



Variation of UK Broadband's 3.4 GHz Licence

Statement

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About this Document

This statement sets out Ofcom's decision to grant an extension to the spectrum licence held by UK Broadband Ltd. within the 3.4 GHz band.

UK Broadband had requested an indefinite extension of its existing licence beyond the current expiry date of July 2018. The licence authorises use of two 20 MHz blocks of spectrum in the frequency ranges 3480 to 3500 MHz and 3580 to 3600 MHz.

Ofcom believes a decision to grant the request will promote competition and encourage investment and innovation, in line with our statutory duties to further the interests of citizens and consumers.

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Section 1

Executive Summary

- 1.1 This statement sets out Ofcom's decision to approve a request by UK Broadband Limited for a variation to the terms and conditions of its 3.4 GHz radio spectrum licence. The variation extends the duration of the licence for an indefinite period beyond the previous expiry date of July 2018.
- 1.2 The UK Broadband 3.4 GHz licence authorises the use of 40 MHz of radio spectrum in two separate 20 MHz blocks at 3480 to 3500 MHz and at 3580 to 3600 MHz. Our decision to grant an indefinite extension to the licence follows proposals set out in a consultation document published in June 2014.¹ The extended licence will be subject to an annual licence fee commencing from the original expiry date (i.e. from July 2018).
- 1.3 Our consultation considered the benefits to consumers that would arise if the licence were extended and UK Broadband proceeded with its investment in a new broadband network. We weighed this up against the potential costs – including the potential spectrum inefficiencies that may arise as a result of the non-contiguous nature of UK Broadband's 3.4 GHz holdings. In setting out our proposals, we said that the benefits to consumers of granting the extension outweighed any potential costs.
- 1.4 Following consideration of the consultation responses and further assessment of relevant factors, this statement sets out our decision to proceed with the licence extension. That decision, and the analysis which supports it, takes account of the full range of our statutory duties.
- 1.5 Having considered the evidence, we believe that it is more likely that UK Broadband's investment will go ahead if the licence extension is granted than if it is refused.
- 1.6 Among the potential benefits we expect to arise from UK Broadband's investment are the delivery of faster broadband speeds in under-served areas; lower prices for broadband; provision to under-served customers (students, the less well-off etc.); additional end-to-end competition in the market for fixed broadband; and the quicker development of new equipment capable of using the 3.4 GHz band. Additionally, we consider UK Broadband's use of new technology in the 3.4 GHz band and the ability of its customers to subscribe to fast broadband without the need for a land-line as innovative approaches.
- 1.7 We also note the likelihood that there will be synchronisation between different users of the 3.4 GHz spectrum band. This makes it likely that much of the potential for spectrum inefficiency we identified in our consultation, related to UK Broadband having a split frequency assignment, will be mitigated.
- 1.8 We have also considered what would happen if we did not extend the licence and the frequencies were auctioned. While it is possible that an operator other than UK Broadband might then acquire the spectrum, and might obtain more value from the frequencies than UK Broadband, this is uncertain. In any case, such use would not be realised for some time.

¹ <http://stakeholders.ofcom.org.uk/consultations/uk-broadband-licence/summary>

- 1.9 UK Broadband on the other hand is a current active user of the spectrum already beginning to roll out new services to customers, and planning further significant investment. A decision to reject the licence extension risks these clear consumer benefits not being extended to other customers – and without any certainty about whether the same level of competition, innovation or investment will come about through another spectrum user.
- 1.10 We also note that UK Broadband’s licence comprises only 40 MHz of spectrum within a total of 190 MHz of spectrum suitable for broadband use in the 3.4 GHz band. The forthcoming auction of the other 150 MHz means alternative operators will still have an opportunity to obtain 3.4 GHz spectrum. The granting of a licence extension to UK Broadband does not affect this.
- 1.11 We have therefore decided to grant an indefinite extension to the spectrum licence held by UK Broadband in the 3.4 GHz band.

Section 2

Introduction

- 2.1 This statement sets out our analysis and decision in relation to a request by UK Broadband Limited for a change to the terms and conditions of the company's 3.4 GHz spectrum licence.
- 2.2 The licence authorises the use of 40 MHz of radio spectrum in two separate 20 MHz blocks at 3480 to 3500 MHz and at 3580 to 3600 MHz. The current licence is due to expire in July 2018. UK Broadband has requested that we amend the licence so that it runs instead for an indefinite period of time, but subject to terms enabling revocation by Ofcom in particular circumstances (which are common to a large number of wireless telegraphy licences).
- 2.3 On 13 June 2014 we published a consultation setting out proposals to grant the UK Broadband request.² The consultation outlined the reasons why we believed a licence extension was in the interests of citizens and consumers, in line with our statutory duties.
- 2.4 The consultation closed on 25 July 2014 and we received six responses for publication. Some additional comments were also submitted in confidence. We have now considered all the responses and reached a final view on the licence extension request.

² <http://stakeholders.ofcom.org.uk/consultations/uk-broadband-licence/summary>

Section 3

Background and summary of consultation proposals

3.1 This section of the statement summarises the background to UK Broadband's request for a licence extension. It then goes on to outline the statutory context in which we have considered the request, before summarising the reasons why we proposed in a consultation published in June 2014 that the request for a licence extension be granted.

Background to UK Broadband's request for licence extension

3.2 A full description of the background to UK Broadband's licence holding and the company's request for licence extension was set out in our June 2014 consultation. A short summary of that background is set out here.

3.3 In 2001, the Ministry of Defence (MOD) agreed to release 40 MHz of spectrum in the 3.4 GHz band to the Radiocommunications Agency (RA). The released spectrum was made available via auction as two separate 20 MHz blocks at 3480 to 3500 MHz and at 3580 to 3600 MHz in 15 regional 'packages'.

3.4 The auction was conducted in June 2003 and 13 of the licences were acquired by the company that became UK Broadband. The additional two licences were acquired by UK Broadband when it bought the companies that held them. The separate licences were combined by Ofcom into a single 3.4 GHz licence in March 2007.

3.5 In the absence of widely available equipment able to use the 3.4 GHz frequencies the rights to use spectrum frequencies were not successfully exploited immediately. However, UK Broadband has invested subsequently in establishing a pilot network using its 3.4 GHz holdings in central London to offer wireless broadband services. A fixed consumer service was launched on 4 June 2014³.

3.6 The company has spelled out its intention to deploy a national 3.4 GHz network focusing on major urban areas and reaching an estimated 45% of the UK's population. It plans to make a substantial investment before 2018 with a view to establishing wireless broadband services to homes/offices in urban areas, and in 'not spots'. It also plans to offer national mobile coverage through a Mobile Virtual Network Operator (MVNO) arrangement.

3.7 However, the company says it requires long term business certainty about its licence holdings before such a significant financial outlay can be justified. It said its request for a licence extension should be seen in that context.

Statutory background

3.8 We now summarise the legal framework within which we are required to reach our decisions about the allocation of UK spectrum. A fuller account of the relevant

³ <http://www.ukbroadband.com/Relish>

European and UK law was presented in our June 2014 consultation document⁴, and our decisions reflect this broad framework.

3.9 The shorter summary set out here concentrates on those duties under the Communications Act 2003 and under the 2006 Wireless Telegraphy Act which are of most direct relevance in reaching a decision on UK Broadband's licence extension request.

3.10 Section 3 of the Communications Act 2003 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.

3.11 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; and
- the availability throughout the UK of a wide range of electronic communications services.

3.12 Ofcom must also have regard to such of the matters listed in section 3(4) as appear to be relevant in the circumstances. Several of those matters appear to be particularly relevant to our decision on the licence extension. These include, 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 high speed data transfer services throughout the UK (section 3(4)(e));
- the different needs and interests of all persons who wish to make use of the electromagnetic spectrum (section 3(4)(f));
- the needs of persons with disabilities, of the elderly and of those on low incomes (section 3(4)(i)); and
- the different needs and interests of persons in different parts of the UK; of the different ethnic communities within the UK; and of persons living in rural and in urban areas (section 3(4)(l)).

3.13 In carrying out its spectrum functions (under section 3 of the Wireless Telegraphy Act 2006) it is the duty of Ofcom 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

⁴ See Section 4.

- the demand that is likely to arise in future for the use of that spectrum for wireless telegraphy.
- 3.14 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.
- 3.15 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.

Public Sector Spectrum Release (PSSR)

- 3.16 The two separate 20 MHz blocks of 3.4 GHz spectrum held by UK Broadband sit alongside a further 150 MHz of spectrum in the 3.4 GHz band which is being released for civilian use by the MOD. These other frequencies form part of the Public Sector Spectrum Release (PSSR) programme, which aims to free up 500 MHz of public sector spectrum for civil use by 2020.
- 3.17 We expect to award the PSSR part of the 3.4 GHz spectrum band by auction sometime in the second half of the financial year 2015/16. In October 2013⁵ we consulted on a proposal to consolidate the UK Broadband holding within this band into a single 40 MHz contiguous block at 3560 to 3600 MHz before the anticipated award.
- 3.18 Some responses to the October 2013 consultation set out arguments disagreeing with this proposal. In particular, it was suggested that the proposal to relocate the UK Broadband frequencies at 3480 to 3500 MHz to 3560 to 3580 MHz amounted to a new award of spectrum, and we were therefore required to conduct a competitive process.
- 3.19 After further consideration, in light of these objections, we set out in the June 2014 consultation our decision not to proceed with the proposal to consolidate the spectrum ahead of the PSSR auction. Instead, we have assessed the arguments for and against granting UK Broadband's request for a licence extension in relation to its existing spectrum holding on their own merits, and separately from the PSSR award.

Summary of our June 2014 consultation

- 3.20 In our June 2014 consultation, we noted and considered the evidence that UK Broadband provided in support of its request for a licence extension – particularly the evidence behind the company's statements that it will proceed rapidly with investment in a new network.

⁵ <http://stakeholders.ofcom.org.uk/consultations/2.3-3.4-ghz/>

- 3.21 We noted the potential consumer benefits in light of our statutory duties to promote competition; to support innovation; and to promote investment. We balanced this against the potential cost in terms of spectrum inefficiency, including that which might arise from more fragmented use of the band as a whole if the variation were granted. In setting out our proposals, we explained why we considered it appropriate to grant the request for a licence extension.
- 3.22 In general, we said the interests of citizens and consumers are furthered by:
- the introduction of new services;
 - reductions in prices;
 - improvements in quality;
 - widening consumer choice; and
 - bringing these benefits forward in time.
- 3.23 We considered that these potential benefits could arise if UK Broadband's request for a licence extension was agreed. We said extending UK Broadband's licence could enable its customers to benefit from its past investment and innovation, and encourage further investment and innovation in future. We also said UK Broadband's investment could create the conditions for technological spill-overs to the rest of the 3.4 GHz band, allowing later users of the spectrum to deploy broadband services in the band more quickly and/or at lower cost.
- 3.24 We set this against the potential costs in terms of spectrum efficiency which we considered were likely to arise from the fact that UK Broadband's spectrum holdings are not contiguous. We said that having two separate blocks of spectrum increased the scope for interference with users in neighbouring parts of the band, and meant extra costs may need to be incurred to avoid it. However, we said that assessing spectrum efficiency also needed to take account of other factors, including the value provided to consumers by the use of spectrum.
- 3.25 We considered two alternatives for dealing with UK Broadband's request: either by refusing the request or by extending the licence as requested. Under the first option, we said UK Broadband's licence would be allowed to expire and we would conduct an auction - either as part of the planned 3.4 GHz PSSR award in the second half of financial year 2015/16, or in another subsequent award for the spectrum.
- 3.26 We provisionally concluded that granting the licence extension was the most appropriate course to take. We said that extension was consistent with our statutory duties in that it would further the interests of citizens and consumers, including through the promotion of competition, and would encourage investment and innovation.
- 3.27 We said that although UK Broadband's split holding meant there was some potential loss of spectrum efficiency in the 3.4 GHz band, this could largely be avoided if operators reached synchronisation agreements. Even if such agreements were not reached, the costs of granting the extension may well be outweighed by the early realisation of benefits to consumers arising from UK Broadband's investment.

Impact assessment

- 3.28 Section 7 of the Act requires Ofcom to carry out impact assessments where its proposals would be likely to have a significant effect on businesses or the general public, or when there is a major change in Ofcom's activities. Impact assessments form part of best practice policy-making as they provide a valuable way of assessing different options for regulation and showing why the preferred options was chosen. Ofcom is committed to carrying out and publishing impact assessments in relation to the majority of its policy decisions.
- 3.29 We set out our impact assessment in the June 2014 consultation. In this document we take into account relevant responses and set out our conclusions on the impact of the changes

Section 4

Consultation responses

- 4.1 This section of the statement outlines the responses we received to our June 2014 consultation. It addresses the points raised by stakeholders or, where relevant, refers to the sections which follow for further analysis and for changes we have made to our assessment as set out in the June 2014 consultation.
- 4.2 Stakeholders responded to two questions:
- *Question 1: Do you agree with our proposal to approve UK Broadband's Licence Variation request to extend the term of its licence indefinitely from 2018? Do you have any other comments you wish to make?*
 - *Question 2: Do you agree that if the variation to UK Broadband's 3.4 GHz spectrum licence is approved then fees should be charged on an annual AIP basis?*
- 4.3 We received six written responses submitted for open publication. We have also received additional comments submitted in confidence.
- 4.4 Three of the written responses were supportive of our proposal to extend UK Broadband's licence. Two were opposed to our proposal. One consultation response suggested a number of additional points for us to take into account if we were to proceed with our proposal to extend UK Broadband's licence.

Responses supporting the proposal to extend UK Broadband's licence

- 4.5 Three responses were wholly in favour of our proposal to extend UK Broadband's licence – those submitted by UK Broadband itself⁶; by Airwave⁷; and by Simon Hughes MP⁸.

Competition, innovation and investment

- 4.6 UK Broadband said the 'Relish' network it had recently launched in London was already demonstrating benefits for consumers and businesses. It said that continued use of the spectrum would enable an extension of its networks both in London and to other parts of the country. The location of business customers so far reflected areas where it was previously difficult to access fast connections to the internet.
- 4.7 UK Broadband said that the home broadband offering was proving attractive to under-served sectors of society, such as students and young professionals, who were seeking a more affordable and flexible product – particularly through the ability to dispense with landlines.

⁶ http://stakeholders.ofcom.org.uk/binaries/consultations/uk-broadband-licence/responses/UK_Broadband_Limited.pdf

⁷ <http://stakeholders.ofcom.org.uk/binaries/consultations/uk-broadband-licence/responses/Airwave.pdf>

⁸ http://stakeholders.ofcom.org.uk/binaries/consultations/uk-broadband-licence/responses/Simon_Hughes_MP.pdf

- 4.8 UK Broadband stressed the correlation between an extension of its licence, and Ofcom's duties in respect to promoting competition, innovation and investment. Its response pointed out the additional competition generated by its investment in new access and backhaul infrastructure. For the first time in more than a decade the telecoms industry was seeing investment in new services which were not based on re-selling BT's network, according to UK Broadband. This meant the company was able to serve customers in areas that are poorly served by legacy copper wiring, such as the Isle of Dogs, Shoreditch and the Barbican in London.
- 4.9 It said that its innovative pricing and marketing structure was introducing *"an element of disruption to a market which has seen little that is new in recent years"*. The success of the Relish launch had given UK Broadband's parent company the confidence to continue investing in the UK - if Ofcom granted the licence variation.
- 4.10 These arguments were supported by Airwave, who said any market entrant with a sustainable business model and who was prepared to invest in new network infrastructure should be welcomed. Greater competition spurred innovation, and this was good for the market as a whole.
- 4.11 There was also firm support for the licence extension in a response submitted by Simon Hughes MP, who represents the constituency of Bermondsey and Old Southwark in London. He said many of his constituents had significant problems obtaining sufficient broadband speeds, with many receiving less than 2 Mb/s. He argued that this was barely suitable for a family, let alone anyone who worked from home or had a business. The dominance of BT, and to a lesser extent Virgin Media, had left large groups of people without many options. He said: *"If both BT and Virgin Media are reluctant to lay down new fibre optic, what is the alternative?"*
- 4.12 Mr Hughes strongly supported Ofcom's aim of promoting competition in this industry. He said it was important that companies such as UK Broadband, which provided independent internet connections separate from BT and Virgin Media infrastructure, should be assisted and promoted. He argued that, until companies such as UK Broadband became a legitimate competitive threat, progress on providing high speed internet to areas like his constituency would be slow or worse.
- 4.13 He said UK Broadband had been clear that it intended to expand and substantially invest in a new network quickly, but needed certainty about the licence in order to make this commercially viable. He added that UK Broadband was intent on prioritising expansion in 'not spot' areas where the need was highest and said: *"I would argue that delaying any consumer benefits further would be an unreasonable and bad outcome"*.
- 4.14 Mr Hughes also stressed the importance of UK Broadband's business model in accommodating customers from economically deprived areas. With the rise of mobile phone technology, he argued that more and more people, particularly from poorer backgrounds, were choosing not to have landline phones. He said that by cutting out the line rental requirement, customers were able to pay less and pay only for what they needed.

Ofcom response

- 4.15 Our consultation identified the potential benefits of granting an extension in terms of promoting competition, innovation and investment. In doing so, we assessed the business plan submitted by UK Broadband which described the level of investment

planned by the company; the new competition for customers; and the innovative technology and marketing approaches.

- 4.16 The further submission by UK Broadband in response to the consultation restated many of the potential benefits we had already considered, but set them more currently in the context of the business it is beginning to develop.
- 4.17 The comments of Simon Hughes MP also relate to some of the important factors we identified in the June 2014 consultation. We note that in some parts of his constituency (particularly London SE16) the choice for home broadband is mainly between Virgin cable broadband and BT copper wiring. UK Broadband is therefore a new potential competitive element. We acknowledge that there are other geographic locations where such issues are also relevant.
- 4.18 Additionally, we accept that the ability of UK Broadband to deliver fixed broadband without the need for a phone line represents an innovative approach which is likely to be attractive to consumers seeking to reduce the prices they pay. The potential benefits of extending the licence are assessed further in sections 7 to 10 of this document.

Potential for inefficient use of spectrum

- 4.19 In their consultation responses, both UK Broadband and Airwave challenged Ofcom's assertion that there was potentially inefficient use of spectrum arising from the non-contiguous nature of the company's spectrum holdings.
- 4.20 UK Broadband also disagreed that more efficient use might be achieved if the spectrum was included alongside other 3.4 GHz spectrum being auctioned. It said this was not necessarily the case because the assumption depended on what size of spectrum blocks Ofcom ultimately decided to auction. This was not yet known. The company said that, although it was possible that an auction of the 3.4 GHz spectrum might lead to more fragmented holdings if the UK Broadband frequencies were not included, it was equally possible for such an outcome to arise as a result of an auction. This view was supported by Airwave.
- 4.21 UK Broadband added that its spectrum blocks would not be available for use by others until 2018 if the extension were not granted. This potentially reduces the value of that spectrum.
- 4.22 UK Broadband also said that the most likely outcomes at auction, if we decided not to extend the licence, would be either a) that no one will bid for the UK Broadband frequencies because they would not be available until 2018, or b) that the UK Broadband spectrum will attract lower bids than other 3.4 GHz frequencies for the same reason, and may be used for less valuable purposes (such as backhaul). In either case, the use of spectrum would be less than efficient and consumers would not enjoy the benefits of competition and new innovative services.
- 4.23 UK Broadband and Airwave both concluded that the potential spectrum inefficiencies arising from a licence extension were unlikely to transpire in reality. UK Broadband said although it might prevent the award of contiguous 50 MHz blocks, this was unlikely anyway. This was because such high bandwidths in a single channel were not popular from a standardisation perspective because of the limited number of countries where they may be used. Operators were instead looking to non-contiguous carrier aggregation to get higher speeds.

- 4.24 In respect to spectrum inefficiencies that might arise from additional boundaries between operators, UK Broadband said it was committed to synchronisation with neighbours, and therefore minimising the loss of spectrum at block edges.
- 4.25 UK Broadband noted Ofcom's decision not to proceed for the moment with a proposal in the October 2013 consultation⁹ to consolidate its holding into a contiguous block. The company confirmed its willingness to relocate one or both of its spectrum blocks within the band at any point up until the award of the 3.4 GHz spectrum. It said its business plan had been tested to take account of the additional network costs this would entail.

Ofcom response

- 4.26 Our June 2014 consultation identified a potential cost to citizens and consumers as a result of UK Broadband's split frequency holding leading to a less efficient use of the spectrum. We note UK Broadband's argument that the potential for inefficient use of spectrum may not be as great as we may have assessed, and we have considered again the factors involved.
- 4.27 Our further analysis of all the issues relating to spectrum efficiency, including what might happen if the licence extension is refused, is set out in section 11.

Responses questioning the extension of UK Broadband's licence

- 4.28 Non-confidential responses opposing the granting of a licence extension to UK Broadband were received from BT¹⁰ and from the MOD¹¹. Additional confidential comments were also submitted by some respondents. Telefónica¹² did not express opposition to the licence extension, but suggested a number of additional issues we should consider if we decided to proceed with the proposal to extend the UK Broadband licence.

Open minded consultation

- 4.29 BT said Ofcom's analysis, as set out in the June 2014 consultation, gave the impression of having been constructed to justify a prior formed view, contrary to Ofcom's obligation to consult when proposals are still at a formative stage.
- 4.30 BT gives no basis for its assertion that Ofcom has consulted with a closed mind and we completely reject the suggestion.

Expiry of licence

- 4.31 Two respondents pointed out that Ofcom had previously stated that the UK Broadband licence would expire in 2018 and that the spectrum would then return to the MOD. BT pointed to a December 2012 consultation on the variation of 28 GHz

⁹ See paras 3.17 - 3.19

¹⁰ <http://stakeholders.ofcom.org.uk/binaries/consultations/uk-broadband-licence/responses/BT.pdf>

¹¹ http://stakeholders.ofcom.org.uk/binaries/consultations/uk-broadband-licence/responses/Ministry_of_Defence.pdf

¹² <http://stakeholders.ofcom.org.uk/binaries/consultations/uk-broadband-licence/responses/Telefonica.pdf>

Broadband Fixed Wireless Access licences¹³ as a recent indication that this was the case.

- 4.32 A confidential response also said the licence was due to expire in 2018 and that UK Broadband could have no reasonable expectation that an extension would be granted at the end of the original 15 year fixed term. It was suggested that the company had not made any significant capital investments in the spectrum as a result. The respondent argued that it was not clear, therefore, on what basis UK Broadband should now be given security of tenure of spectrum.

Ofcom response

- 4.33 We acknowledge that the UK Broadband licence has a current expiry date of July 2018, and that we had expected the spectrum would revert to the MOD after this date.
- 4.34 However, once UK Broadband submitted a request for the licence to be extended we needed to consider that request under our statutory duties. As already noted, the duties which are particularly relevant in this case include our duty to ensure the optimal use of spectrum, and our duties to support competition, innovation and investment for the benefit of citizens and consumers.
- 4.35 We note that the MOD has no plans to use the spectrum after 2018 when the current licence expires, while UK Broadband clearly does. We also note that a further 150 MHz of spectrum in the same 3.4 GHz band is also being released by the MOD for civilian use.

Special treatment for UK Broadband

- 4.36 BT and others said the proposal to extend UK Broadband's licence amounted to special treatment for the company which was not warranted. They argued that an extension would give the company an unfair advantage over potential competitors, who would have to bid for equivalent spectrum in the PSSR auction. UK Broadband's 3.4 GHz frequencies should instead be included alongside the other 150 MHz being auctioned.
- 4.37 BT said that the proposals gave preferential treatment to UK Broadband and discriminated against other parties, contrary to the requirements of section 9(7)(b) of the Wireless Telegraphy Act 2006. According to BT and another respondent, in other instances where Ofcom had presided over the transformation of an existing spectrum position into indefinite licences – i.e. the 900, 1800 and 2100 MHz mobile licences – there were good reasons for the extensions. BT argued that in these other bands, network operators had created large and valuable businesses, greatly to the benefit of end-users, and that in those circumstances, depriving the operators of these holdings would have resulted in substantial consumer detriment.
- 4.38 BT said none of this logic applied to UK Broadband's spectrum, as the company had failed to build any substantial business in the years until now. In this circumstance, BT argued that the proposed licence extension treated UK Broadband in a special and discriminatory way, whereas an open and fair auction in due course would treat all providers in the same manner.

¹³ <http://stakeholders.ofcom.org.uk/consultations/variation-28ghz/>

- 4.39 A confidential response suggested that UK Broadband would hold a significant competitive advantage over participants in the auction if Ofcom granted a licence extension for an indefinite period. It argued that UK Broadband would have both a time advantage over its competitors who participate in the auction, and would also benefit from the fact that it was currently envisaged that it would pay an annual licence fee based on AIP. In contrast, the respondent said, the auction participants will have to pay a potentially significant up-front capital sum for their spectrum.

Ofcom response

- 4.40 We do not accept that our proposal to extend UK Broadband's licence amounts to giving the company special treatment. As BT has pointed out, there are numerous precedents whereby incumbent licensees have been granted on-going use of spectrum after the expiry of original licence terms. For us to consider the case for and against extending UK Broadband's licence is entirely consistent with our statutory duties.
- 4.41 We deal with the point in relation to UK Broadband's investment and use of the spectrum in section 6.
- 4.42 We consider AIP further in setting out our conclusions in section 15.

Relationship to the PSSR 3.4 GHz award

- 4.43 The MOD's consultation response said the question of whether UK Broadband should be granted an indefinite extension to its licence should not be separated from the consideration of whether UK Broadband's spectrum holding can be consolidated.
- 4.44 As a result, the MOD considered there was insufficient information to undertake a full and proper impact analysis on the 3.4 GHz award. Any decision on the licence variation should be delayed until after Ofcom had consulted on the 3.4 GHz auction process in the autumn, when more information would be available.

Ofcom response

- 4.45 We consulted in October 2013 on a proposal to consolidate the UK Broadband holding into a single 40 MHz contiguous block at the top of the 3.4 GHz band (3560 to 3600 MHz) ahead of the PSSR award. Some responses to the 2013 consultation suggested this was not appropriate, since it amounted to a new award of spectrum which should be subject to a competitive process.
- 4.46 After considering these arguments, we stated in the June 2014 consultation that we would not proceed with the proposal to consolidate UK Broadband's spectrum holding at that stage. Instead, we said we would assess the request for a licence extension on its own merits in line with our statutory duties.
- 4.47 We note that the request for an extension was first submitted in March 2013 and that our detailed considerations have already taken around 18 months. Our forthcoming consultation on the award process for the remaining 3.4 GHz PSSR spectrum is not expected to be concluded until May 2015. The award itself is not expected to be made until the second half of financial year 2015/16.
- 4.48 In light of these factors, we believe it is appropriate to conclude our consideration of UK Broadband's request separately from any consideration of the PSSR award –

notwithstanding that the UK Broadband holding sits within the broader 3.4 GHz band to be awarded later.

Spectrum efficiency

- 4.49 BT's consultation response said an extension of the licence would be to the detriment of citizens and consumers as it would perpetuate the historical highly inefficient use of that spectrum; create inefficiencies in the use of the remaining spectrum to be auctioned as a result of additional adjacencies between licensees; and prevent other parties with more credible business models from gaining access to the spectrum.
- 4.50 On the other hand, BT argued, inclusion of the UK Broadband frequencies within the auction was the best way to secure optimal use of the spectrum. BT's response and another confidential submission said an auction would properly determine the most valuable use of the spectrum. The respondents argued there were no clear net benefits of granting an extension, given that the auction was only about a year away in any case.
- 4.51 One confidential response said that evidence presented by Ofcom on "*the supposed gains from allowing the extension*" was qualitative, not quantitative. The response noted that the consultation itself had acknowledged that UK Broadband might not be the highest value user of the spectrum in 2018. Alternatively, full participation in an auction would require UK Broadband to 'stress test' its own business plan in a way which would not occur as part of the process of a licence extension. More specifically, it would require UK Broadband to measure its business plan against its competitors when considering what its bid should be.
- 4.52 BT said combining the UK Broadband frequencies with other 3.4 GHz spectrum in an auction would provide an opportunity for bidders to acquire larger blocks of spectrum than if the UK Broadband frequencies were excluded. This would provide a further benefit in making more efficient use of the frequencies. It would have the added advantage that inefficiencies of boundaries between operators would be reduced.
- 4.53 BT argued it would also allow other parties who might place a higher value on the spectrum, and have better business cases, to acquire the spectrum rather than perpetuating the existing situation of UK Broadband's very limited use to date.
- 4.54 BT said that, given that auction prices were the most likely basis for setting post 2018 annual charges to UK Broadband if the licence were made indefinite, extension prior to auction would actually create uncertainty for the company in terms of the on-going costs of the licence. It would in effect be determined by the sums bid by others. In answer to this, Ofcom's reliance on UK Broadband's statement that its paramount concern was certainty of continued spectrum access - and that any higher than expected fees could be absorbed in the business plan - was not compelling. BT said that if UK Broadband was so confident of being able to afford the market value, the company should simply be required to enter the auction.
- 4.55 A confidential response said the usable spectrum available to UK Broadband itself would be smaller if the licence were extended ahead of consolidation - and there could be more fragmented spectrum holdings across the whole 3.4 GHz band after the auction. The respondent argued that there was uncertainty about how the issue of consolidation would be dealt with, and that costs were likely to be passed onto consumers.

- 4.56 Telefónica said that every effort should be made to maximise the amount of usable spectrum available for mobile broadband within the band. In order to ensure this happened, synchronisation should be a licence requirement. In the absence of synchronisation, guard bands would be needed at each boundary between operators. Similarly, Ofcom should ensure that steps aimed at consolidating spectrum are put in place if this is not achieved through trading.

Ofcom response

- 4.57 These points are dealt with in section 11.

Analysis of costs and benefits

- 4.58 BT said that Ofcom's proposal to extend the UK Broadband licence had only been justified analytically by a comparison of (i) the costs of inefficiencies and filtering if the existing UK Broadband spectrum blocks led to extra adjacencies against (ii) the benefits to competition of potentially cheaper broadband.
- 4.59 BT therefore said that Ofcom's cost benefit analysis was very narrow and failed to assess the potential benefits in terms of efficiency, innovation and also competition from allocating the spectrum to an alternative user. BT argued that although Ofcom had assessed the UK Broadband business plans, the business plans of other parties might have significantly greater valuation. Hence it was not possible to determine whether the UK Broadband investment proposals were better than other uses of the spectrum that other parties might formulate.
- 4.60 BT said that if UK Broadband were the most valuable user of spectrum it would win an auction, and there would only be a one year delay to its plans. BT noted that such a minimal delay made the benefits versus costs very marginal, even bearing in mind UK Broadband's £20/month broadband pricing level.
- 4.61 BT said it did not consider the other scenario modelled by Ofcom (a four year delay if another user acquired the spectrum) to be a valid consideration. If UK Broadband did not win the frequencies at auction, BT argued that it seemed likely that the winner of the spectrum could get access to it early on a geographic basis by spectrum trading - given the very limited UK Broadband network deployments to date. Thus, BT argued, the Ofcom analysis did not provide a strong justification for extending the licence.

Ofcom response

- 4.62 We do not accept our cost benefit analysis was too narrow. It correctly addressed the core issues around licence extension and identified the duties we needed to consider. We have however carefully considered BT's arguments and our further analysis is set out in the sections which follow, in particular section 12.

Fulfilment of commitments

- 4.63 A number of respondents, including BT, said there was no guarantee that UK Broadband would implement its business case or that the assumed consumer pricing would be sustainable - especially given that the annual charge for the spectrum is at this point unknown. BT's response asked: *"If UK Broadband does not commit the level of investment on which Ofcom has based its proposal to extend the licence, what powers will Ofcom include (e.g. coverage/roll-out obligation) so it could then withdraw the licence?"*

- 4.64 Telefónica also said that in order for Ofcom to proceed with the proposal to extend the licence term indefinitely, it was appropriate for a roll out obligation to be placed on UK Broadband. Telefónica noted that mobile spectrum holders had in the past been granted licence extensions only on the basis of greater commitments in relation to roll out and coverage.
- 4.65 Telefónica said that the differentiating factor between Ofcom rejecting the licence extension and accepting the request in the consultation, centred on the benefits accrued from UK Broadband rolling out the services within the time period before the PSSR auction. It would therefore be prudent for Ofcom to follow a consistent approach to licence variation, and place a roll out obligation on UK Broadband, consistent with the business plan it has submitted, and which forms the basis of Ofcom's decision.
- 4.66 Telefónica said that any remedy for failure to meet such an obligation must be robust and act as a sufficient incentive for UK Broadband to invest and meet its commitments in respect of roll out. It also said that it would be appropriate for Ofcom to include an obligation relating to throughput, in the form of a requirement to ensure a sustained downlink speed of not less than 2Mbps. Telefónica believed that this would be consistent with Ofcom's previous decision in relation to cellular licences and ensure that the consumer benefits promised are realised.
- 4.67 Telefónica said that in the absence of coverage and roll out obligations, there was a risk that UK Broadband could instead secure a windfall benefit by trading its licence after the PSSR award.

Ofcom response

- 4.68 We consider these comments further in section 6 below.

Risk of spectrum return

- 4.69 BT's response suggested there was a risk that the UK Broadband spectrum could end up being returned to Ofcom, leading to further inefficient use of the frequencies. BT called into question UK Broadband's appetite to pay future annual fees reflecting market values – particularly since the level of those fees will be determined by the values placed on the use of 3.4 GHz spectrum by others (through the auction).
- 4.70 BT also noted Ofcom's indicative spectrum value of £1.5m/MHz and that Ofcom estimated that the additional cost to UK Broadband from having a split assignment of 3.4 GHz was £83m. BT argued that this suggested it would be cheaper for UK Broadband to obtain new spectrum at auction even before on-going fees for existing spectrum were considered. It said that this highlighted a serious risk that Ofcom may have overlooked.
- 4.71 BT suggested that by extending the existing licence before the auction, Ofcom would be giving UK Broadband a guarantee of securing a minimum amount of 3.4 GHz spectrum that other new entrants did not have. BT suggested that UK Broadband would then plan to buy other 3.4 GHz spectrum at auction, given that it would prefer a contiguous block in order to achieve the lowest deployment costs.
- 4.72 There was a risk that, with pricing of their existing licence tied to the market value in the auction, UK Broadband would then relinquish the existing licence, leaving Ofcom the problem of needing to re-auction it and seeing spectrum left unused in the meantime.

Ofcom response

- 4.73 We consider there are two different points in BT's response related to the risk of the UK Broadband spectrum being returned to Ofcom:
- If UK Broadband values the spectrum more highly than other operators, then there is a risk that UK Broadband will participate in the auction to acquire contiguous 3.4 GHz spectrum and then return (at least part of) its current 3.4 GHz holding.
 - If UK Broadband values the spectrum less than another operator, then it may return the spectrum because of the level of the annual licence fees.
- 4.74 Both of these points are considered in section 11.

Responses on spectrum fees

- 4.75 Although the bulk of responses to our June 2014 consultation centred on the licence extension itself, respondents also addressed our question about licence fees and whether these should be set at levels consistent with AIP principles.
- 4.76 Only one respondent suggested an alternative approach. A confidential response said, in the event of UK Broadband being granted an extension, an up-front capital charge should be levied so that the company was not given any advantage over competitors who obtained spectrum via an auction.
- 4.77 Telefónica agreed with our proposal to levy AIP, but said an incremental AIP level should apply until UK Broadband's spectrum holding was consolidated into a single contiguous band. This would reflect the opportunity cost that the split holding imposed on others through the inefficient use of spectrum. It would encourage UK Broadband to co-operate with moves towards consolidation.

Ofcom response

- 4.78 Our Strategic Review of Spectrum Pricing¹⁴ concluded that setting an annual AIP licence fee is normally the most appropriate form of payment for spectrum after the expiry of an initial term. Fees are normally set at a level which reflects the opportunity cost of the spectrum.
- 4.79 We understand the argument for the approach suggested by Telefónica, and we will consider the implications of adopting such an approach when we consider the question of licence fees, nearer to the expiry date of the current UK Broadband licence.

¹⁴ <http://stakeholders.ofcom.org.uk/binaries/consultations/srsp/statement/srsp-statement.pdf>

Section 5

Overview of analysis

- 5.1 Our assessment of the arguments for and against granting the licence extension has taken account of a range of both quantified and non-quantified factors. We have done so within the framework set out in our original consultation and taking account of the potential scenarios identified below.
- 5.2 As in our June 2014 consultation, we have considered two main options:
- Option 1: the request for a licence variation is refused. Under this option, the existing licence would be allowed to expire in July 2018. The 40 MHz of spectrum currently held by UK Broadband could then be auctioned alongside the additional 150 MHz of 3.4 GHz spectrum being released by the MOD – although it would not become available for use until after the current licence expires in 2018 (unless the licence is traded). Alternatively, the UK Broadband spectrum could be auctioned separately in an additional award.
 - Option 2: the request for a variation extending the licence duration indefinitely is granted. The newly varied licence would be subject to an annual licence fee from its original expiry date of July 2018.
- 5.3 If the request for a licence extension is refused (Option 1), and the UK Broadband spectrum is then auctioned, there are two potential scenarios. It is not possible at this stage to determine which scenario is most likely:
- Scenario 1: another operator acquires the spectrum at auction. The implications of this potential scenario are considered in section 12;
 - Scenario 2: UK Broadband itself acquires the spectrum at auction. We consider this may result in a delay in UK Broadband making significant investment in services compared to extending the licence now, for the reasons set out in section 6 below. Assuming the auction is held in the second half of financial year 2015/16, then this delay would be at least a year.
- 5.4 The remainder of this statement sets out our assessment of the case for and against granting the UK Broadband licence extension. We do not repeat the detailed analysis already set out in the June 2014 consultation, although we refer to some key sections of that consultation. Where we have changed our assessment compared to the June 2014 consultation in light of consultation responses and our further analysis, we make that clear. In particular, we have considered BT's submission to the effect that the cost benefit analysis included in our June 2014 consultation was too narrow, and failed to assess the benefits of alternative potential uses of the UK Broadband spectrum (see section 12).
- 5.5 We have also considered other benefits, such as the social benefits and the benefits for urban areas which were pointed out to us in the response from Simon Hughes MP. We consider these are highly relevant, and things which we must consider in light of Ofcom's specific statutory duties (see sections 7-10).

- 5.6 Our consultation highlighted the importance of synchronisation in minimising the potential spectrum inefficiencies arising from the split nature of the UK Broadband holding, in the event that consolidation is not achieved (such as through the auction process or by trading). We now we consider it is likely that synchronisation¹⁵ between users of the 3.4 GHz spectrum *can* be achieved. We had previously thought this was only a possibility. The impact of synchronisation on our assessment is explained in more detail in section 11.
- 5.7 We have not revisited the quantified estimates of costs and benefits presented in the June 2014 consultation. We consider there is considerable uncertainty in these figures. As a result, we consider it is not useful to seek to refine them further. We note that stakeholders' consultation responses did not question the details of our original estimates.

¹⁵ Agreement on synchronisation between operators would allow the use of permissive block edge masks, which in turn affects the choice of equipment and configuration.

Section 6

Likelihood that licence extension will result in sustainable and increased investment

- 6.1 In our June 2014 consultation we considered whether extending the duration of UK Broadband's licence indefinitely would result in increased investment, and whether the company's business plan was consistent with *sustainable* investment¹⁶. We noted that the contents of UK Broadband's business plan indicated a significant level of such investment only if its licence were extended.
- 6.2 While we did not seek to second-guess the success or otherwise of this business plan, we considered that UK Broadband has taken the actions we would expect of a company seriously appraising a significant investment - and considering this investment to be commercially sustainable in the market environment it expects to face.
- 6.3 We considered the UK Broadband plans indicated the company intended to go ahead with its investments if its licence were extended. We also noted that the financial projections supplied, which were extracted from the plan, showed that the investment was expected to earn internal rates of return above the company's minimum requirement. This suggested that UK Broadband believed it had a financial incentive to undertake the planned investment. We have discussed the business plan with UK Broadband since the publication of our June 2014 consultation and we do not have any reason to revise our expectations.

UK Broadband's use of 3.4 GHz spectrum to date

- 6.4 We noted in our June 2014 consultation¹⁷ that UK Broadband has held spectrum in the 3.4 GHz band for some time but, in the absence of widely available equipment suitable for use in the band, the rights to use the radio frequencies were not successfully exploited immediately.
- 6.5 Two consultation respondents pointed out that UK Broadband's investment has been relatively limited over the first 11 years of the licence. BT said there was a risk of *"perpetuating the existing situation of very limited use (after many years amounting primarily to a few tens of base stations recently deployed in London)."*¹⁸
- 6.6 We consider that it is UK Broadband's current and future investment plans that are of greatest relevance to our decision. We noted in paragraph 5.26 of the June 2014 consultation, the independent review and high-level sign-off of UK Broadband's current investment plan by the parent company. We note that UK Broadband has invested recently in establishing a pilot network using its 3.4 GHz spectrum holdings in central London to offer wireless broadband services, and that its fixed consumer service was launched on 4 June 2014.¹⁹ We note that the company's earlier attempts to use the spectrum productively were hampered by uncertainty over the technology that could be deployed in the band, and the consequent lack of available equipment.

¹⁶ Paragraphs 5.23 to 5.46.

¹⁷ Paragraph 3.8.

¹⁸ BT response to the June 2014 consultation, paragraph 6.

¹⁹ <http://www.ukbroadband.com/Relish>

- 6.7 We said in paragraph 5.25 of the June 2014 consultation that UK Broadband had explained that the development of LTE technology meant the time was now right for it to proceed with its investment. It said that the technology had caught up with its own business vision.²⁰

Potential risk that uncertainty over auction outcome will cause UK Broadband to delay investment

- 6.8 We have considered UK Broadband's investment plans in some detail, including plans set out in confidential internal documents. These plans indicate a significant early investment i.e. ahead of the PSSR auction of the remaining 3.4 GHz spectrum.
- 6.9 We will be consulting soon on an auction design that could result in UK Broadband taking part in the assignment stage of the auction and re-locating some or all of its 40 MHz of spectrum to a different part of the band after the auction. This would avoid non-contiguous allocations within the 3.4 GHz band and could result in more efficient use of the spectrum.
- 6.10 If UK Broadband were to make the investment proposed in its business plan, but were then to obtain different, contiguous spectrum through the auction²¹ it might incur additional costs to change equipment to fit its new allocation.
- 6.11 It is therefore possible that UK Broadband might prefer to wait until after the auction to invest heavily in new equipment, rather than risk incurring costs to move spectrum. If UK Broadband were not to invest in a timely manner once the licence extension has been granted, then the greater consumer benefits which we consider will arise from granting the extension request might be reduced. However, UK Broadband insists it will push forward with its investment plan as soon as the licence extension is granted²² and that it does not expect that the cost of swapping out equipment would exceed the opportunity cost of delaying implementation of its business plan.
- 6.12 We acknowledge there is some risk that the UK Broadband business plan may change, despite the firm statements of intent the company has given, and we have taken account of this risk – along with the other factors identified – in reaching our decision on the licence extension.²³
- 6.13 One possible answer to the risk would be to impose, as part of the terms of the licence extension, obligations on UK Broadband to achieve a certain level of investment in accordance with its proposal.
- 6.14 Although there is a superficial attraction to the idea of setting roll out (e.g. number of base stations) and/or coverage obligations (e.g. proportion of population), such an approach could have unintended consequences that act against consumers'

²⁰ The July 2013 submission, paragraph 1.3.

²¹ This would, of course, depend on the chosen design for the PSSR auction.

²² 'The March Submission', page 1.

²³ We also note that it might be possible for UK Broadband to achieve most of the potential benefits we have identified for fixed broadband consumers with much lower levels of roll out of base stations than it currently plans before the auction. This is because its plans involve aggressively rolling out base stations in 2015 and 2016 in order to be able to deliver a mobile service. We UK Broadband believe could deliver a fixed broadband service for the levels of customers that it projects for 2015 and 2016 with a more limited number of base stations. So even if UK Broadband did roll out base stations less aggressively before the auction, this would not necessarily mean the potential benefits for fixed customers would be significantly reduced.

interests. It would be challenging to define a roll-out obligation given that UK Broadband's initial investments are in a fixed wireless service for which wide-area coverage is not required. We would not want to encourage roll out in inappropriate places merely to meet an arbitrary target. The situation is therefore somewhat different to that for mobile operators where we have imposed coverage obligations in order to achieve services to a wide area.

- 6.15 The extent and location of UK Broadband's fixed wireless services may be driven partly by the speed at which the service is taken up in different locations. A roll out obligation might reduce UK Broadband's ability to respond flexibly to market developments, even if the company is pursuing its planned investment in good faith. We do not wish to constrain UK Broadband's investment plans in any way that might reduce or delay the benefits for consumers. A roll out obligation could also encourage inefficient investment if it were set too high.
- 6.16 In conclusion, we consider that it would not be straightforward to define and maintain a roll out obligation that would be both meaningful and unambiguous. We consider there would be a risk of imposing an obligation that could have unintended consequences that could be detrimental to consumers. We have therefore decided that it is not proportionate to impose a roll out obligation as part of the conditions of granting UK Broadband's request to extend its licence.

Bidding on 2.6 GHz spectrum

- 6.17 BT has said that, in the 2.6 GHz auction in 2013, the *"bidding by the entity that was a subsidiary of UKB's parent company placed a relatively low valuation on additional TDD spectrum ... far less than the ultimate winning bids by BT and others."* BT argues that this *"calls into question UKB's appetite to pay future fees reflecting market values if the spectrum licence is extended"*²⁴.
- 6.18 We consider that the bids made by Hong Kong Telecom (HKT) for the 2.6 GHz frequencies in 2013 do not tell us anything about the value that UK Broadband might currently place on spectrum in the 3.4 GHz band. UK Broadband has told us that *"there was a limit to the amount that made financial sense for the group to pay in order to obtain additional spectrum, given the UK spectrum that the group already owned at the time"*²⁵. We note that UK Broadband's business plan is based around its 3.4 GHz spectrum holding. Whilst it might have made sense to acquire additional spectrum at 2.6 GHz if it could be obtained cheaply, it did not make sense at the full price determined in the auction.²⁶
- 6.19 UK Broadband has told us that it has conducted sensitivity tests on possible levels of annual licence fees and that its business plan remains profitable, even at what it considers to be the highest likely level of fees.

UK Broadband's other spectrum

- 6.20 In its response to the June 2014 consultation, BT said that we had not considered that UK Broadband had other 4G spectrum in the 3.6-3.8 GHz band, and *"so their plans would only need to be modified rather than stopped if they failed to retain their*

²⁴ BT response, paragraph 12.

²⁵ UK Broadband letter of 22 August 2014 Nicholas James, CEO, UK Broadband to Andrew Hudson, Director of Spectrum Policy, Ofcom

²⁶ Ibid.

*3.4 GHz frequencies*²⁷. We note that UK Broadband intends to use its 40 MHz of 3.4 GHz spectrum along with other spectrum it holds to build a dual LTE and Microwave Ethernet network to cover 45% of the UK's population.

- 6.21 UK Broadband has emphasised to us the 'dual prime' nature of the 3.6 GHz band which places coordination constraints on its use in order to protect Permanent Earth stations for satellite services. The 3.6 GHz spectrum cannot be used in all base station sectors, including in a significant part of London. On the other hand, using spectrum in the 3.4 GHz band allows it to guarantee the ability to roll out its network in all areas.²⁸
- 6.22 Additionally, as UK Broadband points out, most of the larger members of GTI²⁹ and 3GPP³⁰ have or are seeking to obtain spectrum in Band 42 (i.e. 3.4 GHz). The majority of development work for chip sets and devices (such as smartphones) is focusing on this band. Widespread device support (particularly for mobile devices) for Band 43 (i.e. 3.6 GHz) is likely to emerge later than for Band 42. For this reason, UK Broadband says it will rely on Band 42 to launch handset and other devices as part of its service.³¹

Implications of uncertainty regarding Annual Licence Fees

- 6.23 As set out in the June 2014 consultation³², we were concerned to understand why UK Broadband would not go ahead with its investment without delay - even if its current licence were not extended. We noted the company would have the option of taking part in the planned auction of the 3.4 GHz band.
- 6.24 If UK Broadband were to go ahead with its plan on the basis of acquiring spectrum at auction, it would have to pay whatever price was necessary to obtain the frequencies. On the other hand, if its licence were extended, UK Broadband would expect to pay an annual fee from 2018. Bids and prices in the PSSR award for 3.4 GHz spectrum are expected to provide a good indication of the opportunity cost of spectrum in the band at the time of the auction. This will be relevant for us to take into account, along with any other relevant evidence, when we consider the appropriate level of annual fees to apply from 2018.
- 6.25 In principle therefore, the costs to UK Broadband of obtaining spectrum through the auction or over time through extension of its existing licence are likely to have some similarity.
- 6.26 UK Broadband insisted it regarded uncertainty about the auction outcome as fundamentally different from uncertainty about the level of annual fees³³. It was unconcerned about the exact level of the annual fee because its business case was sufficiently robust to cater for different reasonable assumptions. It also noted that it

²⁷ BT response to consultation. Paragraph 10.

²⁸ UK Broadband letter of 22 August 2014 Nicholas James, CEO, UK Broadband to Andrew Hudson, Director of Spectrum Policy, Ofcom

²⁹ Global TD-LTE Initiative

³⁰ 3rd Generation Partnership Project (3GPP) is a collaboration between groups of telecommunications associations

³¹ Ibid.(UK Broadband letter)

³² Paragraphs 5.31 to 5.36

³³ See, in particular, 'The February Submission', pages 7 to 8 and 'The March Submission', page 5.

could be possible to trade the rights to use radio frequencies under a licence to a third party, though it considered that would be unlikely.³⁴

Conclusion on the likelihood that extending the UK broadband licence will lead to sustainable and increased investment

6.27 We have considered carefully UK Broadband's submissions and evidence about its investment plans and intentions. We have also taken account of BT's concerns about the reliance that we should place on these submissions and evidence. We consider, on the basis of the evidence available to us that it is more likely that UK Broadband's investment will go ahead as planned if the licence is extended than if it is not.

³⁴ 'The March Submission', page 5.

Section 7

Likely benefits for subscribers and consumers arising from investment by UK Broadband

- 7.1 In section 3 we summarised the statutory framework within which we have assessed the UK Broadband request for a licence extension. Among our other duties, we have a principal obligation to further the interests of citizens in communications matters; and to further the interests of consumers in relevant markets, where appropriate by promoting competition.
- 7.2 In general, the interests of citizens and consumers are furthered by:
- The introduction of new services;
 - Reductions in prices;
 - Improvements in quality;
 - Widening consumer choice; and
 - Bringing these benefits forward in time.
- 7.3 Given that we consider it more likely that UK Broadband will proceed with its planned investment if we extend the licence than if we do not, we now assess the nature of the potential benefits that might arise, and the likelihood that they will materialise. Where relevant, we make specific reference to arguments presented in responses to the June 2014 consultation.
- 7.4 In paragraphs 5.47 to 5.99 of the June consultation, we noted a range of potential benefits for citizens and consumers that could arise from UK Broadband's planned investment. They included:
- Consumer benefits of faster fixed broadband speeds;
 - Consumer benefits of lower fixed broadband prices;
 - Benefits to mobile subscribers;
 - Dynamic gains from competition and spill-over effects;
 - Consumer benefits from faster installation times;
 - Improved functionality for emergency services;
 - Technological spill-overs to rest of 3.4 GHz band;
 - Reaching new customers; and
 - Innovative new services.

- 7.5 We consider some of these benefits below in this section of the statement. We then consider the benefits related specifically to competition (section 8); social benefits (section 9) and innovation (section 10).
- 7.6 In each of these sections, we have assessed the likely benefits that may result from UK Broadband going ahead with its investments compared to circumstances in which those investments were either delayed (i.e. where the licence extension is refused but UK Broadband acquired the spectrum at auction – our scenario 2) or did not go ahead at all (i.e. where the licence extension is refused and another operator acquires the spectrum at auction - our scenario 1).

Consumer benefits of faster fixed broadband speeds

- 7.7 We expect the launch of UK Broadband's new services to result in faster speeds for some of its customers. This would apply to all users who switch to UK Broadband from a standard broadband product. Furthermore, some of these customers may currently be in areas where high speed broadband is not available; these users are likely to benefit most (on average) from taking up the UK Broadband product.³⁵
- 7.8 For scenario 2 (where UK Broadband would acquire the spectrum if there were an auction), we have quantified the benefits of faster download speeds arising from UK Broadband's proposed investment at around £5m. These benefits arise because UK Broadband may invest earlier if we extend the licence.³⁶
- 7.9 These benefits are based on UK Broadband's projected customer base in its business plan. UK Broadband told us that, for planning purposes, it had assumed that on average over ten years, 30% of its customers would take its fixed service and 70% its mobile service.³⁷ However, it said that, whilst it was a reasonable assumption on average over ten years, this was not a reflection of what it expected to happen in practice in each year. It planned to launch the mobile service slightly later than the fixed service, and it expected the share of its customers which take the mobile service to increase over time.
- 7.10 In the absence of more detailed information, we assumed 30% of UK Broadband's total projected customer base was fixed customers in every year. This could mean that the numbers of customers for UK Broadband's fixed service are understated in the early years of the plan (and hence in our quantitative assessment) and overstated in later years. If UK Broadband does get more customers for its fixed services in the early years than we have assumed, then the benefits to customers could also be greater than we have calculated.

³⁵ See paragraphs 5.68 to 5.72 of the June 2014 consultation for more discussion on this potential benefit.

³⁶ Annex 5 to the June 2014 consultation outlined our quantified estimates of the potential benefits and costs of extending UK Broadband's licence, and discussed the assumptions made in our model. See paragraphs A5.43 to A5.61 of the June 2014 consultation for the derivation of this figure of £5m, which relates to the comparison of extending the licence compared to not extending the licence in a scenario where UK Broadband acquires the spectrum at auction anyway. This estimate incorporates the assumption that, in the case where the licence extension request is refused, UK Broadband will proceed with its business plan but with a one year lag. It may be the case that the lag in this scenario would be more than 12 months, but we made the assumption of a one year lag as this is the granularity in our modelling. If the lag were greater than 12 months, the benefits of extending the licence could be greater.

³⁷ Letter from Nicholas James to Andrew Hudson, 19th May 2014

- 7.11 As well as the possibility of these potential benefits being understated, we also recognise the possibility that they are overstated. For example, UK Broadband may not achieve its plans in full and the benefits resulting from the earlier investment may not persist for a long period.³⁸
- 7.12 For scenario 1 (where another operator acquires the spectrum if it is auctioned), in the June 2014 consultation we provided a quantitative estimate of this benefit. For the reasons set out in section 11, we no longer consider that this estimate is appropriate, because we no longer consider that we can quantify this potential benefit.

Consumer benefits of lower fixed broadband prices

- 7.13 We expect the launch of UK Broadband's new services to result in lower prices for some of its customers. UK Broadband expects its fixed broadband product to compare favourably with its competitors in terms of price. Lower prices will clearly benefit the consumers who take the service and save money as a result. The price saving itself is a good measure of the value to existing consumers of lower prices, and this is important because of our duty to further consumers' interests.
- 7.14 For scenario 2 (where UK Broadband acquires the spectrum if there were an auction), we have quantified the benefits of lower fixed broadband prices arising from the company's proposed investment as being around £33m.³⁹
- 7.15 For similar reasons to those discussed above for the potential benefit of faster fixed broadband speeds, we consider this estimate could be either too high or too low.⁴⁰ We also now consider that we cannot estimate the potential benefits of lower prices for scenario 1 (where another operator acquires the spectrum if there were an auction).
- 7.16 Our quantified estimates of potential consumer benefits that would arise from UK Broadband's planned investment are approximate. However, our conclusion does not rely on these numbers being a precise assessment of the potential benefits. In addition, there are many benefits that are likely to arise if UK Broadband's planned investment goes ahead immediately that cannot be quantified, due to their nature. We discuss these benefits below.

³⁸ The potential £5m benefit is not all accrued in the first year of UK Broadband's investment, rather it is accrued over a number of years, as our modelling assumes that the advantage of avoiding the one year delay in investment persists over time. However, we recognise that the further into the future we model, the more uncertain the customer numbers and also that there may be scope to catch up meaning that the benefits may not persist for a long period.

³⁹ This calculation of this £33m assumes that UK Broadband markets its residential broadband at £20 per month compared to an average price for residential broadband of £32 per month for those who take superfast broadband and £24 per month for those that take conventional fixed broadband. See paragraphs A5.43 to A5.55, A5.64 and A5.67 of the June 2014 consultation for more details of the assumptions we have used to generate this figure. In the model published with the June 2014 consultation, this figure is calculated in cell H11 of the 'Results' sheet, though due to confidential figures being redacted this figure is not shown in the published version.

⁴⁰ See paragraphs 5.53 to 5.67 of the June 2014 consultation for more discussion on this potential benefit, including why it may be overstated. Paragraphs 7.10 and 7.11 above that explain the assumption of 30% of UK Broadband's projected customers being fixed customers also applies to this potential benefit of lower prices.

Benefits to mobile subscribers

- 7.17 In addition to fixed consumers, UK Broadband also intends to offer services to mobile customers - although it plans to launch the mobile service slightly later than the fixed service. While the details of UK Broadband's mobile offer are uncertain, we expect there to be benefits to some mobile consumers in terms of lower prices and higher speeds.
- 7.18 Given the uncertainties about the nature of the mobile service UK Broadband will offer, we have not tried to quantify any such potential benefits. Our quantified analysis is therefore confined to the fixed services being offered by UK Broadband.

Consumer benefits from more favourable terms and conditions

- 7.19 In the June 2014 consultation⁴¹, we noted that UK Broadband claims that its customers will benefit from more favourable terms and conditions, in particular faster installation times and shorter-term contracts than other fixed operators provide. In his consultation response, Simon Hughes MP also identified fast installation compared to other providers – and we note that the company undertakes to install equipment within 24 hours.
- 7.20 We consider that the overall scale of these benefits is likely to be small, but that they might be important to some individual customers. We do not include these benefits in our quantified assessment.

Improved functionality for emergency services

- 7.21 In the June 2014 consultation, we noted that UK Broadband told us it could provide full functionality for a new Emergency Services Network by deploying an eLTE solution. If this is correct, then extending UK Broadband's licence to allow the company to have an opportunity to compete for this business could lead to benefits for the emergency services and other large users. However, we have not tested whether UK Broadband would be able to offer a better service than potential alternative suppliers, and nor have we attempted to place a value on these benefits.⁴²
- 7.22 We note that since the June 2014 consultation, UK Broadband has pre-qualified for Lot 3 of the Emergency Services Mobile Communications Programme ("ESMCP").⁴³

⁴¹ Paragraphs 5.73 to 5.74

⁴² In addition, deployment of the ESN may require additional base station sites and hence additional filter and RRU costs. For consistency we have included neither benefits nor costs related to the ESN in our quantified analysis.

⁴³ See <https://www.gov.uk/government/publications/the-emergency-services-mobile-communications-programme>

Section 8

Promotion of competition

- 8.1 In this section we consider the benefits that extending UK Broadband's licence could bring to consumers through promoting competition in the provision of fixed and mobile broadband services. The previous section has already discussed some of the benefits that can impact on competition, such as lower prices. Here we assess the dynamic gains that can result from competition, first considered in the June 2014 consultation, and assess the potential spill-over effects.
- 8.2 With its fixed broadband service, UK Broadband will be competing in the retail market for fixed broadband access alongside BT, Virgin and LLU operators such as Sky and TalkTalk. UK Broadband says it sees significant gaps in the market and some relatively underserved market segments which it believes are well suited to its wireless broadband technology.⁴⁴
- 8.3 We consider that, if it is successful, UK Broadband's offer of a high-speed broadband service at a competitive price is likely to attract users of existing broadband services, even if these are outside its particular areas of focus. Indeed, UK Broadband itself refers to fixed-line providers as "our competitors" in its business plan, and illustrates a claim that "we can price very favourably with competitors" by comparison of its own prices with the prices of comparable high-speed broadband services with unlimited usage offered by Virgin, TalkTalk, Sky, and BT.
- 8.4 UK Broadband's new service could therefore create spill-over benefits to customers who remain with other operators but receive price reductions which their existing suppliers make as a competitive response to UK Broadband. We have not attempted to quantify these benefits because their magnitude is highly uncertain.
- 8.5 However, there are reasons for thinking that, if UK Broadband does induce a competitive response, then its impact could be significant in relation to its size. In particular UK Broadband would be a full infrastructure competitor – unlike LLU operators such as Sky and TalkTalk for example – and with a different cost structure to other suppliers of broadband services.
- 8.6 Competition for customers at the retail level between full-infrastructure operators can impose pressure to reduce costs at all levels in the value chain. This means that UK Broadband would, in effect, have the ability to compete at the infrastructure level, in a market in which BT has entrenched market power and entry is generally considered unlikely. Hence, if UK Broadband were to be seen as a competitor to BT, even on a small scale or in certain geographical areas, there is the potential for dynamic benefits (innovation and cost reductions over time) from any increased competition it provides.
- 8.7 Further investment by UK Broadband could also encourage future roll out of superfast broadband into the same areas by BT or others, adding to consumer choice and competition and bringing additional benefits. Moreover, the threat of entry

⁴⁴ UK Broadband, Letter to Andrew Hudson from Nicholas James, 22nd April 2014.

by UK Broadband could encourage BT and other operators to roll out into other areas not yet served by any superfast broadband provider.⁴⁵

⁴⁵ See paragraphs 5.88 to 5.99 of the June 2014 consultation for more discussion on the potential benefits of dynamic gains and spill-over effects.

Section 9

Social benefits, particularly for urban areas

- 9.1 In this section of the statement we consider whether certain matters which Ofcom has a duty to take into account under section 3(4) of the Communications Act 2003 are relevant to our considerations.
- 9.2 These matters include the different needs and interests of persons in different parts of the UK, including persons living in rural and urban areas. The Act also identifies our statutory duty to take account (where relevant) of the needs of persons with disabilities, of the elderly and of those on low incomes.
- 9.3 In his consultation response, Simon Hughes MP identified a number of potential benefits already being delivered by UK Broadband which relate to these duties, including those in respect to urban areas and to those on low incomes. We consider these are relevant to our consideration of the UK Broadband licence extension.

Addressing slow internet connection

- 9.4 Mr Hughes highlighted the problems faced by many of his constituents in south east London (a densely populated urban area) in obtaining fast broadband speeds. He noted that UK Broadband offered an alternative to BT and Virgin Media that was both fast and available at a cheaper price than its competitors. Mr Hughes noted UK Broadband's prioritisation of 'not spot' areas where need is highest, and concluded that delaying any consumer benefits further (i.e. by declining the licence request) would be a *"bad outcome."*
- 9.5 UK Broadband has also told us explicitly that it is planning to target customers who either cannot get sufficiently fast broadband or who do not choose to have a landline. In addition, it plans to serve areas where broadband speeds are slow or superfast broadband is not available. If it succeeds, the result is likely to be increases in total consumer welfare and gains in economic efficiency.
- 9.6 We note the concerns identified by Mr Hughes about under-served urban areas and we think there is some merit in his arguments. We note that the problems he identifies can also apply to other districts where BT and/or Virgin Media have not rolled out fibre delivered services.

Serving economically deprived areas

- 9.7 Mr Hughes' response also noted that the UK Broadband business model accommodates certain customers from more economically deprived areas.
- 9.8 He pointed out that alternative internet providers require customers to subscribe to a telephone line in order to receive fixed broadband services. He said that more and more people – particularly from poorer backgrounds – were choosing not to have landline phones. By cutting out the line rental requirement, UK Broadband is able to offer internet for less money and allow customers to pay for only what they need.

Reaching new customers

- 9.9 There is some uncertainty about the value of the benefits created by serving new customers. However, we can say that, if they become UK Broadband customers, they would have voluntarily purchased a product that was not available before. As such, it is reasonable to expect they would be made better off as a result of the introduction of the UK Broadband product, at the prices charged.
- 9.10 In paragraphs 5.76 to 5.83 of the June 2014 consultation, we said that lower prices can increase consumer welfare by expanding the market. Expanding the market through price reductions is a benefit to the economy as a whole, as long as the price is not less than the extra costs incurred - that is the (forward-looking) incremental cost.
- 9.11 The prices of telecommunications services are almost always above incremental costs because firms also need to recover common costs and sunk costs, which in telecoms are generally significant. However, reducing prices towards incremental costs will mean that more customers who have a willingness to pay above the incremental cost will be able to consume the service, and this will add to total consumer welfare.⁴⁶
- 9.12 In addition, if bringing high speed broadband to customers who do not have access to such services at present also benefited other users, additional benefits over and above the consumers' own willingness to pay for higher speeds could be created. These are more likely to be relevant if the increase in speed is significant enough to enable a step change in the type of service which customers are able to use and if this step change enables users to participate in a wider range of activities.⁴⁷

⁴⁶ Strictly, any price above marginal cost could increase economic efficiency. Marginal cost is a special case of incremental cost where the increment is one unit of output. A large proportion of the costs of telecoms networks are fixed in the short run, and short run marginal costs can be very low. Setting prices in relation to short run marginal costs would therefore generally understate the costs of telecoms services and incremental cost is generally considered to be a more appropriate benchmark in telecoms networks for this reason. For a discussion of cost concepts, see "*Fixed access market reviews: Approach to setting LLU and WLR charge controls*", 11 July 2013, paragraphs 3.13 to 3.15 at: http://stakeholders.ofcom.org.uk/binaries/consultations/llu-wlr-cc-13/summary/LLU_WLR_CC_2014.pdf

⁴⁷ For a discussion of the circumstances in which "broader social value" may arise, see for example Ofcom, "*Digital Dividend Review*", 19 December 2006 at <http://stakeholders.ofcom.org.uk/binaries/consultations/ddr/summary/ddrmain.pdf>

Section 10

Innovation

- 10.1 This section of the statement considers how granting UK Broadband's licence extension might relate to our duty to promote innovation. Product innovation enables consumers to benefit from higher quality, greater functionality, speed or flexibility from the products they purchase. Other innovations may lower the costs of providing services, enabling prices to be reduced, again to the benefit of consumers.
- 10.2 UK Broadband has been present in the UK since March 2003. Initial efforts to market fixed wireless broadband services using TDD-CDMA technology were ultimately not successful. However, since then, the spectrum UK Broadband holds has been included in Release 10 of the 3GPP LTE standards. UK Broadband now aims to invest in a new network in order to bring the new technology to market and obtain the rewards of its earlier innovation.
- 10.3 Our June 2014 consultation noted that extending UK Broadband's licence could, by enabling UK Broadband (and its customers) to benefit from its past investment and innovation, encourage further investment and innovation in future⁴⁸.
- 10.4 A rapid implementation of its business plan could enable UK Broadband to introduce further new services as they become technically and commercially feasible - utilising its new infrastructure to provide services such as microwave Ethernet backhaul networks. UK Broadband has stated it would be in a good position to bring innovative services to the market.
- 10.5 The June 2014 consultation also said that early development and marketing of products and services was likely to create the conditions for technological spill-overs to the rest of the 3.4 GHz band⁴⁹. These could permit faster development of the ecosystem for broadband services in the band, which may enable deployment by later users more quickly and/or at lower cost.
- 10.6 Finally, we also consider the innovative marketing of UK Broadband's new services to be a benefit – in particular the delivery of services to customers without the need for a landline (as discussed in the previous section).

⁴⁸ Paragraph 5.84 to 5.85

⁴⁹ Paragraph 5.86

Section 11

Efficient use of radio spectrum

11.1 We have identified two main costs that may arise from an extension of UK Broadband's licence: costs related to potentially inefficient use of spectrum, and costs related to the loss of a potentially more valuable use of the spectrum. In this section we consider the efficient use of radio spectrum. In the following section (section 12) we consider the possibility of a more valuable alternative use of the spectrum.

Spectrum efficiency

11.2 Ensuring that spectrum is used optimally means that account must be taken of the value provided to consumers by the use of frequencies. It also requires us to take account of whether the benefits of a particular use of spectrum may be realised more quickly, or only with a considerable delay.

11.3 In determining what is 'optimal', we may be required to take a long-term perspective. For example, competition often leads to increased costs in the short-term if entrants duplicate an incumbent's existing network and economies of scale are lost. But such losses of 'static efficiency' may in the longer term be outweighed by gains in 'dynamic efficiency'. Dynamic efficiency refers to the improvements in efficiency that occur over time as innovation and investment leads to lower costs and the introduction of new services, often as a result of competitive pressure.

11.4 Our June 2014 consultation discussed the potential spectrum inefficiencies arising from the fact that UK Broadband currently holds two blocks of 20 MHz of spectrum which are non-contiguous⁵⁰. We assume the spectrum would be consolidated into a single block if the request for a licence extension were refused and the 40 MHz of spectrum were auctioned alongside the additional 150 MHz of 3.4 GHz spectrum being released by the MOD.

11.5 If UK Broadband's licence extension is granted it is therefore possible that there may be a more fragmented set of spectrum holdings across the entire band, which could result in less efficient use of the band as a whole. This is because any non-contiguous holding increases the number of boundaries between operators, and means additional guard bands may be needed to prevent interference.

11.6 Potential costs of extending UK Broadband's licence with this split assignment of 3.4 GHz could include:

- Less usable spectrum in the 3.4 GHz band;
- Costs of additional remote radio unit (RRU) and filter equipment; and
- The preclusion of large contiguous blocks of spectrum.

11.7 We consider these in turn below. We then consider the likelihood of the first two types of costs arising. As we explain below, the likelihood is affected by:

⁵⁰ Paragraphs 5.103 to 5.124

- Whether there is synchronisation between neighbouring users of 3.4 GHz spectrum. If there is synchronisation, the permissive block edge mask can be used and the costs will be significantly lower, particularly within any split assignment. As already noted, we now believe it is likely there will be synchronisation.
- Whether there is a split assignment for another holder of the 3.4 GHz spectrum that will be included in the PSSR award.

11.8 As we discuss further below, we also note that it is possible that UK Broadband's spectrum could be consolidated into a single contiguous block, either through the auction itself or through spectrum trading.

11.9 Finally, we discuss BT's argument that UK Broadband may have an incentive to bid for contiguous spectrum in the auction and then return its current spectrum holdings, leading to spectrum inefficiencies.

Less usable spectrum in the 3.4 GHz band

11.10 The quantified assessment of costs set out in our June 2014 Consultation considered a case where extending UK Broadband's licence creates two additional adjacencies in the 3.4 GHz band, for both UK Broadband and other operators.⁵¹ This is a worst case scenario because it assumes there is a split assignment of 3.4 GHz spectrum for another operator as a result of UK Broadband's own split holding, and that there is no synchronisation.

11.11 We considered a high and a low cost case, one where the additional adjacencies require 5 MHz of spectrum to comply with the restrictive unsynchronised emission limit at the boundary of UK Broadband's spectrum holding; and one case where 10 MHz of spectrum are required. Given our proxy estimate of the value of the 3.4 GHz band⁵², we found that there could be a total cost of £14m to £28m (£7m to £14m for UK Broadband and £7m to £14m for another operator) in NPV terms.⁵³

⁵¹ See paragraphs A5.31 to A5.34 for more explanation, including an illustrative example.

⁵² As in the June 2014 consultation, the proxy value we use for the 3.4 GHz band is £1.5m/MHz, which we consider could be too high or too low. However, as set out below, there have been changes in the underlying basis of this proxy. We have nevertheless retained the estimate of £1.5m/MHz, reflecting that there is still considerable uncertainty about it, and that reducing it would only decrease our estimate of costs. The estimate of £1.5m/MHz in the June 2014 consultation was based on the value of the unpaired 2.6 GHz band estimated for Ofcom using the "linear reference price" method in the October 2013 consultation on Annual Licence Fees (ALF): see "*Annual licence fees for 900 MHz and 1800 MHz spectrum*", consultation document, 10 October 2013, paragraph 4.20 at: <http://stakeholders.ofcom.org.uk/binaries/consultations/900-1800-mhz-fees/summary/900-1800-fees.pdf>. Since our June 2014 Consultation, we have published another consultation on ALF for 900 MHz and 1800 MHz spectrum. In that second ALF consultation, we preferred to base our ALF estimates on an analysis of bids by the marginal bidders in the UK 4G auction rather than the linear reference price method. See "*Annual licence fees for 900 MHz and 1800 MHz spectrum, Further consultation*", 1 August 2014, <http://stakeholders.ofcom.org.uk/binaries/consultations/annual-licence-fees-900-MHz-1800-MHz/summary/condoc.pdf>. If we were to use an analysis of the marginal bidder for the unpaired 2.6 GHz spectrum it would imply a lower figure than the proxy we have assumed. We also acknowledge the argument made by UK Broadband and Airwave that even if the licence were not extended, there would anyway be costs relating to UK Broadband's 3.4 GHz having a split assignment until mid 2018.

⁵³ See paragraphs A5.31 to A5.35 of the June 2014 consultation for the derivation of these cost estimates. Note that the numbers of £15m and £30m in Figure A5.4 are undiscounted, and so are slightly higher than the £14m to £28m as a result.

- 11.12 However, as we discuss further below, if UK Broadband's licence is extended, it is not necessarily the case that this would result in a split assignment for another operator acquiring spectrum in the PSSR award. If another operator did *not* have a split assignment, then the potential costs above would be halved (to £7m -£14m in NPV terms), as it would only be UK Broadband that would have additional potential costs associated with a split assignment.
- 11.13 As regards the potential cost to UK Broadband of less usable spectrum, we consider that these costs could affect customers through reductions in service quality, and so it is appropriate to include a share of these costs in our quantitative assessment. We have assumed that the effects of any reduction in the amount of UK Broadband's holding which is usable are borne proportionately by its fixed and mobile customers. Given that we have only quantified some benefits for *fixed* customers, and we assume that 30% of UK Broadband's customers are fixed, we only consider 30% of UK Broadband's costs (£2m - £4m) are relevant when comparing with the quantified benefits, to enable a more like-for-like comparison.⁵⁴
- 11.14 We do not know the value consumers would place on any resulting loss of quality, so as a proxy we use an estimate of the value of the unusable spectrum (which also represents the cost of avoiding a quality reduction by hypothetically obtaining more spectrum).
- 11.15 If there were synchronisation, then there would be no additional costs in terms of less usable spectrum to UK Broadband or other operators (regardless of whether there was a split assignment).

Costs of additional remote radio unit (RRU) and filter equipment

- 11.16 Holding spectrum in two separate blocks rather than as a single contiguous block may, in some circumstances, also result in UK Broadband incurring costs of additional RRU and filter equipment as it deploys base stations in order to prevent interference with neighbouring operators. Assuming there is no synchronisation and a second RRU was needed, we estimated in the June 2014 consultation that the additional cost to UK Broadband would be approximately £83m in NPV terms.⁵⁵
- 11.17 If another operator also has a split assignment as a result of UK Broadband's 20 MHz holding in the middle of the 3.4 GHz band, we estimate that the additional costs to that operator could be between approximately £12m if it has 1,000 sites and approximately £56m for 5,000 sites⁵⁶, although this depends on particular circumstances. For example, in some cases additional costs may be incurred as a result of the large allocation rather than due to the split. This will depend on the exact performance of the base station RRU, the bandwidth it can simultaneously support and the exact deployment configuration of the network. If another operator did not have a split assignment, or there were synchronisation, it would clearly not face these additional costs.

⁵⁴ See paragraphs 5.40, 5.51 A5.19, A5.22 and A5.27 to A5.28 of the June 2014 consultation for more explanation on the 30% assumption and how we have used this in our quantification of some of the costs and benefits.

⁵⁵ While some details of UK Broadband's roll out plans may have been refined since the June 2014 consultation, we continue to regard this estimate as giving a reasonable broad indication of the likely additional costs due to additional RRUs and filter costs if there is no synchronisation.

⁵⁶ See paragraphs A5.36 to A5.38 of the June 2014 consultation for the derivation of the £83m, £12m and £56m cost estimates referred to in this section.

- 11.18 In our comparison of quantified costs and benefits for consumers, we have included these additional RRU and filter costs imposed on other operators, as there is a clear possibility that these could be passed on to consumers in the form of higher prices or lower quality services.
- 11.19 It is less clear that any additional costs borne by UK Broadband itself would necessarily be passed on to consumers. On one hand, the scale of the profits projected by UK Broadband suggests they could be borne by the company without affecting the planned prices or quality of service. On the other, we understand that they have not been included in UK Broadband's financial projections, and so there could be the possibility of some adjustment to prices or services. In the light of this, when comparing with the quantified benefits, only an appropriate proportion⁵⁷ of UK Broadband RRU and filter costs are relevant in a 'high case' estimate of costs (giving costs of £25m), and there are no such costs in a 'low case' estimate.
- 11.20 The combined total of UK Broadband's and other operators' RRU and filter costs which we have included in our quantitative analysis is between £12m and £80m in NPV terms. As we said earlier, this is a worst case scenario because it assumes there is a split assignment of 3.4 GHz spectrum for another operator as a result of UK Broadband's split holding and that there is no synchronisation.
- 11.21 If there were synchronisation, then we would expect the other operator's costs to be very small, or even zero, even if that operator had a split assignment. UK Broadband's additional RRU and filter equipment costs could also be significantly lower or even zero if there were synchronisation. Exactly how much lower would depend on the details of what equipment it deployed; how it is used; and how the equipment developed over time.

Likelihood of above costs arising

Likelihood of synchronisation

- 11.22 UK Broadband has noted that it hopes to reach synchronisation agreements with its 3.4 GHz neighbours (i.e. enabling it to use permissive masks). As already noted, synchronisation facilitates the benefits of avoiding some spectral inefficiencies which would otherwise arise from the need to accommodate filter roll-off or guard bands. In particular, synchronisation allows operators to deploy generic equipment rather than equipment that is fitted with operator specific filters. In theory these savings could create an incentive for operators to agree synchronisation where possible.
- 11.23 For synchronisation to work, all operators need to agree the proportion and timing of uplink and downlink traffic and to co-operate to ensure it happens. A difficulty could be that operators have very different business models and timescales for implementing the business models, so they may find it difficult to come to an agreement to synchronise.
- 11.24 We have received a number of comments, both as responses to our technical consultation on technical aspects of the 2.3 and 3.4 GHz PSSR award⁵⁸ and in further confidential discussions with a number of stakeholders, which suggest that synchronisation between neighbouring licensees is now likely. However, as this agreement may still take some time, we are now considering how best to allow

⁵⁷ We included 30% of these costs, reflecting UK Broadband's expected proportion of customers taking it fixed broadband service. See footnote 55 above.

⁵⁸ <http://stakeholders.ofcom.org.uk/consultations/2.3-3.4-ghz/>

deployment with the permissive mask without significant delay. This would result in lower costs associated with additional licensee boundaries.

- 11.25 As described in more detail above, if there is synchronisation, then the cost estimates from additional boundaries are much lower. However, whilst we now consider synchronisation likely, we note that it cannot yet be guaranteed.

Likelihood of split assignment for other 3.4 GHz licensees following auction

- 11.26 Whether there is a split assignment for another operator, in the event that UK Broadband remains in its current position, depends on whether the winning packages in a subsequent auction of 2.3 and 3.4 GHz spectrum can fit around UK Broadband's block of 20 MHz at 3480 to 3500 MHz in a way that gives each winning bidder a contiguous assignment.⁵⁹ This requires that the winning packages can be divided into one group that would fit in 70 MHz of spectrum and another group that would fit in 80 MHz of spectrum. If this were possible, no winner in the 2.3 and 3.4 GHz auction would receive a split assignment.

- 11.27 There are some combinations of auction outcome that cannot be divided into two groups of 70 MHz and 80 MHz. For example, in the June 2014 consultation we showed that if there were three winning bids for 50 MHz, one would require a split assignment.⁶⁰ Agreement on synchronisation between operators would allow the use of permissive block edge masks, which in turn affects the choice of equipment and configuration. Other combinations that would require a split assignment are four lots of 25 MHz and one lot of 50 MHz. Also, any combinations that involve a single winning bid greater than 80 MHz or more would require a split assignment.⁶¹

- 11.28 However, there are many combinations of 150 MHz that can be divided into a group of 70 MHz and a group of 80 MHz. For example, combinations that involve some awards that sum to 80 MHz (such as four lots of 20 MHz, two lots of 40 MHz or a single award of 80 MHz) and any combinations that involve awards that sum to 70 MHz (such as a lot of 40 MHz and a lot of 30 MHz, or two lots of 20 MHz and a lot of 30 MHz, or one lot of 70 MHz). Of all possible outcomes where winners of spectrum are allocated at least 20 MHz and at most 80 MHz in the 3.4 GHz band, less than 9% give rise to a split assignment.⁶²

- 11.29 We also note that the UK Broadband spectrum could be consolidated into a single contiguous block, either through the auction itself or through spectrum trading.^[6]

⁵⁹ This does not depend solely on the size of block that Ofcom chooses to auction. Rather it depends on the size of blocks that result from bids in the auction

⁶⁰ See paragraphs A5.32 to A5.34 in the June 2014 consultation and the associated figures.

⁶¹ We recognise that it is possible for there to be circumstances in which more than one winner in the auction could obtain a split assignment. Whether or not this is possible would depend on the rules for the assignment stage of the PSSR auction, on which we will be consulting shortly. We consider that having two split assignments is unlikely, but not impossible, and have taken this into account in our assessment.

⁶² As well as assuming that all winners of spectrum are allocated at least 20 MHz and at most 80 MHz of spectrum, we also assume that there is no requirement that any unsold spectrum is retained as a single contiguous block above or below UK Broadband's lower block – instead it would be possible to leave some unallocated spectrum below and some above this block. Given these assumptions, there are 727 possible outcomes, 65 of which would involve a split assignment. However, as the different possible outcomes cannot be treated as equally probable, the fact that less than 9% give rise to a split-assignment should not be thought of as a probability.

^[6] We discuss the possibility of such a trade in paragraphs 5.122 to 5.124 and A5.40 of the June 2014 consultation.

We are about to consult on auction designs that could result in UK Broadband taking part in the assignment stage in the auction. This could lead to the relocation of some or all UK Broadband's 40 MHz of spectrum to a different part of the 3.4 GHz band, thereby removing any non-contiguous allocations within the band. However, as we are still consulting on the design of the 2.3 and 3.4 GHz auction, such an auction design is not certain at this stage.

Conclusion on likelihood of above costs arising

11.30 Given that we now consider that synchronisation is likely and that it is possible that there will not be a split assignment for another operator, we consider that the estimates of the costs from less usable spectrum and additional RRU and filter costs are likely to be significantly lower than we have set out in the estimates above. Those estimates should therefore be considered as worst case estimates, and not the expected level of cost.

The preclusion of large contiguous blocks of spectrum

11.31 UK Broadband's 20 MHz holding in the middle of the 3.4 GHz band may prevent some auction outcomes which may be efficient. For example, should any potential bidder wish to acquire a contiguous holding of more than 80 MHz, it would not be able to do so. A potential bidder for a holding of more than 80 MHz of spectrum in the band might face additional costs if such a holding needed to be non-contiguous.⁶³

11.32 If any new acquirer of 3.4 GHz spectrum in the PSSR award needed to be assigned non-contiguous spectrum⁶⁴ it may have an adverse impact on the nature or quality of services that might be offered to consumers.⁶⁵

11.33 We have not been able to quantify these costs, but we take them into account in our overall assessment (as well as the types of benefit we have not quantified).

Risk that UK Broadband may acquire contiguous spectrum in auction and then return current holdings

11.34 In its response to the June 2014 consultation, BT described the risk that if UK Broadband values 3.4 GHz spectrum more highly than other operators it would have an incentive to bid in the PSSR award for contiguous 3.4 GHz spectrum and then return its current holdings (or part of its current holdings) to Ofcom.⁶⁶

11.35 BT noted that we had used a proxy value for the 3.4 GHz spectrum of £1.5m/MHz. This would imply a value of £60m for 40 MHz of 3.4 GHz spectrum. This is less than our estimate of the additional cost to UK Broadband of having a split assignment (£83m). BT considered this suggested it would be cheaper for UK Broadband to buy new (contiguous) 3.4 GHz spectrum in the PSSR award, and by doing so avoid the costs of a split assignment. This argument was further re-enforced by the fact UK Broadband would otherwise have to pay annual licence fees on its existing spectrum after 2018.

⁶³ In its response to our 2013 Call For Inputs on the PSSR award, BT suggested that it might be interested in a single holding of as much as 120MHz: BT response to the CfI, page 5.

⁶⁴ See Figure A5.3 in Annex 5 of the June 2014 consultation for an illustration

⁶⁵ See from paragraph 7.13 of the June 2014 consultation.

⁶⁶ See paragraph 14 of BT's response to the June 2014 consultation.

- 11.36 We do not consider that UK Broadband would necessarily have an incentive to act in this way. We note that the estimate of £83m is on the assumption that synchronisation does not happen, whereas we now consider that synchronisation is likely, for the reasons set out above. Synchronisation would mean that these costs could be significantly lower. If synchronisation does not happen, then UK Broadband could face material costs for modifying its network so it is able to use different spectrum bands (although we note that the company has said it is prepared to pay these costs).
- 11.37 Additionally, UK Broadband has already paid for its rights to use the 40 MHz of spectrum it currently holds in the 3.4 GHz band up until mid 2018. If it bought new spectrum the acquired frequencies would be available earlier, and it could effectively be paying twice for some spectrum for two or three years.
- 11.38 UK Broadband's incentives could also be affected by the auction design. As already noted, we will shortly be consulting on an auction design that could result in UK Broadband taking part in the assignment stage and re-locating some or all of its 40 MHz of spectrum to a different part of the band after the auction. This would remove non-contiguous allocations within the 3.4 GHz band.

Section 12

Possibility of another operator valuing the spectrum more highly

- 12.1 In this section, we consider the costs of extending UK Broadband's licence compared to the potential benefits of another user acquiring the spectrum if it were auctioned.
- 12.2 In our June 2014 consultation, we set out our quantification of some of the potential benefits of licence extension if UK Broadband failed to acquire the spectrum at auction, and another operator subsequently implemented a similar business plan with a four year delay (i.e. after the UK Broadband licence expired).⁶⁷ This analysis suggested the benefits of instead granting the UK Broadband licence extension were potentially large, because of the delay in the realisation of any consumer benefits.
- 12.3 BT's consultation response questioned our cost benefit analysis, saying we had not fully assessed the benefits of the spectrum being used by an alternative operator. We have reviewed our analysis of the scenario where another operator would value the spectrum more highly than UK Broadband in an auction as a result.
- 12.4 We now consider that if an alternative operator was planning similar investments to UK Broadband, but with a four year lag, it is unlikely that it would bid more for the spectrum than UK Broadband. Rather, if another operator bid more for the spectrum in an auction than UK Broadband, it is likely to be because it could generate greater value from this spectrum. This could mean that it would also generate greater consumer benefits from using the spectrum than UK Broadband.
- 12.5 Given that an auction would not take place until the second half of financial year 2015/16, these potentially greater benefits if another operator obtained the spectrum would need to be considered against the potential benefits from UK Broadband's investment during the period before an auction could be held.
- 12.6 We are not able to attempt any actual quantification of this alternative outcome since we have very limited information about how another operator might use the spectrum. However, we can surmise that if an alternative operator would value the spectrum more highly than UK Broadband, the costs of granting the UK Broadband licence extension could amount to the lost benefit to consumers of the alternative use (whatever that may be) added to the costs arising from potential spectrum inefficiencies as a result of UK Broadband's split holding.

Possibility of alternative user obtaining spectrum

- 12.7 If another operator values the spectrum rights after 2018 more highly than UK Broadband then, even if we extend UK Broadband's licence, it is possible that this other operator may still be able to obtain the spectrum. This could mitigate the potential costs of extending the licence in the scenario when UK Broadband does not value it most highly. There are two ways in which this transfer of the spectrum rights could occur:

⁶⁷ Annex 5 of the June 2014 consultation, paragraph A5.56

- UK Broadband could return the spectrum to Ofcom and we could auction it, which could happen if UK Broadband was not prepared to pay the annual licence fees set from 2018; or
- UK Broadband could sell the spectrum licence to the party that values it more highly.

12.8 While either of these outcomes may be better for consumers than if UK Broadband retained the spectrum, it may be less beneficial for consumers than if we did not extend the licence and instead auctioned the spectrum sooner. For example, there may remain a split assignment of the 3.4 GHz spectrum that UK Broadband currently holds which could have been avoided if we auctioned that spectrum together with the other 3.4 GHz spectrum.⁶⁸

12.9 Also, there could be a delay in a new owner knowing it would have the spectrum after mid-2018, which could mean that the spectrum may not be used as effectively as it might be after 2018. This may be particularly the case if the spectrum is returned to Ofcom, rather than traded.

⁶⁸ Another example of the possible loss of benefit with such trading is given in paragraph 5.129 of the June 2014 consultation.

Section 13

Practical considerations

- 13.1 We have seen from previous sections of this statement that there are a range of potential benefits likely to arise from a decision to grant an extension to UK Broadband's licence. These include benefits derived from investment, competition and innovation.
- 13.2 We have also seen that there are some potential costs. These include costs derived from the split nature of UK Broadband's spectrum holdings and the loss of any potentially more valuable use of the frequencies.
- 13.3 Although some of the benefits of extending the licence can be quantified, a number of other clear benefits cannot. Similarly, we have been able to consider quantification of some of the costs arising from a decision to grant an extension to the licence – particularly those related to the potential spectrum inefficiencies that may arise from the split nature of the UK Broadband assignment – but other costs cannot be meaningfully quantified.
- 13.4 Even where we have been able to consider quantified costs and benefits there is considerable uncertainty. For example, the potential costs which could arise as a result of UK Broadband's split frequency assignment may be significant or not significant, depending on whether or not there is synchronisation between 3.4 GHz spectrum users.
- 13.5 In the same way, any assessment of alternative uses of the UK Broadband spectrum is dependent on unknowns, including which companies would acquire the spectrum at auction; which technologies they would wish to employ; what funding they would have available; and the types of consumer benefits that might or might not result.
- 13.6 Nevertheless, and in spite of these significant uncertainties, we are required to reach a decision on whether or not to grant the extension to UK Broadband's licence. In making our judgement, it is appropriate for us to consider and take reasonable account of the practical circumstances for consumers.
- 13.7 A key consideration in that regard is the fact that UK Broadband is already using the radio frequencies it holds in the 3.4 GHz band and is currently rolling out its Relish broadband service. Customers are already subscribing to the services. As a result, the consumer benefits we have identified in other parts of this statement are actually being realised in some areas of the country.
- 13.8 Those benefits sit squarely within the objectives which Ofcom has been set under its statutory duties, and meet the aims sought by the statutory considerations to which we must have regard under legislation. A decision to refuse the licence extension risks the loss of those already tangible benefits.
- 13.9 In contrast, although the benefits to citizens and consumers of *not* granting the UK Broadband licence extension could - in some circumstances - be greater, they are intangible at present; uncertain in the future, and in any case not easily identified. In summary, we have had to balance the *possibility* that a so far unknown user may eventually deliver benefits under our duties (whether similar or greater) against the fact that UK Broadband is already doing so.

- 13.10 UK Broadband is providing services to areas and to customers currently underserved by BT – its principle competitor, and the strongest opponent of licence extension among the consultation respondents.
- 13.11 The practical considerations identified above are an important part of our overall assessment of the pros and cons of granting the UK Broadband licence extension. We have taken account of them alongside our assessment of the potential costs and benefits identified earlier in the statement.

Section 14

Overall assessment and conclusion

- 14.1 This statement has set out our assessment of whether or not we should grant UK Broadband's request for a licence extension. Our analysis has been conducted in the light of responses received to our June 2014 consultation, and as a result of our further consideration of some important factors.
- 14.2 We have assessed the relative merits of either granting or not granting the licence extension in line with our statutory duties and having regard to the particular circumstances. In doing so, we have assessed two possible scenarios which could arise if the licence were refused: one where UK Broadband would win the spectrum if it were auctioned instead, and one where another operator would win it.
- 14.3 We have noted the difficulties associated with making quantified estimates, and that there is considerable uncertainty in our figures. This means they could be higher or lower than we have estimated. We have attached significant weight to some benefits and costs that we have not quantified.
- 14.4 We have also noted that the potential costs we identified relating to UK Broadband's split spectrum assignment are likely to be much lower than we originally considered, because it is now likely that there will be synchronisation between spectrum users in the 3.4 GHz band.
- 14.5 Having considered the evidence, we believe it is more likely that UK Broadband's investment will go ahead as planned (in 2015) if the licence extension is granted than if it is refused.
- 14.6 Among the potential benefits we expect to arise from licence extension as a result are the quicker delivery of faster broadband speeds in under-served areas; lower prices for broadband; provision to under-served customers (e.g. students and the less well-off); additional end-to-end competition in the market for fixed broadband; and the quicker development of new equipment capable of using the 3.4 GHz band. We see use of new technology in the 3.4 GHz band and the ability of consumers to subscribe to fast broadband without the need for a land-line as innovative approaches.
- 14.7 We acknowledge that if we were not to grant the request for a licence extension and auction the spectrum instead, it is possible that an operator other than UK Broadband might win the spectrum and obtain more value from it than UK Broadband. However, this is uncertain.
- 14.8 Were UK Broadband to acquire the spectrum itself in such an auction, its investment could be delayed by at least a year. The delay in investment could be to the detriment of consumers in the meantime.
- 14.9 We note additionally that the UK Broadband licence comprises only 40 MHz of spectrum within a total of 190 MHz of spectrum suitable for broadband use in the 3.4 GHz band. The forthcoming auction of the other 150 MHz means alternative operators will still have an opportunity to obtain 3.4 GHz spectrum. The granting of a licence extension to UK Broadband does not affect this. The availability of further 3.4 GHz spectrum lessens the risk that another potential user will have a significantly higher valuation of the spectrum than UK Broadband.

- 14.10 We also note that if the licence were to be extended, and if there were to be a more valuable use of the spectrum, UK Broadband may have an incentive to trade the frequencies, thereby mitigating any costs.
- 14.11 We have considered all of these factors in light of our statutory duties - in particular our duties to promote competition, to support innovation and to promote investment. We have considered the potential benefits of granting the licence against the potential costs, including from spectrum inefficiency which might arise from a more fragmented use of the band as a whole.
- 14.12 We have given regard to the current situation for consumers. UK Broadband is already an active user of the spectrum. It is already beginning to roll out new services to customers and is planning further significant investment. There are consumers enjoying the benefits of UK Broadband's services right now.
- 14.13 A decision to reject the licence extension risks these clear consumer benefits not being extended to other customers without any certainty about whether the same level of competition, innovation or investment will come about through another spectrum user.
- 14.14 **We have therefore decided to grant an indefinite extension to the spectrum licence held by UK Broadband in the 3.4 GHz band (3480 to 3500 MHz and 3580 to 3600 MHz).**

Section 15

Further considerations

- 15.1 This final section of the statement looks at some consequences arising from an extension of UK Broadband's licence.
- 15.2 It sets out first how the licence will be amended to reflect the extension; it then, considers the question of licence fees; and finally addresses the question of aligning the licence conditions of an extended UK Broadband 3.4 GHz licence with those of other future licences in the same band,

Licence term

- 15.3 In order to reflect the extension of UK Broadband's licence, we will amend the licence term provisions of the licence so they read as follows:

"This Licence shall continue in force until revoked by Ofcom or surrendered by the Licensee."

Annual licence fees

- 15.4 Our spectrum pricing policy is set out in our revised Framework for Spectrum Pricing⁶⁹ (the SRSP 2010). This notes that where we license spectrum, we employ one of three mechanisms for setting fees for rights to use the frequencies: cost based pricing, administered incentive pricing (AIP) and auctions.
- 15.5 Until now, the 3.4 GHz spectrum held by UK Broadband has not attracted annual licence fees because it was awarded through an auction. Spectrum access rights granted via auctions are subject to payment of a sum determined through the award process itself. They are not subject to additional fees until after the end of the initial licence term. We consider what fee level to apply at that time, and once we impose a fee, payment is usually required annually.
- 15.6 We have considered the consultation responses we received in respect to annual licence fees. As set out elsewhere in this document, we proposed that annual fees based on AIP principles should apply from the current expiry date of UK Broadband's licence (July 2018).
- 15.7 Only one (confidential) response proposed an alternative approach, suggesting that, in the event of UK Broadband being granted an extension, an up-front capital charge should be levied. This would ensure UK Broadband was not given any advantage over competitors who obtained spectrum via an auction.
- 15.8 Another respondent, Telefonica, agreed with our proposal to levy AIP, but said an incremental AIP level should apply until a time when UK Broadband's spectrum holding was consolidated into a single contiguous band. This would reflect the additional opportunity cost that the split holding imposed on others through the potentially inefficient use of spectrum. It would encourage UK Broadband to co-operate with moves towards consolidation.

⁶⁹ <http://stakeholders.ofcom.org.uk/binaries/consultations/srsp/statement/srsp-statement.pdf>

- 15.9 We remain of the view that an annual AIP fee is the most appropriate form of payment for spectrum after the expiry of an initial term, in line with the conclusions of our Strategic Review of Spectrum Pricing. The licence will therefore be subject to an annual fee from July 2018.
- 15.10 We will consider the level of this fee nearer the time, but we expect it to be set in line with the principles of AIP. The bids and prices indicated in the 3.4 GHz award are expected to provide a good indication of the opportunity cost of spectrum at the time of the auction.
- 15.11 We will consult on our proposed licence fee, but do not envisage that our approach would necessarily give UK Broadband an advantage over competitors. Our usual practice has been for fees to be set at a level designed to reflect the advantages of annual fees, compared to an upfront fee. Additionally we will give more detailed consideration to the approach suggested by Telefónica before setting out our proposals.
- 15.12 In light of the above, we will amend the licence fee provisions of UK Broadband's licence so they read as follows:

“From 17 July 2018, the Licensee shall each year pay to Ofcom the relevant fee as provided in section 12 of the Act and the Regulations made thereunder on or before the fee payment date, or on or before such dates as shall be notified in writing to the Licensee, failing which Ofcom may revoke this Licence.”

Licence conditions

- 15.13 As noted throughout this statement, the UK Broadband spectrum holding sits within the 3.4 GHz band which also includes 150 MHz of spectrum being released by the MOD under the PSSR programme. We believe it is appropriate that licence conditions should be consistent across the whole band.
- 15.14 In our consultation on technical coexistence issues for the 2.3 and 3.4 GHz award⁷⁰, we did not support the idea of a guard band between UK Broadband and any potential new broadband wireless users. We proposed that the award of the 3.4 GHz band should align with revised EC conditions. Our technical co-existence consultation asked the following questions:

Do you agree with our approach that it is not necessary to impose any guard bands or restricted blocks in order to manage the adjacencies between the incumbent UK Broadband and new users of spectrum to be awarded in the 3.4 GHz band?

Do you agree with our approach to require UK Broadband to have the same coordination requirements as other users of the band?

- 15.15 All respondents who addressed this issue endorsed our approach.
- 15.16 In our June 2014 consultation on the extension of UK Broadband's licence, we further set out our position that it would be appropriate to align the UK Broadband licence with those of new licensees within a reasonable period from the date of the PSSR award. None of the consultation responses expressed any dissent from this position.

⁷⁰ <http://stakeholders.ofcom.org.uk/consultations/pssr-2014/>

- 15.17 We also note that UK Broadband itself has indicated a willingness for its licence to be aligned with other 3.4 GHz licensees. Accordingly, we expect to apply consistent licence conditions across the whole band in due course. This consistency will apply to all conditions, including synchronisation requirements (should they be applied subsequently) and mobile trading regulations.
- 15.18 We have not yet concluded our consideration of the exact details of the technical and non-technical licence conditions to be applied to that part of the 3.4 GHz spectrum band for award via the PSSR auction. However, once the technical licence conditions have been finalised by our consultation process, we will seek to change the technical conditions of the UK Broadband licence to reflect our decisions. We note that UK Broadband could itself choose to request a change of licence conditions prior to the award in order to adopt the more permissive block edge mask, which would support synchronisation.

International coordination requirements

- 15.19 UK Broadband will be required to operate in compliance with any cross-border coordination to be agreed with our international neighbours. The coordination requirements are likely to be based on internationally agreed criteria and we anticipate making further details available in the PSSR award Information Memorandum.

3.4 GHz band national coordination requirements

- 15.20 Coordination requirements will be applied to the UK Broadband 3.4 GHz licence:
- Related to continued MOD use of spectrum around Bude in Cornwall;
 - Related to use for aeronautical radars.
- 15.21 MOD analysis of military navy radars and coexistence with proposed services in the adjacent spectrum is on-going. It is therefore not yet clear whether any additional restrictions may be necessary to protect these military services. We will, however, provide confirmation in advance of the PSSR award. Any coordination requirements will also be applied to the UK Broadband 3.4 GHz licence.

Consolidation of UK Broadband spectrum

- 15.22 Although we believe our decision to extend UK Broadband's licence provides the best overall outcome - when considered against the alternative of not extending the licence – we note there may still be potential for spectrum inefficiency costs to arise as a result of the non-contiguous nature of the frequencies.
- 15.23 We note that there may be opportunities to address this once the licence has been extended. One opportunity to avoid or reduce the additional spectrum costs we have identified is if UK Broadband and other operators are able to reach synchronisation agreements. As indicated elsewhere in this statement, we now consider this to be a likely outcome.
- 15.24 A further option for reducing any costs of spectrum inefficiencies is if UK Broadband were to relocate some or all of its spectrum to another part of the band i.e. into one contiguous block. Consolidation of the UK Broadband spectrum would capture the consumer benefits achieved from extending the licence whilst mitigating any remaining potential loss in spectrum efficiency arising from the existing non-

consolidated holding (but with costs incurred by UK Broadband to relocate to new frequencies). Consolidation would:

- make it easier to accommodate a range of different demands within the spectrum to be awarded, in particular the potential for larger contiguous assignments that could in turn give operators the flexibility to deploy larger channel sizes; and
- reduce the number of inter-operator frequency boundaries which results from the spectrum award process, thereby reducing the technical constraints arising from the need to manage a higher number of spectrum boundaries between licensees (although noting that synchronisation could also largely avoid this).

15.25 UK Broadband has told us it is willing to co-operate with any regulatory move to consolidate its spectrum holding ahead of the 3.4 GHz PSSR award. There are two other ways in which consolidation could be achieved:

- via a spectrum trade; or
- through the PSSR award itself.

15.26 Trading provides an opportunity to achieve contiguous spectrum after the award. The alternative to consolidation through trading is consolidation through the PSSR award itself. Alongside this statement, we will very shortly publish a consultation on proposals for the PSSR auction design. This will discuss further the prospects for consolidation of the UK Broadband spectrum through the auction process.

Annex 1

Glossary

Access Network - The part of a fixed telecommunications network that connects directly to customers from the local telephone exchange.

Airwave Solutions - a British mobile communication company that operates the Airwave Network, a mobile communications network used by Great Britain's emergency services. The Airwave network is based on the specialist Terrestrial Trunked Radio specification.

Annual Licence Fee (ALF) - This is a fee based on administered incentive pricing (AIP) charged to holders of spectrum licences to encourage them to make economically efficient use of their spectrum.

Backhaul – The use of wireless communications systems to get data from an end user to a node in a major network.

Assignment - Authorisation given by licensing authority (such as Ofcom) to use a specific radio frequency or channel under specified conditions.

Asymmetric Digital Subscriber Line (ADSL) - A digital technology that allows the local loop to send a large quantity of data in one direction and a lesser quantity in the other. See also DSL (Digital Subscriber Line).

Band - A recognised frequency range or a recognised group of frequency ranges where each range has a defined start and end frequency.

Bandwidth - This describes the maximum data transfer rate of a network or Internet connection. It measures how much data can be sent over a specific connection in a given amount of time. As well as referring to data, the term can also apply to spectrum bandwidth (i.e. the amount of spectrum in the channel).

Base station - A radio transmitter and receiver installed by an operator to provide a communications service.

Block Edge Mask (BEM) - A block edge mask is a transmitter spectrum mask that applies at the edge of a licensed block of spectrum and is designed to offer sufficient protection from interference to any anticipated receiving system in an adjacent frequency block. The emissions of all transmitters operating within a licensed block must comply with this block edge mask, regardless of the bandwidth of such transmitters.

British Sky Broadcasting Ltd (BskyB or Sky) - A UK based satellite broadcasting, broadband and telephone services company.

BT Group plc (BT) - A UK based multinational telecommunications services company.

European Conference of Postal and Telecommunications Administrations (CEPT) - The European Commission can mandate the European Conference on Postal and Telecommunications (CEPT) to carry out studies and other preparatory activities to harmonise the use of the radio spectrum in Europe (current membership stands at 48).

Charge controls – One approach by which charges to customers are capped, e.g. prices can raise by no more than the rate of inflation minus 'X' in each year.

Commission (EU) - The European Commission is the EU's executive body. The term 'Commission' refers to both the college of commissioners and the institution and its officials.

Communications Act - The Communications Act 2003, which came into force in December 2003.

Consumer surplus - The difference between the maximum price a consumer would be willing to pay for a good or service and the actual price they do pay.

Cost of Capital - See "weighted average cost of capital."

Downlink - The downlink part of a network connection on a mobile device is used to receive, or download, data to the mobile device from the base station. The uplink connection is used to send data from the mobile device back to the base station.

Digital Subscriber Line (DSL) - A family of technologies generically referred to as DSL, or xDSL, capable of transforming ordinary phone lines (also known as "twisted copper pairs") into high-speed digital lines, capable of supporting advanced services such as fast internet access and video-on-demand.

Duplex Mode - Both Frequency Division Duplex or Time Division Duplex are types of duplex made, see 'FDD' and 'TDD'.

Emergency Services Mobile Communications Programme (ESMCP) – A cross-government programme to deliver the next generation of communication systems to the emergency services and other public safety users.

Fixed Links - Communications links between fixed points. Such links may be unidirectional or bidirectional, and may be point-to-point or point-to-multipoint.

Fixed Satellite - A service between mobile earth stations and one or more space stations, possibly including feeder links in operation.

Frequency-Division Duplex (FDD) – Operations that require the outward and return signals to operate on different carrier frequencies.

Frequency Range - Any formally recognised division of the radio spectrum defined in terms of a start and end frequency (or centre frequency and bandwidth).

Fixed Wireless Access (FWA) - A wireless link to the home or the office from a cell site or base station.

Gigahertz (GHz) - A unit of frequency of one thousand million Hertz (cycles per second).

Global TD-LTE Initiative (GTI) - A virtual open platform to advocate co-operation among global operators to promote TD-LTE, formed to support early adoption of the technology and convergence of TD-LTE and LTE FDD.

Hong Kong Telecommunications Limited (HKT) - a telecommunications company and wholly owned subsidiary of Cable & Wireless.

Incremental costs – Those costs which are directly caused by the provision of a service in addition to the other services which the firm also produces. Another way of expressing this is that the incremental costs of a service are the difference between the total costs in a situation where the service is provided and the costs in another situation where the service is not provided.

International Telecommunications Union (ITU) - Global decision making body on some spectrum matters. Part of the United Nations with a membership of 193 countries and over 700 private-sector entities and academic institutions.

Licence - A formal authorisation under section 1 of the Wireless Telegraphy Act 1949 for a customer to use radio equipment under certain restrictions

Local loop – The access network connection between the customer's premises and the local serving exchange, usually comprised of two copper wires twisted together.

Local Loop Unbundling (LLU) – A process by which a dominant provider's local loops are physically disconnected from its network and connected to a competing provider's networks. This enables operators other than the incumbent to use the local loop to provide services directly to customers.

Long Term Evolution (LTE) – Part of the development of 4G mobile systems that started with 2G and 3G networks. Aims to achieve an upgraded version of 3G services having up to 100 Mbps downlink speeds and 50 Mbps uplink speeds.

Microwave Ethernet network - A family of computer networking technologies for local area networks (LANs) based on fixed wireless links.

Megahertz (MHz) - A unit of frequency of one million Hertz (cycles per second).

Ministry of Defence (MOD) – The British government department responsible for implementing defence policy. As part of this the MoD also holds spectrum.

Mobile Virtual Network Operator (MVNO) - An organisation that provides an electronic communications network that provides mobile services by purchasing the services of an existing network operator (or "MNO").

Not Spots - An area that has no broadband Internet, or no (or limited) mobile phone coverage.

Net Present Value (NPV) - The difference between the present value of cash inflows and the present value of cash outflows. NPV is used in capital budgeting to analyse the profitability of an investment or project.

Ofcom - The Office of Communications - Ofcom is the regulator for the UK communications industries, with responsibilities across television, radio, telecommunications and wireless communications services.

Opportunity Cost – The benefit foregone by not using a resource in its best alternative use.

Permanent Earth stations - A satellite earth station operating from a permanent, specified location to a satellite, normally one which is in geostationary orbit. It is typically used to provide telephony and data backhaul, broadcast feeder links, private corporate networks or satellite telecommand and control.

PCCW - UK Broadband's Hong Kong based parent company.

Permissive mask - Block edge masks specifying allowed emissions from a communications signal in the 3.4 GHz band when there is a bilateral agreement around network synchronisation in place between operators.

Philippine Long Distance Telephone Company (PLDT) - Leading telecommunications service provider in the Philippines. Provides the country's most extensive fixed line and cellular networks.

Public Sector Spectrum Release (PSSR) - A release programme for public sector held spectrum which includes MOD spectrum in the 2.3 and 3.4 GHz bands.

Rate of Return (RoR) - The ratio of money gained or lost (whether realised or unrealised) on an investment relative to the amount of money invested.

Radio Spectrum Committee (RSC) - A specialist EU body responsible for specific technical measures required to implement the broader Radio Spectrum Policy. The RSC is composed of Member State representatives and chaired by the European Commission.

Release 10 (3GPP Standards) – A 3GPP standard released in 2011 and covering LTE-Advanced definitions.

Remote Radio Unit (RRU) - A unit that contains the radio transceiver for a sector on a base station, it may also contain an inbuilt filter to meet Block Edge Mask (BEM) requirements.

Restrictive masks - Block edge masks specifying allowed emissions from a communications signal in the 3.4 GHz band when there is no bilateral agreement around network synchronisation in place.

Satellite Earth Stations - A transceiver at a particular location used for communicating by radio with a space satellite.

Significant Market Power (SMP) - The significant market power test is set out in European Directives. It is used by National Regulatory Authorities (NRAs), such as Ofcom, to identify those CPs which must meet additional obligations under the relevant Directives.

Softbank - A Japanese telecommunications and Internet corporation, with operations in broadband, fixed-line telecommunications, e-commerce, Internet, technology services, finance, media and marketing, and other businesses.

Superfast broadband – A broadband connection that can support a maximum download speed of 30Mbps or greater.

TalkTalk Telecom Group plc (TalkTalk) – A UK based company which provides pay television, telecommunications, internet access, and mobile network services.

Telefónica, S.A. – A Spanish broadband and telecommunications provider.

Third Generation/3G - Refers to the third generation of mobile telecommunications technology.

Time-Division Duplex (TDD) - Time-division duplexing is the application of time-division multiplexing to separate outward and return signals.

Time-division duplex-Code Division Multiple Access (TDD-CDMA) - This is a channel access method based on using spread spectrum multiple access (CDMA) across multiple time slots (TDMA).

Spectrum - A range of frequencies of electro-magnetic radiation (for example, radio waves)

Tradable - The ability to transfer the rights and obligations held by the licensee to a third party.

Technical Licence Conditions (TLCs) - A series of engineering and related conditions a spectrum licensee has to adhere to.

Third Generation Partnership Project (3GPP) - A group of six telecommunications standard development organizations (ARIB, ATIS, CCSA, ETSI, TTA, TTC) working on a definition of third generation mobile technologies.

UK Broadband Limited (UKB) - A UK based company provides wireless data capacity, equipment and services.

Uplink - The uplink part of a network connection is used to send, or upload, data from a mobile device to a base station. The downlink connection on a mobile device is used receive data from the base station.

Virgin Media Inc. (Virgin) – A company which provides fixed and mobile telephone, television and broadband internet services in the UK.

Weighted Average Cost of Capital (WACC) - The rate that a company is expected to pay on average to all its security holders to finance its assets.

Wholesale Local Access (WLA) - Covers fixed telecommunications infrastructure, specifically the physical connection between end users' premises and a local exchange.

Willingness to pay (WTP) - The maximum amount an individual would be willing to pay for a good or service.