency services network.

We consulted on these proposals on 19 August 2016 setting out Ofcom's preliminary view that granting the requests is an efficient use of the spectrum and would benefit citizens and consumers, with low risk of harmful interference to other stakeholders. This statement confirms that after consideration of the responses received we have decided to grant the licence variation.

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## Section 1

# Executive summary

- 1.1 This document confirms that following consultation we have approved two licence variation requests from EE Limited (EE) in relation to licences issued to it under the Wireless Telegraphy Act 2006. These were:
- i) A request to vary its Spectrum Access 2100 MHz Wireless Telegraphy Act 2006 licence in order to liberalise the use of its unpaired frequencies 1899.9 to 1909.9 MHz to allow Long Term Evolution (LTE) (a 4G technology); and
  - ii) A request to vary its Spectrum Access 800 MHz/2.6 GHz and 1800MHz Wireless Telegraphy Act 2006 licences in order to permit the use of mobile transmit (uplink) frequencies only as a backhaul path to connect Emergency Services Network (ESN) nomadic base stations (“ESN Gateway devices”) operating at 1899.9 to 1909.9 MHz to its network at powers up to 31 dBm e.i.r.p.
- 1.2 On 19 August 2016 we published a consultation “EE application for licence variations in support of enhanced mobile communications for the emergency services” (the “Variation Consultation”)<sup>1</sup> that assessed EE’s variation requests. The document:
- provided background information on the requests, the spectrum bands concerned and EE’s licences;
  - set out and considered the requests in the context of Ofcom’s statutory and policy framework;
  - considered the impact of the proposals, including the potential for interference to other users; and
  - set out how we proposed to implement the requested changes.
- 1.3 Our provisional conclusion in the Variation Consultation was that the liberalisation from 3G to 4G technologies in the 1899.9 to 1909.9 MHz band would:
- be an efficient use of the spectrum and would not result in undue interference to other spectrum users given that:
    - the technical parameters we were proposing to implement were in line with the least restrictive technical conditions for this band as set out in European Conference of Postal and Telecommunications Administrations (CEPT) Report 39. This report addresses the coexistence issues with uses in spectrum adjacent to the 1900 to 1920 MHz band;
    - we were proposing to include a requirement to adopt a specific Time Division (TD) frame structure and to synchronise this with other TD-LTE (or

<sup>1</sup> [https://www.ofcom.org.uk/\\_data/assets/pdf\\_file/0027/91575/EE-2100-MHz-Variation-Consultation\\_final.pdf](https://www.ofcom.org.uk/_data/assets/pdf_file/0027/91575/EE-2100-MHz-Variation-Consultation_final.pdf)

- equivalent) networks operating in the rest of the 1900 to 1920 MHz band as and when such networks are deployed; and
- we were proposing to prohibit the use of ESN Gateway devices fitted to vehicles whilst they are in motion;
  - not distort competition in the mobile market. We also noted that this spectrum is unlikely to be used for the provision of mobile services in general; and
  - provide benefits to citizens through supporting the provision of a new emergency services communication network.
- 1.4 We also considered that the increase in transmit powers in the 800 MHz and 1800 MHz spectrum for the backhaul of ESN Gateways would:
- not result in undue interference to adjacent users, providing it is limited to the provision of backhaul for ESN Gateway devices which are intended only for occasional and limited use;
  - not distort competition due to the restrictions placed on its use; and
  - provide benefits to citizens through supporting the provision of a new emergency services communication network.
- 1.5 The Variation Consultation closed on 30 September and we received four responses (two of which provided both confidential and non-confidential versions). These responses are available on our website<sup>2</sup>.
- 1.6 The responses raised the following issues:
- 1.6.1 Liberalisation of 1900 MHz unpaired spectrum for LTE:
- Potential to cause interference to adjacent DECT devices; and
  - Possible competition issues, including how this decision relates to spectrum caps in upcoming awards as it would increase the amount of LTE spectrum that EE holds. Also other licensees in the 1900 MHz are subject to different technical conditions which may could place constraints of their ability to deploy LTE.
- 1.6.2 Allowing higher power use in the 800 MHz and 1800 MHz band to provide backhaul for ESN:
- Potential to cause interference to mobile networks in adjacent frequencies to EE; and
  - Possible impact on Digital Terrestrial Television (DTT).
- 1.7 After considering the points raised in all of the responses, we consider that our provisional conclusions remain valid for the reasons set out in this document.

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<sup>2</sup> <https://www.ofcom.org.uk/consultations-and-statements/category-2/EE-licence-variation-1990-1920MHz>

Therefore, we have decided to vary EE's licence as set out in the following sections of this document.

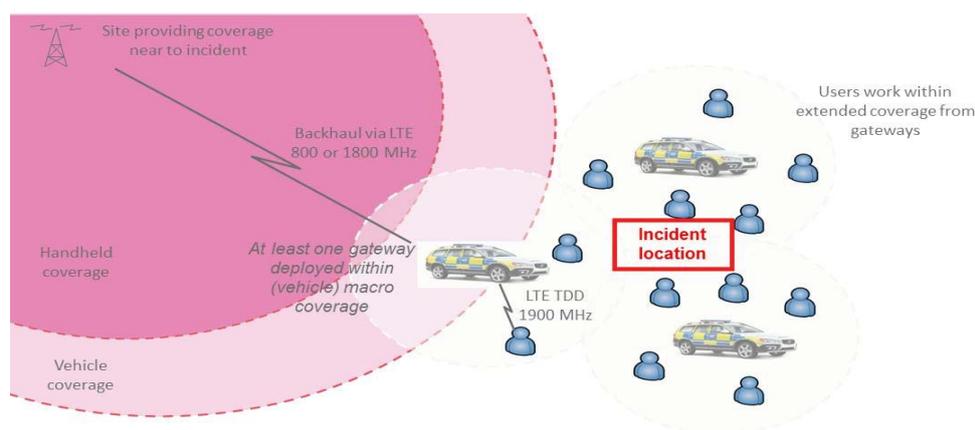
## Section 2

# Background

## Context

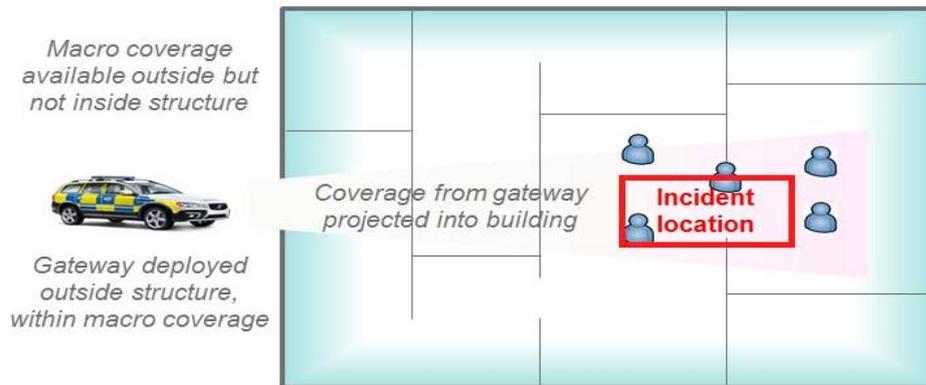
- 2.1 EE has been awarded a contract by the UK Home Office to provide Mobile Services for a new ESN based on its LTE network<sup>3</sup>. As part of that contract, the Home Office wants EE to provide an ESN Gateway device solution also based on an LTE air interface that, for instance, could be fitted to some emergency services vehicles.
- 2.2 The ESN Gateway device is intended to provide an extension to mobile coverage if the emergency services are responding to an incident in an area or location that has weak network coverage. This may be where the incident is beyond the normal network coverage (Figure 1) or for penetrating into buildings where the signal level from the external network is insufficient to support reliable communications (Figure 2). Within normal coverage of EE's macro network, ESN user terminal devices are expected to connect to the network directly.
- 2.3 Where the incident is occurring in a location with insufficient coverage, the emergency services vehicle fitted with an ESN Gateway can be deployed at the edge of the networks' ordinary coverage. The ESN terminal devices will connect to the ESN Gateway device, which will in turn connect to the main network. The approximate number of ESN Gateway devices expected to be deployed is of the order of 10,000 (noting that there are approximately 45,000 Emergency Services vehicles in total that could, in theory, be fitted).
- 2.4 The ESN Gateways will use TD-LTE technology operation in EE's 1900 MHz unpaired spectrum holding at 1899.9 to 1909.9 MHz to effectively provide a bubble of coverage around the ESN Gateway device. The ESN Gateway will be connected back (backhaul<sup>4</sup>) to the EE network via EEs 800 MHz or 1800 MHz access spectrum.

**Figure 1: Extension of coverage to a remote location**



<sup>3</sup> <https://www.gov.uk/government/publications/the-emergency-services-mobile-communications-programme/emergency-services-network#about-the-emergency-services-network>

<sup>4</sup> For the purposes of this licence variation consultation, use of the term "backhaul" should be taken to mean the connection between the ESN Gateway device and the main EE LTE access network.

**Figure 2: Extension of coverage into a building**

- 2.5 In support of the above, EE requested that its spectrum access licences be varied so as to permit it to:
- i) allow TD-LTE use as the licence currently restricts use of the 1900 MHz unpaired spectrum to Universal Mobile Telecommunications Service (UMTS) use; and
  - ii) connect (backhaul) the ESN Gateway devices to the main EE network using EE's paired spectrum at 800 MHz (796 to 801 MHz paired with 837 to 842 MHz) and at 1800 MHz (1831.7 to 1876.7 MHz paired with 1736.7 to 1781.7 MHz). To do this EE said it would like ESN Gateway devices to be authorised to transmit at a maximum mean power of 31 dBm e.i.r.p.<sup>5</sup> in the uplink frequencies 837.0 to 842.0 MHz and 1736.7 to 1781.7 MHz; this power is higher than that currently permitted in these bands. Apart for the maximum transmit power, all other technical conditions for the backhaul function of ESN Gateway devices should be as specified in EN 301 908-13. To achieve this EE has asked us to consider how we might authorise this (including the increase in power over exempt apparatus), suggesting a variation of the licences which include the 800 MHz and 1800 MHz bands.

## EE Consultation

- 2.6 On 19 August 2016 we published the Variation Consultation that discussed the two licence variation requests from EE, which would enable the use of 4G technology and support the provision of enhanced mobile communications for the emergency services.
- 2.7 The regulatory background to the spectrum bands affected by these variation requests was set out at Section 3 of the Variation Consultation. An outline of the relevant legal framework and Ofcom's duties and functions was set out at Section 4 of the Variation Consultation, and is re-produced at Annex 2.
- 2.8 In the Variation Consultation we considered the impact that the proposed variations would have on:
- citizens and consumers;

<sup>5</sup> 3GPP UE class 1

- competition; and
- spectrum management.

2.9 In summary, when considering the request as against our statutory duties and regulatory functions, we reached the provisional conclusion as set out in the Variation Consultation that the liberalisation of the 1899.9 to 1909.9 MHz spectrum band from 3G to 4G technologies to permit the use of LTE equipment would:

- be an efficient use of the spectrum and would not result in undue interference to other spectrum users given that:
  - the technical parameters we were proposing to implement were in line with the least restrictive technical conditions for this band as set out in CEPT Report 39. This report addresses the coexistence issues with uses in spectrum adjacent to the 1900 to 1920 MHz band;
  - we were proposing to include a requirement to adopt a specific TD frame structure and to synchronise this with other TD-LTE (or equivalent) networks operating in the rest of the 1900 to 1920 MHz band as and when such networks are deployed; and
  - we were proposing to prohibit the use of ESN Gateway devices fitted to vehicles whilst they are in motion;
- not distort competition in the mobile market. We also noted that this spectrum is unlikely to be used for the provision of mobile services in general; and
- provide benefits to citizens through supporting the provision of a new emergency services communication network.

2.10 We also considered that the increase in transmit powers in the 800 MHz and 1800 MHz spectrum for the backhaul of ESN Gateways would:

- not result in undue interference to adjacent users, providing it is limited to the provision of backhaul for ESN Gateway devices which are intended only for occasional and limited use;
- not distort competition due to the restrictions placed on its use; and
- provide benefits to citizens through supporting the provision of a new emergency services communication network.

2.11 Overall we believed that granting the requests would be an efficient use of the spectrum and would benefit citizens and consumers, with low risk of harmful interference to other stakeholders.

## Section 3

# Responses to the consultation

- 3.1 We received four responses to the Variation Consultation. Two respondents provided non-confidential responses and two provided confidential responses (both of whom also provided redacted non-confidential versions of their responses). All non-confidential versions of the responses are available to view on the Ofcom website<sup>6</sup>.

### **Question 1: Do you agree with our proposal to vary EE's Spectrum Access 2100 MHz licence to allow LTE technology? If not, please explain why you think it would not be appropriate to vary the licence.**

#### **Technical**

- 3.2 Hutchison 3G UK Ltd ("Three") in their response said that they broadly agreed with Ofcom's technical assessment and the subsequent proposal to vary EE's unpaired 2100 MHz spectrum access licence permitting LTE to be used in this band. They also said that it seemed appropriate for Ofcom to use CEPT Report 39 as the basis for the technical conditions for the licence variation. They welcomed the proposed adoption of a specific TD frame structure and synchronisation techniques similar to those proposed for the 2.3 GHz and 3.4 GHz bands. Furthermore, they supported the additional proposed safeguard against interference by restricting use of ESN gateways mounted on vehicles to only when stationary.
- 3.3 Vodafone in their response to the first consultation question said that they did not believe that they would likely experience any adverse effects to their licensed spectrum. However, they did raise concerns over the impact this might have on adjacent DECT devices. They noted that the analysis in CEPT Report 39 was of a theoretical nature, and did not include empirical evidence, it concluded that a small proportion of DECT terminals would lose connectivity when faced with an adjacent interferer. Vodafone suggested that before allowing the liberalisation Ofcom should carry out tests in order to ascertain the likely level of degradation for users.
- 3.4 Although we note Vodafone's concerns we do not believe that the use of LTE in the 1900 MHz band is likely to cause undue interference to DECT devices due to the likely separation distances of the devices. The ESN Gateway device will operate at low power and will primarily be used outdoors whereas DECT is largely used indoors. This automatically creates distance between the two devices and when combined with the signal loss caused by building attenuation further minimises the risk. Furthermore, we have been advised by EE that the coverage extension functionality will be used mainly in urban commercial building/public buildings where mobile coverage can sometimes be a problem. In these cases, DECT use is significantly less prevalent rather than in domestic dwellings where DECT usage is more concentrated. Finally, we note how the channel selection functionality within the

<sup>6</sup> <https://www.ofcom.org.uk/consultations-and-statements/category-2/EE-licence-variation-1990-1920MHz>

DECT system is able to move to lower DECT channels thus giving sufficient frequency separation to mitigate any interference which may occur.

- 3.5 Interference between DECT systems and UMTS Time Division Duplex (TDD) systems was studied in European Radio Committee (ERC) Report 65<sup>7</sup>. This identified two main scenarios where interference was a potential possibility:
- i) Mutual interference between a UMTS Macro Base Transceiver Station (BTS) and above roof-top a DECT Wireless Local Loop (WLL) system; and
  - ii) Mutual interference between an indoor DECT system and an indoor Transceiver Station (TS) belonging to a UMTS Macro cell system.
- 3.6 As the LTE-TDD systems being considered for this variation will operate at significantly lower power than the UMTS TDD systems studied for ERC Report 65 (which assumed a 55.5 dBm EIRP for the UMTS TDD base station) and that DECT WLL is not deployed in the UK, scenario i) above is not a concern and by extension interference to indoor DECT base stations from TD-LTE low power base stations is not a concern.
- 3.7 For the case of interference to indoor DECT systems from indoor terminals, i.e. equivalent to scenario ii) above, CEPT Report 39 concluded that *"...studies have shown that it is possible for ECN TS to achieve compatibility with DECT by complying with an emission level of -30dBm/MHz below 1900 MHz. When this level cannot be fulfilled compatibility can be achieved by ECN TS using a time frame that is detectable by DECT DCS mechanism..."*. The TD-LTE systems being considered in this licence variation will meet these conditions.
- 3.8 Given the above, we are confident that the risk of harmful interference from ESN Gateway devices and terminals to indoor DECT systems is very low and empirical tests to ascertain the likely level of degradation for DECT users are not necessary.

## Competition

- 3.9 Vodafone said that the proposed licence variation, as outlined in the Variation Consultation, would not in itself raise competition issues. However, both Telefonica and Three in their responses highlighted that the restrictions placed on the band by CEPT Report 39 impose much stricter power conditions on other unpaired 1900 MHz spectrum (above the 1899.9 to 1909.9 MHz used by EE). Telefonica argued that this would place even more of the usable LTE spectrum with BT/EE. They advised that this windfall benefit would not be available to other users of the spectrum and stated that the gross asymmetry in spectrum holdings demonstrates that the current assignment of spectrum between UK mobile operators is inefficient. They went on to state that this situation represents a threat to competition as well as posing a risk of consumer harm. They urge Ofcom not to make decisions that would deepen asymmetries in spectrum holdings and further threaten competition.
- 3.10 Vodafone and Telefonica both stated that the use of this spectrum should now count towards any future assessments and spectrum caps of LTE-capable spectrum. Telefonica argue that the most effective way to utilise the spectrum would be as a single 20 MHz block. This they argue would address the fragmentation created by the packaging in the original 3G auction design that has impeded development of the

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<sup>7</sup> <http://www.erodocdb.dk/docs/doc98/official/pdf/rep065.pdf>

band. They advise that Ofcom should take this opportunity to intervene in order to promote defragmentation.

- 3.11 None of the respondents objected to the liberalisation of the 1900 MHz band in principle, but they do object to the approach we were proposing to take to its liberalisation. We note that there are already many mobile handsets available in Europe that can use this spectrum (as part of a wider band) and, despite this, we are not aware of it being used elsewhere in Europe for mainstream mobile services. This is despite the CEPT Report 39 dating from 2010 that provided the technical parameters that would have allowed the rollout of mobile services. We are aware that if we were to liberalise spectrum in this band held by other operators, in line with the approach set out in the Variation Consultation and this Statement, this may bring the spectrum into more widespread use. However, we are still of the opinion that it would be of limited utility for the deployment of mainstream mobile services given the limitations on macro cell power.
- 3.12 As a direct result of the lack of use of the band in a number of Member States, the European Commission mandated CEPT to assess and identify alternative uses of the spectrum other than for mobile electronic communication services. In response, CEPT produced Report 52<sup>8</sup>. This highlighted that the band could be used for Broadband Direct Air to Ground (DA2GC), Programme Making and Special Events (PMSE), Short Range Devices (SRD), DECT and ad-hoc Public Protection and Disaster Relief (PPDR). Work is still ongoing by the European Commission but we currently do not think it is likely that we will see the spectrum being used for mobile services in other Member States in the near future. We therefore consider it unlikely that there will be an impact on mainstream mobile competition as a result of the licence variation.
- 3.13 Even if Vodafone and Telefonica's arguments were correct and EE's unpaired 1900 MHz spectrum were useful for providing mainstream mobile services, we would still consider it likely to be in consumers' interests to vary the licence. We note that the situation with EE's 1900 MHz spectrum is different to considering competition measures in auctions (such as in the forthcoming auction of 2.3 GHz and 3.4 GHz spectrum). With a spectrum auction, if one operator is not allowed to obtain the spectrum due to competition measures, then the spectrum is available for other operators to use. In contrast, when considering EE's licence variation request, the choice is between varying the licence to allow them to use a newer technology or not to allow it. Another Mobile Network Operator (MNO) is not able to obtain this spectrum if we do not vary the licence and neither would we revoke EE's licence. If the alternative is that this spectrum cannot be used for LTE mobile services, we consider it unlikely that preventing EE from having more LTE mobile spectrum could serve consumers' interests (even if this makes spectrum holdings between MNOs more asymmetric).<sup>9</sup>
- 3.14 Telefonica suggested that other options were possible, and that Ofcom should intervene to promote defragmentation of the unpaired 1900 MHz spectrum, and

<sup>8</sup> <http://www.erodocdb.dk/Docs/doc98/official/pdf/CEPTREP052.PDF>

<sup>9</sup> On previous occasions we have liberalised the use of certain bands, for example the liberalisation of 900 MHz band for 3G services and 1800 MHz for 4G services, where not all MNOs had access to the spectrum and allowed them to deploy newer technologies before others, giving them a first mover advantage. In these cases, we looked at whether operators would gain such a large advantage over competitors that there would be a material distortion of competition. We concluded that our relevant regulatory objectives and statutory duties were best served by granting the variation request. Unlike in these previous decisions, the current variation does not provide anyone with first mover advantage.

reduce the asymmetry of spectrum holdings between MNOs. For example, one option could be to revoke EE's licence (and the other unpaired 1900 MHz licences) and then auction a 20 MHz block. We note that to revoke the licences on spectrum management grounds we would need to provide at least five years notice. We do not consider that this would be efficient in terms of spectrum management, for the following reasons:

- 3.14.1 EE has made its variation request so it can use the spectrum to provide communications which they could utilise to provide services to the Emergency Services, which may represent the best use of the spectrum.
  - 3.14.2 It is not clear that the spectrum would be useful for mainstream mobile use, given the restrictions on power use. This is consistent with the spectrum not being used elsewhere in Europe for mainstream mobile use.
  - 3.14.3 Even if the spectrum were useful for mainstream mobile services, we do not see strong reasons for revoking the spectrum because of competition concerns relating to asymmetries in holdings of mobile spectrum. This is because before the unpaired 1900 MHz spectrum could become available for other operators (after at least five years), a significant amount of other mobile spectrum will be available (including at 2.3 GHz and 3.4 GHz). This means all MNOs will have other opportunities to obtain mobile spectrum and Ofcom can take any competition measures that were appropriate in future auctions.
  - 3.14.4 We also note that the spectrum rights can be traded, and that if there were strong benefits from unifying the unpaired 1900 MHz spectrum, it would be possible for the current licence holders to trade the spectrum, which would be faster than regulatory intervention.
- 3.15 We note the points raised concerning including this spectrum as part of the spectrum relevant for any caps imposed on licences as part of any future award process. In our consultation "Award of the 2.3 and 3.4 GHz spectrum bands" published on 21 November 2106<sup>10</sup> (the "Award Consultation"), we set out our provisional view that the unpaired 1900 MHz spectrum was not relevant to our assessment of mobile competition for that award.<sup>11</sup> We will consider responses to this consultation on this point when we consider other responses to the Award Consultation.

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<sup>10</sup> [https://www.ofcom.org.uk/\\_data/assets/pdf\\_file/0026/93545/award-of-the-spectrum-bands-consultation.pdf](https://www.ofcom.org.uk/_data/assets/pdf_file/0026/93545/award-of-the-spectrum-bands-consultation.pdf)

<sup>11</sup> See in particular paragraphs A5.19 to A5.23 of the Award Consultation.

**Question 2: Do you agree with our proposal to authorise the backhaul of ESN Gateway devices at a maximum mean transmit power of 31 dBm e.i.r.p. in the uplink frequencies 837.0 to 842.0 MHz and 1736.7 to 1781.7 MHz in EE's 800 MHz and 1800 MHz licensed spectrum to facilitate the occasional and limited use of higher power uplink transmission? If not, please explain why you think it would not be appropriate to vary the licence.**

### Technical

- 3.16 Three and Telefonica agreed with our proposal to authorise the backhaul of ESN gateway devices in the 800 MHz and 1800 MHz bands at the higher maximum mean transmit power of 31 dBm EIRP, provided that the authorisation was limited to the provision of backhaul for ESN gateway devices. They advised that they believed the interference risk to services in the 800 MHz and 1800 MHz band to be low.
- 3.17 Vodafone in its response disagreed with the proposals and outlined a number of issues it had with the proposed variation in reference to the 800 MHz band. They highlighted the fact that our consideration of the impact on other MNO networks only took into account the rural user case, whereas the extension to in-building coverage is likely to be used in more urban areas and could adversely affect their customers, at precisely the time (e.g. an emergency or major incident) when being in contact is most important. As well as the impact on consumers, they cite potential impact to Category 1 and 2 responders under Mobile Telecommunication Privileged Access Scheme (MTPAS) on the Vodafone network. A confidential respondent also stated that EE needed to demonstrate how an increase in uplink power would not affect the public network.
- 3.18 In the consultation we said the following. *“Given the supporting network density and the outdoor use case of the ESN Gateway solution, it is considered that transmit powers close to or at the maximum will more likely be needed in rural areas. As noted above, a key mitigation in relation to ESN Gateways (and therefore also in relation to backhaul related to their use) is that their use is intended to be short term, occasional and transient in nature, with generally a very low return period to any specific location. The low return period and the generally lower loading of rural base stations offer additional mitigation in relation to such interference.”*
- 3.19 Our view is that the rural use case, where the ECN Gateway and an 800 MHz base station can be separated by relatively large distances, is the one where the increased transmit powers are likely to be most needed. In urban areas the ESN gateway is much more likely to be relatively close to an 800 MHz base station where the higher power requirement will not be needed. In the urban case it is far more likely that the ESN Gateway will transmit at powers similar to the 23 dBm currently authorised for terminal devices and would therefore cause no more interference than an 800 MHz terminal device would if it were operating towards the upper end of its power range. In addition, we have been advised by EE that the hierarchy of band preferences in their network would favour the use of 1800MHz spectrum when this is available further reducing an already low potential for interference to 800 MHz base stations. This, coupled with the points we made about ESN Gateway use being intended to be short term, occasional and transient in nature, with generally a very low return period to any specific location, leads us to maintain our original provisional conclusion that we do not consider that the proposed increase in maximum transmit power for the

backhaul of ESN Gateway devices will result in undue interference to adjacent 800 MHz spectrum.

- 3.20 Vodafone also questioned the proposal in the Variation Consultation to specify that all other relevant parameters must meet the requirements of the European Telecommunication Standards Institute (ETSI) European Standard (EN) 301 908-13. They pointed out that this standard only covers Class 3 (23 dBm) equipment and if the licence power is varied this would be a relaxation on the Adjacent Channel Leakage Ratio (ACLR) requirements. In their response they stated that their position is that permission to use increased power must be contingent on the ACLR being constrained such that the noise floor in their licensed frequencies remains unchanged.
- 3.21 We accept the point made by Vodafone that without a tighter ACLR there is a risk that the noise floor in their adjacent spectrum may potentially rise. However, the proposed 3GPP RAN 4 methodology for derivation of the required ACLR for Band 3 (1800 MHz) and Band 20 (800 MHz) are identical to that used for 3GPP Band 14<sup>12</sup> where the ACLR requirement for Class1 (31 dBm) equipment is more stringent than for Class 3 equipment. This work is specifically intended to not result in neighbouring system degradation greater than that caused by power Class 3 devices. If the proposed 3GPP RAN 4 methodology is agreed and implemented, we do not believe that this will result in a change in the noise floor. However, in the unlikely event that the work in 3GPP results in an ACLR that indicates a material increase to the noise, we are likely to propose varying EE's licence accordingly to impose a more stringent ACLR requirement on them.
- 3.22 Vodafone also advised that we did not appear to have given any consideration to the impact on Digital Terrestrial Television (DTT). They stated that predicting where interference to DTT will occur has proven to be an inexact science and that whether the LTE downlink signal is in the bottom (791 to 796MHz) or top (811 to 821MHz) blocks of the downlink band has little correlation with whether interference arises. Based on this they advised that it was not clear whether higher transmit powers would not similarly result in degradation of DTT performance, particularly in the rural case where DTT signals are likely to be poorer. They went on to state that although temporary, an incident may be the time Police would want local residents to see local TV bulletins about safety advice. Further they express concerns that if interference were to occur then this is likely to lead to increased calls to Digital Mobile Spectrum Limited (about TV interference) and cost Vodafone and Telefonica more in contributions, due to the funding model established, despite them not being the source of problems in this scenario.
- 3.23 As part of the 800 MHz award Ofcom commissioned Cobham Technical Services to carry out a study into the impact of LTE on DTT systems<sup>13</sup>. The study identified a single case of interference of an outdoor device into a DTT system at UE transmit powers of 28dBm at 30 metres inter system horizontal separation. This was close to Image Channel N+9. Given this test information, the fact that the user equipment will unlikely be radiating at full power in many situations and that spatial separation distances will in many cases be greater than those in the study we believe the risk of DTT interference to be low. We have been advised by EE that the hierarchy of band

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<sup>12</sup> 3GPP Band 14 is a frequency band used in the United States for emergency services. It is currently the only 3GPP band where Class1 (31 dBm) terminal equipment is specified in the LTE standard.

<sup>13</sup> [https://www.ofcom.org.uk/\\_data/assets/pdf\\_file/0023/38057/2010-0026.pdf](https://www.ofcom.org.uk/_data/assets/pdf_file/0023/38057/2010-0026.pdf) January 2010

preferences in their network would favour the use of 1800MHz spectrum when this is available further reducing an already low potential for interference.

- 3.24 Finally, Vodafone advised that using the 800 MHz band isn't the only solution open to EE and they should provide evidence as to why none of the other 260 MHz of spectrum it holds is not suitable for this application. They said that if none of this other spectrum is suitable it should be incumbent on Ofcom to field test what coexistence issues arise rather than allowing the increase on the basis that it will not happen very often and not in the same place twice.
- 3.25 As advised in our consultation EE is proposing to use both their 800 MHz and 1800 MHz band to provide backhaul services and that the network preference would be to use the 1800 MHz band when available We consider that, given the likely outcome of standardisation work with respect to ACLR limits for Class1 equipment in this band and the small number of use cases in which a degradation to service may occur, that coexistence field tests are not necessary.

### Other issues raised

- 3.26 A confidential respondent raised a number of issues concerning the operation of the emergency services network. They advised that EE should have a 100% coverage requirement imposed on the service. If their plan extends only to existing base stations, then it isn't an appropriate use of the spectrum and should be blocked pending a formal review.
- 3.27 The issues of coverage and service requirements imposed on EE in relation to the operation of the ESN is a contractual matter between EE and the Home Office and falls outside the scope of this consultation.

## Section 4

# Ofcom's decision

- 4.1 Based on our preliminary assessment and further consideration in the light of responses received to the consultation, we have decided to grant the two licence variations to EE for the reasons outlined in this section.

## Implications for LTE deployment in the frequency band 1900 to 1920 MHz

### Impact on citizens and consumers

- 4.2 In general, we believe that supporting innovation by liberalising spectrum use should bring about benefits for citizens and consumers, as it enables operators to use new technologies and provide new services. In this instance, the liberalisation of EE's 1900 MHz unpaired spectrum to permit the use of LTE equipment will benefit citizens and consumers by supporting the provision of a new emergency services communications network.
- 4.3 The Home Office has advised that the use of a cheaper, smarter communications network, which this variation is part of, will enable more effective use of police, fire and ambulance resources<sup>14</sup>. They cite the example of ambulance crews being able to send high-resolution images and video to waiting consultants or live streaming of body worn cameras at a crime scene. Although difficult for Ofcom to quantify, we believe that granting this variation request would provide benefits to citizens through supporting the provision of a new emergency services communication network.
- 4.4 However, as outlined below this liberalisation measure could provide further opportunities to exploit this previously unused spectrum band. The 1900 MHz unpaired spectrum is already designated for use for TD-LTE by the 3rd Generation Partnership Project (3GPP). The 1900 to 1920 MHz band is covered by 3GPP Band 33 and it is a subset of 3GPP Band 39. Although deployment of equipment covering 1900 MHz unpaired spectrum is currently limited to China, many mobile handsets available to UK consumers already support the use of this band. While availability of networks that use Band 33 and 39 may be limited, we consider that clarity around the use of the band for TD-LTE and the availability of equipment will provide additional momentum to expand the use of this spectrum to provide niche / local capacity solutions.
- 4.5 Given the availability of equipment, if in the future EE or other licensees in the 1900 MHz unpaired spectrum wished to use this spectrum for services other than ESN then it may provide additional but potentially limited capacity for broadband services which may result in some benefits for consumers. This could provide the networks greater capacity to deal with increased data demand in local areas. However, at present we believe it to be more likely that the use of this spectrum would be to provide niche solutions, due to the power restrictions across the band, rather than be

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<sup>14</sup> <https://www.gov.uk/government/news/final-contracts-for-new-emergency-services-network-are-signed>

available to all users and therefore any consumer benefits may be relatively limited in scope.

### Impact on competition

- 4.6 As set out in section 3, we consider that this spectrum will be of limited use for the deployment of mainstream mobile services given the limitations on macro cell power. We therefore do not expect it to have a material impact on mobile competition generally.
- 4.7 Even if this spectrum *were* useful for providing mainstream mobile services, we would still consider it likely to be in consumers' interests to vary the licence. As set out in section 3, the choice is between varying the licence to allow EE to use the 1900 MHz spectrum, and not allowing EE to use the spectrum. Another MNO is not able to obtain this spectrum if we do not vary the licence. If the alternative is that this spectrum cannot be used for mobile services, we consider it unlikely that preventing EE from having more mobile spectrum could serve consumers' interests (even if this makes spectrum holdings between MNOs more asymmetric). We set out in section 3 why we do not consider it would be in consumers' interests to revoke the licence (and other similar licences) and re-auction the spectrum block.
- 4.8 In our Award Consultation, we set out our provisional view that the unpaired 1900 MHz spectrum was not relevant to our assessment of mobile competition for that award. We will consider responses to this consultation on this point when we consider other responses to the Award Consultation.

### Impact on spectrum management

- 4.9 We consider that allowing this spectrum to be brought into productive use will be beneficial provided it does not cause interference to users in adjacent bands. We have therefore considered varying the licence in line with technical conditions necessary to provide other users adequate protection against harmful interference. Specifically, our analysis includes considering the potential impact to the following adjacent users: DECT in the band 1880 to 1900 MHz; other licensees of 1900 MHz unpaired spectrum, Telefónica Ltd (1909.9 to 1914.9 MHz) and Hutchison 3G Ltd (1914.9 to 1920.0); the uplink band of paired 2100 MHz spectrum, particularly Hutchison 3G which holds the nearest such allocation 1920.0 to 1934.9 MHz.
- 4.10 CEPT Report 39<sup>15</sup>, published in 2010, established a set of least restrictive technical conditions for Electronic Communication Networks including conditions that are appropriate for the use of TD-LTE in the unpaired band 1900 to 1920 MHz. It concluded that the minimal and least restrictive technical conditions included in the report, and set out below in Table 1, were sufficient to manage the risk of interference in general.

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<sup>15</sup> [Report from CEPT to the European Commission in response to the Mandate to develop least restrictive technical conditions for 2GHz bands, Final Report 25 June 2010](#)

**Table 1: CEPT Report 39 key conditions**

Maximum mean in-block e.i.r.p of base stations	1900 to 1905 MHz	43 dBm/5MHz
	1905 to1910 MHz	30 dBm/5MHz
	1910 to1920 MHz	20 dBm/5MHz
Maximum mean out-of-block e.i.r.p of base stations	1920-1980 MHz	-50 dBm/5MHz
Other main elements of the base station block-edge-mask	As described in CEPT Report 39	

- 4.11 In addition to the findings of CEPT’s work, we further considered the potential for interference from the use of ESN Gateway devices. In particular, we looked at whether there is anything specific to the proposed ESN Gateway usage which lead us to believe that a set of technical conditions based on those contained in CEPT Report 39 would not be sufficient to manage the risk of interference to neighbouring spectrum users. Details of this analysis were given in annex 6 of the Variation Consultation.
- 4.12 We found that a key mitigation in relation to ESN Gateway use is its short term, transient nature and that the ESN Gateways are at a lower height (approximately 2 to 3 meters for most vehicles) than the base stations considered in Report 39 (which assumed a height of 20 metres), i.e. more likely to be shielded by local clutter.
- 4.13 In addition, the use of synchronisation between licensees will further minimise the risks of interference. Synchronisation is where networks coordinate the timeslots that base stations transmit on to avoid the situation where one nearby base station is trying to receive while the other is transmitting. Our synchronisation analysis was contained in Annex 7 of the Variation Consultation.
- 4.14 As noted in section 3, Vodafone raised concerns about the potential impact our proposals might have on adjacent DECT devices. We have set out at paragraphs 3.4 to 3.8 why we consider the risk of harmful interference from ESN Gateway devices and terminals to indoor DECT systems to be very low and empirical tests to ascertain the likely level of degradation for DECT users to be unnecessary.
- 4.15 However, use of ESN Gateway devices at (vehicular) speeds may increase the risk of interference to neighbouring spectrum users and should be avoided. We have therefore included a condition in the licence that ESN Gateways mounted on vehicles are not to be used while the vehicle is in motion.

## Our decision

- 4.16 We have decided to grant the request to permit TD-LTE technologies in the 1899.9 to 1909.9 MHz unpaired spectrum as we believe this to be an efficient use of the spectrum. Our decision is predicated on the basis that additional technical conditions have been included in EE’s licence<sup>16</sup>. These technical conditions are required to prevent undue interference to other users of the adjacent spectrum. The technical conditions we have set:

- are consistent with CEPT Report 39;

<sup>16</sup> <https://www.ofcom.org.uk/manage-your-licence/radiocommunication-licences/mobile-wireless-broadband/uk-cellular-operators>

- impose a requirement to adopt a specific TD frame structure (3:1 DL:UL configuration) and be capable of frame synchronisation (i.e. alignment of the frame start times and all frames/sub-frames being the same) with other unpaired TD-LTE (or equivalent) systems deployed in the 1900 MHz unpaired band in accordance with the relevant licence schedule (explained further in annex 7 of the Variation Consultation); and
  - prohibit the use of ESN Gateway devices fitted to vehicles whilst they are in motion.
- 4.17 Given the above conditions, we did not consider that undue interference from EE's proposed use of 1899.9 to 1909.9 MHz was likely. We believe our decision would provide benefits to citizens through supporting the provision of a new emergency services communication network. We see no competition grounds that would prevent us from approving this request.
- 4.18 We have not specifically considered the impact of extending this variation to the other two licences in the 1900 MHz unpaired band but would do so if requested. However, as we noted in the Variation Consultation, our preliminary view is that a set of technical conditions based on those contained in CEPT Report 39 is likely to be appropriate to most use cases based on TD-LTE (or equivalent) technology and that synchronisation between TDD networks in the band is likely to be necessary.
- 4.19 It should be noted that CEPT Report 39 established an in-band power limit for the 1910 to 1920 MHz block that is lower than the limits for the 1900 to 1905 MHz and 1905 to 1910 MHz blocks. Any variation for the other two licences may have to reflect this difference.
- 4.20 We consider that the variation we are making to EE's 2100 MHz spectrum access licence is:
- **objectively justifiable** as it is necessary in order to enable the use of 4G technology in the 1900 MHz unpaired band;
  - **non-discriminatory** as we would consider any requests from other operators to vary other comparable licences in the same band on the same basis;
  - **proportionate** because the licence variation would permit operators the maximum flexibility to use of their spectrum in line with current technical reports and the restrictions and conditions placed on the use of that spectrum go no further than is necessary to protect spectrum users in adjacent bands; and
  - **transparent** because it is clear on the face of the licence variation what it is intended to achieve.

## Implications of authorising the backhaul of ESN Gateway devices using the 800 MHz and 1800 MHz bands

### Impact on consumers and citizens

- 4.21 In so far as the variations of EE's licences in the 800 MHz and 1800 MHz bands to authorise the use of these bands for backhaul are concerned, given the restrictions to only permit the use of this backhaul for ESN Gateway equipment, we believe that the variation will be of benefit to emergency services users. However, we believe

that benefits to other consumers will be limited. We have outlined the impact on citizens previously when we discussed the variation of EE’s 2100 MHz licence in paragraphs 4.2 to 4.5 and that discussion applies equally to the related variations of EE’s Spectrum Access 800 MHz / 2.6 GHz and 1800 MHz licences.

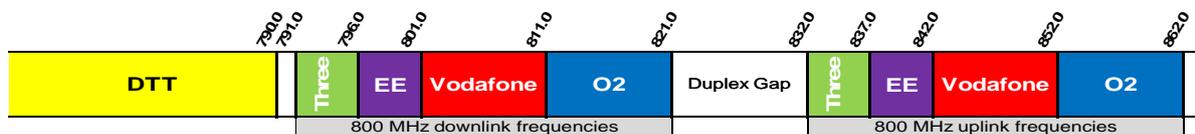
### Impact on competition

4.22 EE’s proposal to use the 800 MHz and 1800 MHz bands for backhaul at powers up to 31 dBm e.i.r.p. relates specifically to the support of emergency services communications and does not change the conditions of the licences authorising the general use of the 800 MHz and 1800 MHz bands. We have not considered more generally the impact of allowing uplink transmissions in the 800 MHz and 1800 MHz bands from devices with a maximum mean power of 31 dBm e.i.r.p. Consequently, we have decided that the use of devices using 31 dBm e.i.r.p should be restricted in the licence to the backhaul of ESN Gateway devices only, which are intended only for occasional and limited use. Given this restriction, we do not believe that granting the request would give rise to any adverse impact on competition in the mobile market.

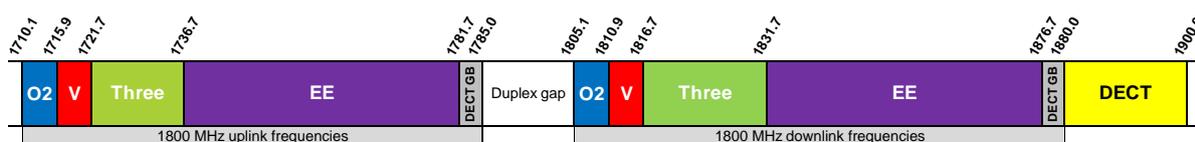
### Impact on spectrum management

4.23 In considering EE’s request to use the 800 MHz and 1800 MHz bands for ESN Gateway backhaul, we assessed the potential coexistence impact on the use of neighbouring spectrum. Figures 3 and 4 below illustrate EE’s paired spectrum holdings in the 800 MHz and 1800 MHz bands in relation to the neighbouring spectrum.

**Figure 3: EE’s 800 MHz Paired Bands and Neighbouring Spectrum Use**



**Figure 4: EE’s 1800 MHz Paired Bands and Neighbouring Spectrum Use**



4.24 We assessed the potential interference impact of allowing uplink transmissions with a maximum mean power of 31 dBm e.i.r.p. using 800 MHz and 1800 MHz to provide backhaul for ESN Gateway devices. The main interference mechanism to consider is interference into the base station receivers of other mobile operators operating in adjacent paired spectrum (primarily Three and Vodafone in the 800 MHz band; Three in the 1800 MHz band and Concurrent Spectrum Access licensees in the 1781.7-1785 and 1876.7-1880 MHz bands (the “DECT Guard Band”)).

4.25 Devices with a maximum mean power of 31 dBm e.i.r.p. operating in the uplink frequencies 837.0 to 842.0 MHz and 1736.7 to 1781.7 MHz could potentially cause desensitisation of base station receivers in adjacent spectrum over a relatively large distance. However, base stations are designed to operate in an environment where such desensitisation could occur. This interference is most pronounced where terminal stations are operating at their maximum power, are located close to the ‘victim’ base station, and where the ‘victim’ base station is receiving a relatively weak

signal from one of its own user terminal devices. This interference is naturally mitigated as these circumstances are generally encountered relatively rarely due to the naturally transient nature of mobile transitions and the power control mechanism implemented.

- 4.26 We think that it is likely that work in 3GPP on the standardisation of Class 1 devices for backhaul of ESN Gateway devices using 800 MHz and 1800 MHz spectrum will lead to the development of an ETSI Harmonised Standard with an ACLR requirement that will not result in a material change to the noise floor in neighbouring spectrum. However, if this is not the case, as noted above at paragraph 3.21, we are likely to propose varying EE's licence further so as to limit the ACLR level so that the impact on adjacent users is similar to what they experienced prior to this variation.
- 4.27 Given the supporting network density and the outdoor use case of the ESN Gateway solution, it is considered that transmit powers close to or at the maximum will more likely be needed in rural areas. As noted above, a key mitigation in relation to ESN Gateways (and therefore also in relation to backhaul related to their use) is that their use is intended to be short term, occasional and transient in nature, with generally a very low return period to any specific location. The low return period and the generally lower loading of rural base stations offer additional mitigation in relation to such interference.
- 4.28 We have also considered the potential interference impact of devices with a maximum mean power of 31 dBm e.i.r.p. on Digital Terrestrial Television (DTT) receivers operating below 790 MHz. Given the frequency separation between EEs uplink spectrum (837 to 842 MHz) and the DTT block below 790 MHz and the mitigation factors described above it is not considered likely that use of devices with a maximum mean power of 31 dBm e.i.r.p. for ESN Gateway backhaul will be problematic for DTT reception.

### Our decision

- 4.29 We have decided to grant EE's variation request to its Spectrum Access 800 MHz / 2.6 GHz and 1800 MHz licences in order to allow the backhaul of ESN Gateway devices at a maximum mean power of 31 dBm e.i.r.p. in the uplink frequencies 837.0 to 842.0 MHz and 1736.7 to 1781.7 MHz. We do not consider that this will result in undue interference to adjacent users however, we will keep this under review and may vary EE's licence to impose more stringent technical requirements if the need arises.
- 4.30 However, we have not considered more generally the impact of allowing uplink transmissions in the 800 MHz and 1800 MHz bands from devices with a maximum mean power of 31 dBm e.i.r.p. For this reason, we have decided to authorise this only in relation to its use for the backhaul of ESN Gateways, which are intended only for occasional and limited use.
- 4.31 As discussed previously we believe that there are benefits to citizens through supporting the provision of a new emergency services communication network. We see no competition reasons not to approve the request.
- 4.32 We consider that the variations we have decided to make to EE's Spectrum Access 800 MHz / 2.6 GHz and 1800 MHz spectrum access licences are:
- **objectively justifiable** as they are necessary in order to enable the use of ESN Gateways in connection with the new national emergency services network;

- **non-discriminatory** as we would consider any requests from other operators to vary other comparable licences in the same bands on the same basis;
- **proportionate** because the restrictions and conditions placed on the use of that spectrum go no further than is necessary to achieve the objective of permitting the use of ESN Gateways in connection with the new national emergency services network while protecting spectrum users in adjacent bands; and
- **transparent** because it is clear on the face of the licences what they are intended to achieve.

**Annex 1**

# Respondents

**Name withheld**

**Hutchison 3G UK Ltd**

**Telefonica**

**Vodafone**

## Annex 2

# Ofcom's duties and functions

- A2.1 This section provides an overview of the main UK and European legislative provisions relevant to wireless telegraphy licensing and to the requested variation. It is not a full statement of all legal provisions which may be relevant to Ofcom's functions and to wireless telegraphy licensing.
- A2.2 The applicable legal framework derives from our duties under both domestic and European legislation, specifically from:
- the Communications Act 2003 (the "2003 Act") and the Wireless Telegraphy Act 2006 (the "2006 Act"); and
  - the European Common Regulatory Framework<sup>17</sup> for electronic communications networks and services, in particular, the Framework Directive and the Authorisation Directive – together with a number of Decisions that apply to these specific spectrum bands.

## Ofcom's general duties

- A2.3 Section 3 of the 2003 Act states the general duties of Ofcom. Under section 3(1) it is the principal duty of Ofcom in carrying out its functions:
- to further the interests of citizens in relation to communications matters; and
  - to further the interests of consumers in relevant markets, where appropriate by promoting competition.
- A2.4 In doing so, Ofcom is required to secure, amongst others (under section 3(2)):
- the optimal use for wireless telegraphy of the electro-magnetic spectrum;
  - the availability throughout the UK of a wide range of services;
- A2.5 In performing its duties, Ofcom must have regard to, amongst others, the following matters:
- the desirability of promoting competition (section 3(4)(b));
  - the desirability of encouraging investment and innovation (section 3(4)(d));
  - the desirability of encouraging availability and use of broadband services throughout the UK (section 3(4)(e)); and
  - the different needs and interests of persons in different parts of the UK (section 3(4)(l)).

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<sup>17</sup> The European Common Regulatory Framework comprises the Framework Directive (Directive 2002/21/EC), the Authorisation Directive (Directive 2002/20/EC), the Access Directive (Directive 2002/19/EC), the Universal Service Directive (Directive 2002/22/EC) and the Directive on privacy and electronic communications (Directive 2002/58/EC), as amended.

A2.6 The management of the UK radio spectrum is carried out within a framework set out by the European Common Regulatory Framework, which aims to harmonise the regulation of electronic communications networks and services throughout the European Union. Related to that, Section 4 of the 2003 Act requires Ofcom when carrying out its spectrum functions to act in accordance with “six community requirements” when managing the wireless spectrum within the UK. These include:

- the requirement to promote competition (section 4(3));
- the requirement to secure that Ofcom’s activities contribute to the development of the European internal market (section 4(4));
- the requirement to promote the interests of all persons who are citizens of the European Union (section 4(5)).

### **Ofcom’s duties when carrying out spectrum functions**

A2.7 In carrying out its spectrum functions it is the duty of Ofcom (under section 3 of the 2006 Act) to have regard in particular to:

- the extent to which the spectrum is available for use or further use, for wireless telegraphy;
- the demand for use of that spectrum for wireless telegraphy; and
- the demand that is likely to arise in future for the use of that spectrum for wireless telegraphy.

A2.8 It is also the duty of Ofcom to have regard, in particular, to the desirability of promoting:

- the efficient management and use of the spectrum for wireless telegraphy;
- the economic and other benefits that may arise from the use of wireless telegraphy;
- the development of innovative services; and
- competition in the provision of electronic communications services.

A2.9 Where it appears to Ofcom that any of its duties in section 3 of the 2006 Act conflict with one or more of its general duties under sections 3 to 6 of the 2003 Act, priority must be given to its duties under the 2003 Act.

### **Ofcom’s spectrum functions**

A2.10 Ofcom’s powers to carry out its spectrum functions are set out in the 2006 Act. Such powers include, under paragraph 6 of Schedule 1 of the 2006 Act, the general discretion to revoke or vary any wireless telegraphy licences by serving a notice in writing on the licence holder or by way of general notice to licensees in a class.

A2.11 Ofcom also has a duty set out in section 9(7) of the 2006 Act, reflecting Article 6 of the EU Authorisation Directive 2002/20/EC, to ensure that wireless telegraphy licence conditions are objectively justified in relation to networks and services to

which they relate, non-discriminatory, proportionate and transparent. Ofcom considers that this obligation is ongoing and must be assessed against market circumstances and the state of technology development at the time.

A2.12 Ofcom has a broad discretion under paragraph 6 of Schedule 1 of the 2006 Act to agree to vary licences, but legal rules operate to limit that discretion. These legal rules on licence variation include the following, in summary:

- Pursuant to paragraph 6A of Schedule 1 of the 2006 Act, any variation of a wireless telegraphy licence must be objectively justifiable;
- UK obligations under European law or international agreements where use of spectrum has been harmonised: Ofcom will not agree to remove restrictions from licences or other changes that would conflict with the UK's obligations under international law. This includes changes in use or technology that would contravene binding Community measures, such as directives or harmonisation measures adopted under the Radio Spectrum Decision (676/2002/EC) and ITU Radio Regulations.
- Ofcom must comply with any direction from the Secretary of State under section 5 of the 2003 Act and section 5 of the 2006 Act.
- Ofcom must act in accordance with its statutory duties, including the duty to ensure optimal use of the spectrum, the duty mentioned in paragraph 4.7 and obligations under the European Authorisation Directive (2002/20/EC).
- General legal principles, which include the duties to act reasonably and rationally when making decisions and to take account of any legitimate expectations.

## **Liberalisation and the framework for analysis of licence variation requests**

A2.13 The radio spectrum is a finite resource of considerable economic and social value. Where possible we have adopted market-based mechanisms, including trading and liberalisation, which empower spectrum users to take more decisions on spectrum. We believe that this is likely to lead to optimal use of the radio spectrum.

A2.14 Liberalisation, the removal or reduction of restrictions in licences, is central to this approach to spectrum management. Together with incentive pricing, auctions and spectrum trading, it makes spectrum available on a more flexible and dynamic basis for new wireless applications. It is also consistent with Ofcom's aim to deregulate or simplify regulation wherever possible.

A2.15 Our approach to liberalisation operates within the legal rules described above that limit Ofcom's discretion to vary licences. Therefore, in considering requests for the variation of individual licences the factors that we will take into account include:

- impact on spectrum users in adjacent bands;
- benefits for consumers and citizens;
- optimal spectrum use;
- impact on competition;

- objective justification for licence conditions; and
- legal considerations that limit Ofcom's discretion to vary licence conditions.

A2.16 In this statement and the Variation Consultation, the analytical framework we have applied in considering this variation request reflects our relevant regulatory objectives and our statutory duties, as set out above.

A2.17 We have considered both the likely impact on competition and consumers of granting the variation and the likely effect on spectrum management, in particular the impact on existing licensed or exempted use of adjacent spectrum.

## Impact assessment

A2.18 This statement as a whole, including its annexes and together with previous consultation documents, comprises an impact assessment as defined in Section 7 of the 2003 Act.

A2.19 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 2003 Act, which means that generally, we have to carry out impact assessments where our proposals would be likely to have a significant impact on businesses or the public, or when there is a major change in Ofcom's activities.

## Equality Impact Assessment

A2.20 Ofcom is separately 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.

A2.21 We do not consider that our decisions in respect to EE's licence variation are likely to have a particular impact on one group of stakeholders as opposed to another.

A2.22 Additionally, we do not believe any aspect of the decision to vary EE's licence raises issues requiring separate EIAs in relation to race or gender equality or equality schemes under the Northern Ireland and Disability Equality Schemes.