

Orange response to Ofcom's consultation "Application of spectrum liberalisation and trading to the mobile sector, a further consultation", May 2009

1 Executive summary

1.1 Introduction

Orange welcomes the opportunity to respond to Ofcom's second consultation on the liberalisation and trading of 2G spectrum.

Orange has conducted an extensive review into Ofcom's latest proposal and has sought independent advice on the technical and legal issues that the proposal is predicated on. We have also instructed **[a well-respected independent consultancy firm with expertise in this particular field]** to review Ofcom's economic modelling approach (our summary copy of their analysis is enclosed in Appendix C). Orange agrees with Ofcom's view on the significant benefits that 900MHz affords for UMTS but firmly disagrees with Ofcom's overall recommendation on a release of only 2x5MHz of 900MHz by Vodafone and O2. Orange's view is based upon four key areas within the Ofcom consultation:

- The competitive imbalances inherent within the proposed solution
- The use of 800MHz spectrum as a viable alternative to 900MHz spectrum
- The draft amended GSM Directive and European Competition Law
- The Cost Benefit Analysis modelling approach.

These issues are summarised in more depth below.

Based on a robust review, Orange is clear that **[confidential]**

In addition, Orange has made clear its support for the Government's objectives of achieving a universal broadband service by 2012 as part of Digital Britain. In order to deliver these objectives, Orange **[confidential]**

1.2 Benefits of 900MHz spectrum are clear

As Ofcom recognised in its previous consultation¹, 900MHz spectrum delivers significant advantages in terms of rural and in-building coverage. Ofcom's own analysis suggests that a reasonably conservative estimate of the cost saving per operator of using 900 MHz compared to 2.1 GHz was in the order of £1bn in the case of deployment in densely populated areas and £250m in rural areas, giving a total potential cost saving per operator of £1.25bn.

Ofcom's current proposal to release only one block of 900 MHz spectrum potentially allows only one additional mobile operator access to 900 MHz spectrum, costing any such operator without access to 900 MHz spectrum, using Ofcom's own figures above, an additional £1.25bn to maintain a similar level of service. This would create a significant competitive distortion in the mobile market.

¹ 'Application of spectrum liberalisation and trading to the mobile sector', November 2007

1.3 The key failings of the Ofcom approach

It is clear to Orange that Ofcom's proposal is deficient in four main areas. These are summarised below:

1.3.1 The inherent competition imbalance assumed in the analysis

Examination of the competition impacts inherent in Ofcom's approach highlight the flaws. In its approach, Ofcom effectively assumes that the first and only block of spectrum will be allocated to spectrum sharers. Ofcom states that this assumption is made partly "to ensure that the net benefits analysis is consistent with its quantitative modelling²". From Ofcom's assumption that there are three non-incumbent 900MHz operators and that two of these are assumed to share spectrum, it naturally follows that, **[confidential]** These assumptions result in a concentration of welfare benefits in the first released block, biasing the analysis in favour of the policy option of the release of just a single block. Furthermore these assumptions imply **[confidential]**. It is also worthy of note that were Ofcom to adopt a similar assumption with respect to Vodafone and O2, ie that they share spectrum, the release costs would be substantially reduced and **[confidential]** as more favourable than Ofcom's proposal to release only a single block.

1.3.2 The use of 800 MHz spectrum as a viable alternative to 900 MHz spectrum

Ofcom's view is that those operators that do not get access to 900 MHz spectrum will be able to bid and replace it with 800 MHz spectrum as a viable alternative. This view is misguided. As this response will detail, the timing of the availability of 800 MHz spectrum and LTE 800 equipment is such that Vodafone and O2 will secure **[confidential]** over other operators by capturing immediately the enhanced cost and coverage benefits afforded by UMTS900. Added to this, the substantially lower business risk afforded to Vodafone and O2 by allowing them to retain the valuable low-frequency 900 MHz spectrum rather than be subject to the uncertainty of a future auction will further distort the competitive market in the UK.

Ofcom has already assumed that 800 MHz spectrum will not be ready for use until end 2012 at the earliest, and **[confidential]**. In addition, **[confidential]**. It is entirely feasible however that Vodafone and O2 could already be enabling their networks for 900 MHz now and be in a position to switch on a UMTS 900 network **[confidential]**. The functionality and benefits of the 900 MHz spectrum are well established, whilst those of the 800 MHz spectrum are not yet clear.

1.3.3 The draft amended GSM Directive and EU competition law

Orange has sought legal opinion on Ofcom's proposals contained within this latest consultation and it is clear from this opinion that Ofcom's reforming proposal is contrary to European Law; **[confidential]**. These points are summarised below:

[confidential]

² Paragraph 5.67 of the Ofcom consultation

1.3.4 Approach within the Cost Benefit Analysis model

The Ofcom proposal to release 2x5 MHz of 900 MHz spectrum is based upon a cost benefit modelling approach that calculates the net social welfare benefits for the UK economy for a variety of different scenarios and spectrum release options. By balancing the competitive benefits derived from a broader distribution of 900 MHz spectrum against the costs to Vodafone and O2 of releasing that spectrum, Ofcom calculates that a 2x5 MHz release is the optimum. Whilst Orange agrees that a cost benefit modelling approach is the appropriate means to calculate the optimum quantity of spectrum that is released, we firmly disagree with some of the key assumptions that are used within the model.

Ofcom's choice of assumptions systematically biases the analysis in favour of its proposal and against options of the release of more blocks, but in many cases the assumptions are not supported by evidence. For example, Ofcom uses a price elasticity figure of -1.0 in this consultation whereas it has in the past consistently used lower figures³. We propose instead to use a figure **[confidential]** (the main body of this report contains further details on this and other omissions). Using a more balanced and supportable assumptions set would lead to a policy choice **[confidential]**, as each of these options generates considerably more net social welfare than Ofcom's proposal of **[confidential]**. Further, it is clear that some of the assumptions are subject to a high degree of uncertainty and that varying these assumptions within a reasonable range leads to policy options of **[confidential]** generating greater welfare than **[confidential]**.

In short, Ofcom's model and analysis do not support its policy choice of a 1 block release but does support a policy **[confidential]**.

1.4 Summary and conclusions

In summary, Orange believes that, for the reasons stated above, Ofcom's proposal does not address the underlying competitive disadvantages to Orange arising from an unbalanced distribution of 900 MHz spectrum. Vodafone and O2 will have increased 3G capacity with better in-building coverage **[confidential]**. This will enable them to build brand awareness as a result of improved communication, marketing and advertising campaigns highlighting their superior quality of service. Increased brand awareness and advertising will increase market share, hence profitability, particularly as the mobile market has high fixed costs and high capex spend. A virtuous circle will ensue of increased profitability for 900 MHz mobile operators, allowing them to spend more on customer acquisition, communication and promotion, creating an increased market share, and hence more profitability.

As part of the Orange's response to the interim Digital Britain objectives, Orange has made its support clear. Orange has also stated that **[confidential]**

In conclusion, **[confidential]**.

³ Ofcom's 2007 statement on mobile termination uses a price elasticity of -0.3 for mobile subscription, referring to a study by Dr Rohlf's used by the CC in 2002 and used again by Ofcom/Oftel in 2004. Although this only refers to mobile voice, mobile voice forms a significant part of the relevant market under consideration here.

Orange considers that Ofcom's proposal is economically and legally flawed, anti-competitive and discriminatory and firmly requests that Ofcom reconsiders its proposal in light of the serious errors and omissions identified above.

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2. Orange views on Ofcom proposal

- **Ofcom's latest proposal, to release one block (2x5 MHz) of 900 MHz spectrum is significantly at odds with its previous proposal for three blocks (2x15 MHz) of 900 MHz spectrum to be released by Vodafone and O2.**
- **Orange believes that this proposal fails to resolve adequately the competition issues and potentially leads to the very real possibility of discrimination against Orange.**
- **Orange believes that the only way for Ofcom to deliver a competitively balanced proposal is [confidential] by the existing mobile operators.**

Orange welcomes the opportunity to respond to Ofcom's second consultation on the liberalisation and trading of 2G spectrum. Orange has previously responded to Ofcom's initial consultation 'Application of spectrum liberalisation and trading to the mobile sector' November 2007.

Orange is a key brand of the France Telecom Group, one of the world's leading telecommunications operators with more than 182 million customers on five continents.

At the end of December 2008, Orange had about 17 million customers in the UK – 15.9 million active mobile customers (it provides high-quality GSM coverage to 99% of the UK population) and over one million fixed-line broadband customers (providing services both over its own LLU network and on BT's network).

2.1 Summary of the Ofcom proposal regarding the reallocation of 900 MHz spectrum

In its consultation, Ofcom proposes that the regulatory solution would comprise the following key steps to address potential distortions of competition and facilitate the efficient use of 900 MHz, 1800 MHz, and also licence extension for the 2.1 GHz, spectrum bands for the provision of mobile services, for the benefit of UK consumers⁴.

The issue of most concern to Orange from a public policy perspective is that of the re-allocation of 900MHz spectrum and we consider it in detail in this response.

Ofcom's main proposals in relation to 900 MHz spectrum are:

- to require the incumbent holders of 900 MHz spectrum (O2 and Vodafone) to release one block of spectrum (2x5 MHz) between them to Ofcom, which would be awarded to the market. Ofcom proposes giving two years' notice of the requirement to release, e.g. release in 2011 following a decision in 2009;
- to re-award the released spectrum using an auction, in which Vodafone and O2 are prohibited from bidding;
- for the 900 MHz spectrum retained by the incumbents to be liberalised and made tradable (subject to a competition review) as soon as practicable following Ofcom's

⁴ Paragraph 1.8 of the Ofcom consultation

final decision. The licences to be varied to clarify that they are indefinite but subject to five years' notice of revocation for spectrum management reasons; and

- to revise the level of AIP payable on 900 MHz spectrum as close as possible to the time of liberalisation.

From the Ofcom consultation and from meetings held⁵, it is our understanding that the final proposal has been predicated extensively on (i) the cost and difficulty of release of 900 MHz spectrum, and (ii) the availability of 800 MHz spectrum by 2013 and equipment by 2012. We instructed **[a well-respected independent consultancy firm with expertise in this particular field]** to review Ofcom's economic modelling approach (our summary copy of their analysis is enclosed).

Appropriate consideration⁶ of these points both individually, and taken together, leads one to the conclusion that Ofcom's proposed policy conclusions and underlying analysis should be rejected as economically and legally unsound and harmful to competition in the mobile sector, to the ultimate detriment of end users. In addition, we believe that further serious consideration needs to be given **[confidential]**.

[confidential] by assuming that the option which meets the objectives to (i) promote competition and (ii) secure the optimal use of spectrum would also meet Ofcom's overarching duty to further the interests of consumers and citizens⁷.

2.2 Details of the Ofcom analysis of the 1800 MHz spectrum

We agree with the analysis regarding the liberalisation of 1800 MHz spectrum. As Ofcom concludes, the holding of 1800 MHz spectrum is unlikely to bestow a significant competitive advantage on the current holders in the near future (and there is considerable uncertainty about whether it might do so even in the longer term). Therefore intervention is not necessary to address a potential distortion of competition⁸. **[confidential]**.

We therefore believe that the competitive advantage afforded to Vodafone and O2 under these current proposals will not be offset by liberalisation of the 1800 MHz spectrum.

Therefore, without Orange having access to 900 MHz spectrum to rollout rural and urban high data rate services, Orange will be at a severe competitive disadvantage.

2.3 Ofcom proposals regarding Administered Incentive Pricing (AIP)

We note that Ofcom will publish further details of its intended approach to the review of AIP for 900 MHz and 1800 MHz spectrum bands in due course⁹. Orange intends to fully engage with the proposed stakeholder debate on the appropriate level of AIP to be applied to the 900 MHz and the 1800 MHz spectrum.

2.4 BERR proposal (as a result of Digital Britain discussions)

⁵ 4 March 2009, 16 March 2009, 16 March 2009

⁶ Section 7 and Appendix C of submission

⁷ Paragraph 2.35 of the Ofcom consultation

⁸ Paragraph 6.37 of the Ofcom consultation

⁹ Paragraph 8.37 of the Ofcom consultation

Finally, at the time of submission, the BERR proposal, as a result of Digital Britain and Independent Spectrum Broker discussion, has not stabilised. Obviously, there would be more value from all participants in submitting a response in the full knowledge of the alternative. To this end, we reserve our right to submit further amendments or information at a later date.

3. [confidential] in a universal broadband Digital Britain

- **Orange has committed to extending its broadband mobile network to deliver universal service of 2 Mbps at its own cost, provided it is allocated a minimum of 2x5 MHz contiguous clean 900 MHz spectrum within the framework of an equitable refarming solution for the industry.**
- **Due to the delayed timing of the 800 MHz spectrum, access to 800 MHz spectrum alone would not allow Orange to deliver the Government's vision of Digital Britain by 2012.**

The Interim Report on Digital Britain demonstrates that the Government's overall ambition is to ensure digital communications are upgraded to meet the demands of a modern economy and provide benefits to all. Orange has the same ambition – to deliver services to consumers in the UK wherever they are, whenever they want, however they choose. With this in mind, the Government proposes five objectives: upgrading and modernising digital networks; a dynamic investment climate; high quality content; universal availability to enable near-universal economic and social participation and the on-line delivery of public services and business with the Government. The Government vision is for universal connectivity of 2Mbps by 2012. This view has been reinforced in the recent budget announcements which have approved funding of £100m to a 'Digital Region', led by Yorkshire Forward, which will roll out next generation broadband across the South Yorkshire region, stimulating economic activity through high-speed connectivity¹⁰.

Orange's recent submission¹¹ to BERR's Interim Digital Britain report commits to the provision of a universal broadband service of 2 MBps at its own expense, contingent on access to 2x5 MHz contiguous 900 MHz spectrum¹². Without access to 900 MHz spectrum, Orange will be prevented from honouring this commitment and consumers will have less choice. Vodafone and O2 would therefore be the only mobile operators able to contribute to a Digital Britain broadband service by 2012, allowing them a huge competitive first mover advantage. They will be able to determine where and when such a network is rolled out. **[confidential]**

Orange supports the Government's Digital Britain vision and, as one of the biggest fixed and wireless network providers in the UK and a significant investor in the British economy, Orange has the ability and desire to play a major part in achieving all of these objectives. However, this will require significant levels of investment and the Government will need to foster an environment that allows such investment by creating a level playing field and appropriate regulatory and competitive conditions. The current Ofcom proposal does not enable the Government's vision.

A significant market distortion is created by the historic inequality in the allocation of spectrum. Without a fair redistribution, there will never be a level playing field and universal connectivity and the benefits that go with this cannot be achieved.

The lower frequency 900 MHz UMTS band must be reallocated so that its ability to provide greater coverage and greater indoor data levels can be used to achieve the key

¹⁰ http://www.hm-treasury.gov.uk/bud_bud09_repindex.htm

¹¹ http://www.culture.gov.uk/images/publications/OrangeUK__DBIRResponse.pdf

¹² As defined by the BERR working group led by Peter Black (as defined in document "20090404 Inaugural Broadband USC Technical Group – MNO Modelling.doc" published 03/03/2009)

Digital Britain objectives. Unless the 900 MHz band is shared more equitably between mobile network operators, those without it will be unable to compete effectively on either differentiation or cost. .

As discussed above, the availability of the 800 MHz spectrum band is potentially positive, but cannot be compared with the confirmed benefits of the 900 MHz band. While the 900 MHz band is already being used (with the potential for re-use), the 800 MHz will be not be ready **[confidential]** and so cannot be realistically considered as part of a package to achieve universal connectivity. Such a situation means that the 900 MHz band needs to be reallocated fairly, and quickly.

We will discuss the delayed timing, **[confidential]**, of the 800 MHz spectrum and lack of mass market penetration **[confidential]** later in this response. Access to the 800 MHz spectrum, which will be **[confidential]**, the Government's proposed date for Digital Britain, will not enable Orange to deliver the Government's vision.

4 The competitive imbalances inherent within the proposed solution

- Ofcom's proposal is discriminatory and seriously damaging to competition.
- In 2008, the total market service revenue was [confidential], with an average EBITDA/ service revenue ratio in excess of [confidential]¹³. A loss of total [confidential] of market share for an operator over 4 years would equate in aggregate to [confidential] service revenue and [confidential] EBITDA. It is conceivable that a shift of [confidential] of market share to Vodafone and O2 could easily happen, which would be equivalent to [confidential] EBITDA. Since the market share will take many years to regain, if ever, the advantage to Vodafone and O2 will be much more than [confidential] EBITDA over four years.
- Orange believes that it should take no longer than [confidential] Vodafone and O2 to release two blocks (2x10 MHz) contiguous clean 900 MHz spectrum to Ofcom for redistribution using a combination of proven techniques.
- [confidential]

As Ofcom recognised in its previous consultation¹⁴, 900 MHz spectrum delivers significant advantages in terms of rural and in-building coverage compared to the 1800 MHz spectrum. Ofcom's own analysis suggests that a reasonably conservative estimate of the cost saving per operator of using 900 MHz compared to 2.1 GHz was in the order of £1bn in the case of deployment in densely populated areas and £250m in rural areas, giving a total potential cost saving per operator of £1.25bn.

Ofcom's current proposal to release one block of 900 MHz spectrum potentially allows only one mobile operator access to 900 MHz spectrum, costing any operator without access to 900 MHz spectrum, using Ofcom's figures above, an additional £1.25bn to maintain a similar level of service. This would create a significant competitive distortion in the mobile market.

Implementation of the proposal will cause irreparable damage to competition in the mobile telecommunications sector in the UK. It will create a two-tier structure that permanently favours Vodafone and O2 and permanently impedes the ability of Orange to compete in the relevant markets.

4.1 Benefits of 900 MHz spectrum

For Ofcom to suggest that it is willing to sacrifice the competitive position of two mobile operators who do not have access to 900 MHz spectrum for the benefit of those who have access to 900 MHz spectrum, is untenable and will significantly deter investment in this sector in the future.

As we will discuss, 800 MHz spectrum will not be ready [confidential]. UMTS 900 equipment already exists. Vodafone and O2 could already be enabling their networks to deploy UMTS 900 and could be in a position to switch on a UMTS 900 network by the end of 2009 as the functionality and benefits of UMTS 900 spectrum are well tested. [confidential]

¹³ Taken from latest published UK operator accounts

¹⁴ 'Application of spectrum liberalisation and trading to the mobile sector', November 2007

The indisputable facts outlined above lead to a formidable sustainable competitive advantage. Vodafone and O2 will have increased 3G capacity, better in-building coverage and will be able to benefit from the lead time for 800 MHz spectrum to build brand awareness as a result of improved communication, marketing and advertising campaigns highlighting their superior quality of service. Increased brand awareness and advertising will increase market share (the fundamental basis of sustainable competitive advantage), hence profitability, particularly as the mobile market has high fixed costs and high capex spend. In addition, Vodafone and O2 will be able to provide international roaming using UMTS 900, which will not be possible with LTE 800 until spectrum and equipment is harmonised.

This will create a virtuous circle of increased profitability for 900 MHz mobile operators, allowing them to spend more on customer acquisition, communication and promotion, creating an increased market share, hence more profitability and continued (sustainable) competitive advantage.

Current market trends **[confidential]** will exacerbate the competitive advantage of Vodafone and O2, as they will be able to lock-in increased market share **[confidential]**. In our view, the first mover advantages resulting from the ability to rollout UMTS 900 for Vodafone and O2 could impact on **[confidential]**.

The expected delay in the development of LTE 800 will also mean the range of UMTS 900 devices will be more advanced, with greater choice at a lower cost than those of LTE 800.

In the meantime, the additional data capacity enjoyed by Vodafone and O2, as a result of deploying UMTS 900, **[confidential]**.

In 2008, the total market service revenue was **[confidential]**, with an average EBITDA/ service revenue ratio in excess of **[confidential]**. Therefore, a loss of **[confidential]**.

4.2 The impact on competition of pursuing Ofcom's current proposals

A key element of Ofcom's proposals is for liberalisation of 900 MHz spectrum to take place two years in advance of its release to the market. This is a policy change from the September 2007 consultation, which proposed that the 900 MHz spectrum retained by the current licence holders should not be liberalised until any spectrum that they have been required to release is available for use by the acquiring operator(s). Ofcom states in the current consultation that:

*'This was intended to ensure that the incumbent holders of 900 MHz spectrum did not gain a competitive advantage, relative to the acquirer(s), through being able to deploy new technology in the 900 MHz band earlier.'*¹⁵

Orange considers that Ofcom has erroneously made a policy switch on this issue, as it fails to appreciate the market significance of the interim period between liberalisation and release. Ofcom merely asserts, without evidence, that the harm to competition would be minimal:

'If the effect on competition of such earlier access were to be enduring, then we might consider the cost of delay, in the form of lost benefits to consumers, to be worthwhile, in order to ensure that the longer-term benefits of competition were

¹⁵ Paragraph 8.43 of the Ofcom consultation

maximised. In the current situation, however, we consider it unlikely that a short delay in the availability of the released spectrum, relative to the liberalisation of the retained spectrum, would have a significant and enduring impact on competition; the period of time during which the existing licensees would, in practice, be able to offer enhanced services in advance of any acquirer is, we believe, too short to be significant¹⁶.

Orange submits that Ofcom's proposal is discriminatory and seriously damaging to competition, in that it offers a timing and cost advantage to Vodafone and O2. As recognised by Ofcom, and discussed above, 900MHz spectrum is a resource of fundamental value to mobile operators and Ofcom's proposal to allocate liberalised 900MHz spectrum with immediate effect (and with no allocation fee) to Vodafone and O2 provides a clear advantage to these operators and a clear disadvantage to other operators **[confidential]**.

To the extent that the 900MHz spectrum is of fundamental value to the industry, Ofcom's proposal has the effect of selecting Vodafone and O2 as winners in the industry in place of a market mechanism. In contrast, a fair approach to spectrum refarming is better seen as simply a reversal of a previous misallocation of resources, from which Vodafone and O2 have hitherto derived unfair competitive advantage. This unfair competitive advantage will only be continued and compounded going forward were Ofcom's proposal to a) liberalise 900 MHz in advance of its reallocation and b) reallocate only one block of spectrum implemented.

Orange also notes that its argument **[confidential]** is not inconsistent with its separate position that re-farming of 1800 MHz spectrum be allowed immediately. This is not self-serving, but rather reflects the acknowledged relative value of 1800 MHz versus 900 MHz spectrum – i.e., liberalising the lower value 1800 MHz immediately does not lead to market distortion and competitive disadvantage. Moreover, each MNO has access to and utilises 1800 MHz, and thus liberalisation of this band is competitively neutral. In any event, the issue of sequentiality of liberalisation and mandatory release do not arise in the case of 1800 MHz, since the latter policy is not being proposed in respect of this band.

Orange does not believe that the current Ofcom proposal resolves the refarming issue. A release of only one block of 900 MHz spectrum means that two operators out the current five mobile operators will not have access to 900 MHz spectrum. Without access to 900 MHz spectrum, Orange will be seriously disadvantaged in competing effectively in the market.

Allowing Vodafone and O2 to retain and refarm their existing 900 MHz spectrum is not only a failure to use the spectrum efficiently, but also confers on them a substantial competitive advantage, **[confidential]**. They will benefit from first mover advantages in the supply of mobile broadband services and a spectrum band that allows them to provide better services overall than their competitors.

Implementation of the proposal will cause irreparable damage to competition in the mobile telecommunications sector in the UK. It will create a two-tier structure that permanently favours Vodafone and O2 and permanently impedes the ability of Orange to compete in the relevant markets.

¹⁶ Paragraph 8.45 of the Ofcom consultation

4.3 Orange's experience of refarming 900 MHz spectrum

Orange has mobile operations in many countries in Europe. In a number of these countries we have already started to gain experience of liberalising our 900 MHz spectrum **[confidential]**. Additionally, Orange has carried out **[confidential]**.

Based on comparison with other Vodafone and O2 country operations, it can be seen that both 900 MHz operators in the UK are both operating networks with a higher benchmark of total spectrum holdings per subscriber¹⁷. **[confidential]**

[confidential]

However, it is clear that stakeholders have different views regarding the ease and timing of liberalisation and refarming 900 MHz spectrum. To this end, we suggest that Ofcom holds a stakeholder workshop to seek consensus on fundamental assumptions (as it has done for other key policy decisions).

¹⁷ Taken from published GSM data

5. The use of 800 MHz spectrum as a viable alternative to 900 MHz spectrum

- Orange sees the role of the 800 MHz spectrum as an opportunity to enable access to a similar amount of low frequency spectrum amongst all operators in time, but [confidential]
- Orange insists [confidential]
- Convening stakeholder workshops on (i) the costs and timing of refarming and (ii) the timetable for the development and implementation of LTE 800 will assist in reaching consensus across the industry

Ofcom's view is that those operators that do not get access to 900 MHz spectrum will be able to bid and replace it with 800 MHz spectrum as a viable alternative is misplaced. As this report will detail, [confidential]. Added to this, the substantially lower business risk afforded to Vodafone and O2 by allowing them to retain the valuable low-frequency 900MHz spectrum rather than be subject to the uncertainty of a future auction will further distort the competitive market in the UK.

Ofcom has already assumed that 800 MHz spectrum will not be ready for use until end 2012 at the earliest, and allocation may not in fact be complete until the end of 2013. [confidential].

There are issues with 800 MHz spectrum from a competition and commercial perspective that must be taken into consideration. These include the availability and harmonisation of spectrum and also the timing of availability of equipment for mass market deployment.

5.1 Release of 800 MHz spectrum

Ofcom discusses the availability of 800 MHz spectrum¹⁸ in its consultation document. Ofcom makes the mistaken presumption that because 800 MHz spectrum has similar characteristics to 900 MHz spectrum; it serves as an alternative to 900 MHz. From a purely propagation perspective the characteristics of 900 MHz and 800 MHz spectrum have been regarded as similar. However, based on recent band-plan discussions at CEPT, there may be a 1dB degradation for 800 MHz as compared to 900 MHz spectrum (based on the 11 MHz duplex spacing band-plan being recommended). [confidential].

In general, spectrum at 800 MHz will start to become available on a country by country basis from [confidential]. It is not mandated by the ITU or by the EC that this spectrum has to be used for mobile services; some national regulators have already stated that they intend to keep this spectrum purely for TV broadcasting. Other key countries have border coordination issues and will not be able to release the spectrum [confidential]. As a result, there is [confidential].

For the UK, when the analogue TV switchover completes in 2012, there are still likely to be delays in freeing the spectrum band associated with clearing PMSE. Ofcom has indicated that this process should complete sometime between the end of 2012 and the end of 2013, with a date towards the latter end most likely.

Ofcom has already assumed that 800 MHz spectrum will not be ready for use until end 2012 at the earliest, [confidential].

¹⁸ Section 4.3 to 4.6 of the Ofcom consultation

5.2 Availability of a technical ecosystem

UMTS 900 handsets and network equipment enabling high data rates for indoor services are already being rolled out across Europe, whereas, it is likely that LTE 800 will not be available widely until, **[confidential]**. To this end, Orange sees the role of the 800 MHz spectrum - in conjunction with the 900 MHz spectrum – as an opportunity to enable access to a similar amount of low frequency spectrum amongst all operators. To this end, Orange does not see it as a substitute for 900 MHz **[confidential]**.

[confidential] We believe that convening stakeholder workshops on (i) the costs and timing of refarming and (ii) the timetable for the development and implementation of LTE 800 will assist in reaching consensus across the industry.

5.3 Standardisation of LTE 800

Standardisation is one of the most important aspects to the success of any technology in a highly competitive market. Without standardisation the process of proprietary technology introduction is more risky for both vendors and operators due to issues with obsolescence and higher costs.

In contrast, a standardised technology carries less risk and naturally stimulates large market ecosystems which drive economies of scale and delivers lower costs to vendors, operators and customers. GSM 900 versus GSM 1800 and UMTS are excellent examples of this process. In the case of 790-862 MHz, we are currently in the early stages of standardisation in 3GPP.

5.4 **[confidential]**

Ofcom considers the timing of 800 MHz relative the 900 MHz in its consultation:

*‘There is also likely to be a material gap, of at least two to four years, between when consumers could start to benefit from high quality mobile broadband services using 900 MHz spectrum (around 2011 to 2012) and when the use and quality of services using 800 MHz spectrum, if deployed, could catch-up with 900 MHz services (around 2014-2015)’.*¹⁹

Firstly, we do not believe that Ofcom has taken account of the most likely scenario. **[confidential]**

¹⁹ Paragraph 4.6 of the Ofcom consultation

6. The draft amended GSM Directive and European Competition Law

- The proposal as it stands discriminates against Orange UK and offers Vodafone and O2 scope to secure a significant and sustainable competitive advantage which is directly at odds with the intentions of the draft amended GSM Directive and EC law

[confidential]

In substance, Ofcom argues that the simultaneous release of capacity (through auction) and liberalisation of capacity might entail a delay of six months in the availability to consumers of higher-quality mobile broadband services from the incumbent 900 MHz operators. Ofcom considers that such delay would carry significant costs for consumers. On the other hand, Ofcom considers that allowing the incumbents operators to effectively benefit from liberalisation before new entrants obtain access to 900 MHz through auctioning, would not have significant effects on competition. Ofcom does not quantify in exact terms the duration of the competitive advantage. However, it would appear that such duration will be at least six months **[confidential]**. Meanwhile, as Ofcom points out, broadband services are growing fast.

[confidential] These are described in more detail below.

[confidential]

7. The Cost Benefit Modelling approach

- **Orange considers that Ofcom's CBA which underpins its policy proposal is seriously flawed, hence undermining it as a basis for policy choice**
- **[confidential]**

In this section, we consider the general approach to the CBA as well as the appropriate model assumptions used by Ofcom.

The sections above have demonstrated that Ofcom has erred in respect of both the timing of and the incentive mechanism for spectrum release, to the detriment of sustainable competition. Orange submits that Ofcom has committed even more serious errors of policy and analysis in respect of the *amount* of spectrum to be reallocated. In particular, as demonstrated in this section, Orange considers that Ofcom's CBA which underpins its policy proposal is seriously flawed, hence undermining it as a basis for policy choice.

Ofcom's approach of modelling the issue of spectrum release by constructing a CBA, which comprises production and competition benefits offset by release costs, is a reasonable basis for assessing the merits of different policy options. However, there are shortcomings in both i) the overall approach to the CBA and ii) in several of the assumptions, which may potentially distort the policy decision.

7.1 Ofcom's overall approach to the CBA

In terms of Ofcom's overall approach to the CBA, Orange wishes to highlight four fundamental shortcomings:

- Firstly, Ofcom implicitly assumes that operators make commercial decisions based upon maximising total welfare;
- Secondly, Ofcom fails to take account of the distribution of value between operators. In particular, Ofcom's analysis is predicated on assumptions that suggest that **[confidential]** a non-RAN sharing non-900MHz incumbent is not viable. This risks becoming self-fulfilling as it leads to the selection of policy options that deny **[confidential]** the ability to compete;
- Thirdly, there is an inconsistent approach to sharing of spectrum which concentrates competition benefits in the first released block and increases costs of releasing further blocks; and
- Fourthly, Ofcom erroneously assumes 800MHz spectrum will be an effective substitute for 900MHz from 2015.

Orange strongly believes that Ofcom must revisit its approach to the CBA to take account of these fundamental considerations of how the mobile market really works. **[confidential]**

7.1.1 Ofcom implicitly assumes that operators make commercial decisions based upon maximising total welfare

As discussed throughout our submission, Orange disagrees with Ofcom **[confidential]**, which results from several flaws in the modelling of costs and benefits. Another flaw in this respect is how Ofcom's CBA models how commercial decisions are made. The various commercial decisions to be made by operators which drive and underpin Ofcom's analysis are implicitly assumed to be driven by maximisation of social welfare. That is, inherent within Ofcom's analysis is the implicit assumption that operators always make decisions consistent with maximising social welfare (i.e. there is no market failure, and there is always perfect alignment between operators' interests and the overall interests of consumers). It is this "no market failure" assumption that we are challenging here. Two examples of this are operators' choice of network deployment strategy²⁰ which will in fact be determined by operators' commercial considerations rather than social considerations, and the allocation of spectrum which Ofcom proposes to be determined by operator commercial decisions at an auction²¹ rather than by an ex officio allocation based upon maximising social welfare.

With regard to operators' choice of network deployment strategy in the case of failure to secure 900 MHz spectrum, i.e. whether or not to roll out more 2.1 GHz network as an interim measure until 800 MHz becomes available, the use of commercial metrics and a commercial cost of capital would result in **[confidential]**. The release of additional spectrum would therefore more likely increase competition (and increase the welfare benefits) than implied by Ofcom.

With regard to the decision by operators to acquire spectrum at the auction, for instance in Ofcom's Medium B Significance Scenario, it is likely that **[confidential]**.

Appropriately varying the implicit assumption in Ofcom's approach that operators make decisions based on maximising social welfare would lead to **[confidential]**.

7.1.2 Distribution of value between operators

Ofcom effectively assumes that the first and only block of spectrum will be allocated to spectrum sharers. Ofcom states that this assumption is made partly "*to ensure that the net benefits analysis is consistent with our quantitative modelling... The modelling work completed suggests that commercially agreed sharing (i.e. two RAN sharing operators) is a likely outcome as the benefits to sharing operators in our modelling work, and hence the willingness to pay for the released spectrum, is greater than the benefits to a single operator*²²."

From Ofcom's assumption that there are three non-incumbent 900MHz operators and that two of these are assumed to share spectrum, it naturally follows that, **[confidential]**. Ofcom's assumptions, in contrast, result in a concentration of welfare benefits in the first released block, biasing the analysis in favour of the policy option of the release of just a single block.

On the one hand, Ofcom ostensibly maintains that it is not being prescriptive of the outcome of an allocation, stating that "*the use of a sharing assumption does not imply*

²⁰ Paragraph 5.67 of the Ofcom consultation

²¹ Paragraph 1.8 of Ofcom the consultation

²² Paragraph 5.67 of the Ofcom consultation

that we think sharing is most likely, or most beneficial, merely that this is the appropriate assumption to use in our quantitative net benefits analysis²³.” However, in assessing the costs and benefits of policy options, Ofcom relies solely on the results of an allocation of the first block to spectrum sharers, thus implicitly ascribing a 100% probability to this outcome. Ofcom has therefore effectively biased the results by pre-supposing an outcome where spectrum sharers receive the allocation. A more appropriate approach would be to weight the probabilities of allocation outcomes occurring. This would have the effect of spreading the competition benefits over the first few blocks, rather than compressing them in the first block. Orange recognises Ofcom’s modelling simplification on this issue, however considers that Ofcom got the balance between simplicity and reality wrong.

Ofcom’s analysis also assumes that the injection to competition associated with the entry of spectrum sharers **[confidential]** is equivalent to two competitors. Orange has considerable reservations about this approach. First, such an assumption is made in the absence of evidence. Second, Orange refutes the notion that two spectrum sharers contribute the same degree of competitiveness as two stand-alone operators. **[confidential]**

In sum, Ofcom implicitly overstates the true *expected* addition to competition resulting from the release of the first block. **[confidential]**

7.1.3 Inconsistent approach to sharing of spectrum

Ofcom deals with the issue of spectrum sharing in an inconsistent fashion, **[confidential]**

7.1.4 800 MHz spectrum not effective substitute for 900

We have previously discussed why we believe that the spectrum and technology ecosystem for 800 MHz to support a mass market service will not be available **[confidential]**. A delay **[confidential]** would magnify the competition benefits of 900 MHz redistribution and increase the benefits of increasing **[confidential]**.

We believe that each of the above factors creates at least significant uncertainty regarding whether Ofcom has proposed the appropriate policy option, and together support the conclusion that the appropriate policy option **[confidential]**.

7.2 Critique of model assumptions used by Ofcom in its CBA

The following section considers the ingredients of two of the three components²⁴ of the CBA welfare calculation, namely:

1. costs of releasing spectrum, and
2. The benefits of competition, derived using a Cournot competition model

For each of these component we:

²³ Paragraph 5.67 of the Ofcom consultation

²⁴ We do not further comment on the third component – namely, the productive efficiency benefit of allocating 900MHz spectrum to an operator that would otherwise have deployed a higher cost 2.1GHz network – since Orange is broadly in agreement with Ofcom’s analysis on this issue.

- a. critique Ofcom's key assumptions, and
- b. perform sensitivity analyses on these assumptions in order to explore the effect of varying these assumptions on the CBA results and, ultimately, the policy choice.

This section provides an overview of this analysis. More detail is included in Appendix C (Critique and sensitivity analysis of model assumptions used by Ofcom in its CBA).

Our conclusion, in summary, is that the assumptions employed by Ofcom in its CBA together systematically underestimate the net welfare gains associated with the introduction of a second block of spectrum.

7.2.1 Cost of release

In Ofcom's model, the cost of release is calculated as the cost of clearing spectrum over and above the cost of first clearing spectrum for Vodafone and O2's own use.

One of the driving assumptions of the cost of clearance is the volume of traffic on the network. In the base case, Ofcom assumes that 2G traffic in 2011 will be 110% of the level it was in 2007²⁵. **[confidential]**

We therefore suggest a prudent assumption of **[confidential]** of 2007 traffic levels (against Ofcom's 110%). **[confidential]** In our view, Ofcom's use of 110% of 2007 traffic levels to estimate 2G 2011 traffic levels systematically overstates the cost of releasing more blocks of spectrum, which, in turn, will reduce the net benefits of block release, and thus tend to bias the results against the release of more blocks. We substantiate this view by carrying out sensitivity analysis, which is included in Appendix C.

7.2.2 Cost of future clearance

In the detail of the Annexes, Ofcom reveals a further clearance cost that has a significant impact on the policy choice. In particular, Annex 7 highlights a significant additional cost which is included in the total net welfare benefit calculation but not otherwise mentioned in the main consultation document. This "Increased cost of future clearance" relates to the cost to Vodafone and O2 of clearing an additional two blocks in 2015 (available 1st Jan 2015), for either 3G capacity or LTE.

Calculating the cost of full release of 900 MHz and 1800 MHz in the case of 2011, Ofcom considers the only viable option for dealing with displaced 2G traffic would be 2.1 GHz widening (i.e. building out additional 2.1 GHz infrastructure to carry this traffic as necessary). Given that the other approaches involve the very 900 MHz and 1800 MHz spectrum that they are trying to clear, Orange agrees this is a reasonable approach in 2011.

However, Ofcom carries forward this assumption (about the only viable option) for its calculation of the cost of full clearance in 2015:

²⁵ Paragraph A16.61 of the Ofcom consultation

'In order to estimate the cost of full clearance and release of 900 MHz and 1800 MHz spectrum the only viable approach would be to carry all 2G traffic on the operators' 3G networks at 2.1 GHz (and accelerating handset migration). To calculate this cost we have used the UMTS2100 widening element from approach 1 (including building out additional sites outside the 80% 3G coverage area and adding additional UMTS2100 sites inside this area)²⁶.'

Orange considers that the cost assumption for the cost of future clearance in Ofcom's base case is very high and does not reflect the likely true cost of clearance in 2015. This is driven by the fact that **[confidential]**. In this regard, by 2014 both Vodafone and O2 would have 3G 900 MHz coverage, and the majority of handsets would be 3G 900 MHz compatible.

We suggest that a more reasonable assumption would be that there would be no significant costs of future clearance. Furthermore, we note that where Vodafone and O2 share spectrum (as is assumed for T-Mobile and H3G) **[confidential]**.

The results of this analysis are included in Appendix C. The basic result is that Ofcom's assumption regarding the cost of future clearance is again likely to overstate costs of clearance and thus understate the net benefits of releasing blocks of spectrum.

7.2.3 Benefits from competition

Ofcom uses a Cournot model to calculate the welfare benefit from the increase in number of operators resulting from the release of more spectrum. The use of a Cournot model for this purpose is subject to some debate between regulators and operators, and was widely commented on in response to the September 2007 consultation. Ofcom has reiterated that it believes that such a model is the most appropriate way of estimating welfare benefits from increased competition.

A Cournot model has its limitations, but its use by Ofcom is now established, so rather than considering the arguments for and against the use of a Cournot model per se, we focus on Ofcom's use of it in relation to this consultation: the assumptions used, and the sensitivity of the choice of policy option to variations in the assumptions.

Orange's primary observation, and criticism, of Ofcom's model of competition benefits is that the model is very sensitive to inputs that are subject to a high degree of uncertainty to the extent that policy choice is dependent upon which assumptions from a reasonable range are used in the model. This is demonstrated by Ofcom's own sensitivity analysis that it presents in the consultation document, and confirmed by Orange's own modelling

The key issues which may impact the policy choice are set out below. Further explanation and evidence, as well as sensitivity analysis, is provided in Appendix C.

- **Approach to spectrum sharing:** In Ofcom's analysis the mapping of released spectrum blocks onto competitors does not result in an increase in competitors on a one-to-one basis: the first block released is assumed to be allocated to the spectrum-sharers who both benefit from the single block. In the High Significance Scenario, where operators do not participate in the market unless they have 900 MHz spectrum, the allocation of this first block

²⁶ Annex 16.296 of Ofcom consultation

increases the number of competitors by two so benefits are concentrated in the release of the first block. We address this in our sensitivity analysis by modelling separately the impact if spectrum is not shared from the scenario where it is shared.

- **Size of the market:** The relevant market is set at an arbitrary and low 25% of the total mobile market.²⁷
- **Price elasticity of demand is set to -1.0** in the base²⁸, which we believe is an overly high elasticity (sensitivity to price) for the relevant market. In the past Ofcom has consistently used lower figures. We propose instead to use a figure of **[confidential]**.
- **800 MHz:** assumed to be an effective substitute for 900 MHz three years following the release of 900 MHz spectrum²⁹. **[confidential]**
- **Marginal cost:** Arising out of a modelling simplification, the marginal cost is not independent of, and increases with, the number of operators³⁰.
- **Demand curves:** The model has two demand curve variants: linear demand and non-linear demand. Ofcom uses and relies primarily on the linear demand curve in its analysis³¹, whereas it is appropriate to accord at least equal weight to the non-linear variant.

²⁷ Paragraph A9.29 of the Ofcom consultation

²⁸ Paragraph A9.38 of the Ofcom consultation

²⁹ Paragraph A9.18 of the Ofcom consultation

³⁰ Paragraph A9.31 of the Ofcom consultation

³¹ Paragraph A9.38 of the Ofcom consultation

Summary Orange's critique of assumptions used in Ofcom's CBA

Parameter	Ofcom assumption	Key deficiencies and argument for change	Alternative assumption	Impact of alternative
Allocation of first block	To the spectrum-sharers [confidential]	Competition benefits are concentrated in the release of the first block. [confidential]	Model separately the impact if spectrum is not shared from the scenario where it is shared.	Increases welfare gains of facilitating more entry
Size of the relevant market	25%	The relevant market is set at an arbitrary and low 25% of the total mobile market. True size of affected market is large, given the proportion of the total market that would not be accessible if an operator, unlike other operators, did not offer mobile broadband.	[confidential]	Increased welfare gains from releasing more blocks and facilitating more entry.
Price elasticity of demand	-1.0	Too high, given benchmarks closer [confidential]	[confidential]	Use of [confidential] instead of -1.0 yields additional welfare gains of moving to 3, 4, and 5 players
800MHz is effective substitute by certain year	2013	Unrealistic and overstates expected role of 800 MHz	[confidential]	Taking account of the delay increases the welfare gain from increasing the number of operators.

Parameter	Ofcom assumption	Key deficiencies and argument for change	Alternative assumption	Impact of alternative
Marginal cost	Marginal cost, by operation of the Cournot model, is dependent on, and increases with, the number of operators,	Not reflective of reality; MC more likely to be independent of the number of operators.	Adopt a manual input of marginal cost.	Increase in the welfare impact of increasing competitors
Linear vs non-linear demand curve variants	Ofcom places primary weight on results of CBA using linear demand curve	Ofcom does not provide adequate justification for this choice. Non-linear demand functions have more theoretical appeal, in that they better model consumer preferences and behaviour.	Orange would expect that at least an equal weighting would be applied to the results of the non-linear variant in making policy decisions	Welfare gains of increasing competitors are significantly greater with the use of a non-linear demand curve as compared with the linear variant, with a two block release yielding the greatest gains
Cost of release of spectrum driven by level of 2G traffic in 2011, estimated by %age of level of traffic in 2007	110%	Ofcom's assumption of 110% of 2007 levels is substantially higher than that implied by analysis of independent projections.	Adopt a prudent assumption that traffic will be at [confidential] .	Use of lower estimate of 2G traffic in 2011 reduces the cost of release and hence increases the welfare gains of increasing the number of competitors

Parameter	Ofcom assumption	Key deficiencies and argument for change	Alternative assumption	Impact of alternative
Cost of future clearance (to VF and O2) of 2 further blocks for LTE or 3G capacity by deploying 2.1 GHz coverage as interim measure	Ofcom carries forward assumption of only viable option for dealing with displaced 2G traffic would be 2.1GHz widening (i.e. building out additional 2.1GHz infrastructure to carry this traffic as necessary).	The cost of future clearance in Ofcom's base case is very high and does not reflect the likely true cost of clearance in 2015 as [confidential]	Remove this cost	Decreases costs of clearance, thus increasing the net benefits of releasing blocks of spectrum

8. Conclusions

Orange agrees with Ofcom's view on the significant benefits that 900 MHz affords for UMTS but firmly disagrees with Ofcom's overall recommendation on a release of 2x5 MHz of 900 MHz by Vodafone and O2. Orange's view is based upon four key areas within the Ofcom consultation:

- The competitive imbalances inherent within the proposed solution;
- The use of 800MHz spectrum as a viable alternative to 900MHz spectrum;
- The draft GSM Directive and European Competition Law; and
- The Cost Benefit Analysis modelling approach

In summary, Orange believes that, for the reasons stated above, Ofcom's proposal does not address the underlying competitive disadvantages to Orange arising from an unbalanced distribution of 900 MHz spectrum. Vodafone and O2 will have increased 3G capacity with better in-building coverage **[confidential]**. This will enable them to build brand awareness as a result of improved communication, marketing and advertising campaigns highlighting their superior quality of service. Increased brand awareness and advertising will increase market share, hence profitability, particularly as the mobile market has high fixed costs and high capex spend. A virtuous circle will ensue of increased profitability for 900 MHz mobile operators, allowing them to spend more on customer acquisition, communication and promotion will exist, creating an increased market share, and hence more profitability.

As part of the Orange's response to the interim Digital Britain objectives, Orange has made its support clear. Orange has also stated that **[confidential]**.

Orange considers that Ofcom's proposal is economically and legally flawed, anti-competitive and discriminatory and firmly requests that Ofcom reconsiders its proposal in light of the serious errors and omissions identified above.

APPENDICES

- A SUMMARY
- B GLOSSARY OF DEFINITIONS
- C CRITIQUE OF MODEL ASSUMPTIONS USED BY OFCOM IN ITS CBA

APPENDIX A SUMMARY

2. Orange views on Ofcom proposal

- Ofcom's latest proposal, to release one block (2x5 MHz) of 900 MHz spectrum is significantly at odds with its previous proposal for three blocks (2x15 MHz) of 900 MHz spectrum to be released by Vodafone and O2.
- Orange believes that this proposal fails to resolve adequately the competition issues and potentially leads to the very real possibility of discrimination against Orange.
- Orange believes that the only way for Ofcom to deliver a competitively balanced proposal is [confidential].

3. Inability to participate in a universal broadband Digital Britain

- Orange has committed to extending its broadband mobile network to deliver universal service of 2 Mbps at its own cost, [confidential].
- Due to the delayed timing of the 800 MHz spectrum, [confidential].

4 The competitive imbalances inherent within the proposed solution

- Ofcom's proposal is discriminatory and seriously damaging to competition.
- In 2008, the total market service revenue was [confidential], with an average EBITDA/ service revenue ratio in excess of [confidential]³². A loss of total [confidential] of market share for an operator over 4 years would equate in aggregate to [confidential] service revenue and [confidential] EBITDA. It is conceivable that a shift of [confidential] of market share to Vodafone and O2 could easily happen, which would be equivalent to [confidential] EBITDA. Since the market share will take many years to regain, if ever, the advantage to Vodafone and O2 will be much more than [confidential] EBITDA over four years.
- Orange believes that it should take no longer than [confidential].
- [confidential]

5. The use of 800 MHz spectrum as a viable alternative to 900 MHz spectrum

- Orange sees the role of the 800 MHz spectrum as an opportunity to enable access to a similar amount of low frequency spectrum amongst all operators in time, but it is not seen [confidential]
- Orange insists on [confidential]

³² Taken from latest published UK operator accounts

- **Convening stakeholder workshops on (i) the costs and timing of refarming and (ii) the timetable for the development and implementation of LTE 800 will assist in reaching consensus across the industry**

6. The draft amended GSM Directive and European Competition Law

- **The proposal as it stands discriminates against Orange UK and offers Vodafone and O2 scope to secure a significant and sustainable competitive advantage which is directly at odds with the intentions of the draft amended GSM Directive and EC law**

7. The Cost Benefit Modelling approach

- **Orange considers that Ofcom's CBA which underpins its policy proposal is seriously flawed, hence undermining it as a basis for policy choice**
- **Adopting more reasonable assumptions leads to the conclusion that [confidential]**

APPENDIX B

GLOSSARY OF DEFINITIONS

Contiguous clean spectrum	2x5 MHz block of 900 MHz spectrum without adverse interference from adjacent operators
Universal Broadband Service	As defined by the BERR working group led by Peter Black (defined in document "20090404 Inaugural Broadband USC Technical Group – MNO Modelaling.doc" published 03/03/2009)
MBNL	Mobile Broadband Network Ltd
AIP	Administered Incentive Pricing

APPENDIX C
CRITIQUE AND SENSITIVITY ANALYSIS OF MODEL ASSUMPTIONS USED BY
OFCOM IN ITS CBA

CONTENTS

- C.1. Ofcom's approach to CBA modelling
[confidential]

C. Critique and sensitivity analysis of model assumptions used by Ofcom in its CBA

This Appendix considers the ingredients of the three components of the CBA welfare calculation, namely:

1. costs of releasing spectrum;
2. productive efficiency benefits of allocating 900 MHz spectrum to an operator that would otherwise have deployed a higher cost 2.1GHz network; and
3. The benefits of competition arising from the entry facilitated by spectrum block release.

For each of these components, we:

- critique Ofcom's key assumptions, and
- perform sensitivity analyses on these assumptions in order to explore the effect of varying these assumptions on the CBA results and, ultimately, the policy choice.

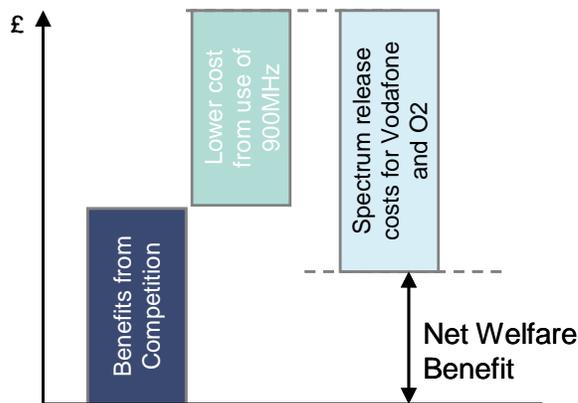
In order to set the scene, we first provide an overview of our understanding of Ofcom's approach to modelling the costs and benefits of spectrum release, followed by Orange's general approach to sensitivity analysis of Ofcom's CBA.

C.1. Ofcom's approach to CBA modelling

Ofcom compares the total welfare impact of different policy options as the basis of determining the best policy option. The total welfare impact is composed of the sum of the change in consumer and producer surplus arising from the three components of the CBA: cost of release, the productive efficiency benefits of using 900 MHz spectrum, and the competition benefits of facilitating entry into the relevant market.

Acknowledging the uncertainty and the subjectivity associated with some of the assumptions, Ofcom presents a range of different scenarios for each policy option. In particular it presents analysis to highlight the different geographic and in-building coverage capabilities of 900 MHz and 2.1 GHz spectrum but acknowledges that the extent that this translates into market differentiation is a matter of conjecture. Its core scenarios are distinguished by the extent to which 900 MHz spectrum, and its attendant benefits, is significant: called Significance Scenarios.

For each Significance Scenario it calculates the net welfare benefit relative to a counterfactual case of no spectrum release and liberalisation of the spectrum in the hands of the incumbents by combining the benefits from increased competition (consumer and producer surplus), lower costs for recipients of the released spectrum, offset by the costs of releasing the spectrum.



[A further degree of complexity is added by the use of different Consumer Outcomes: where the market reacts by voluntarily trading spectrum, providing access (national roaming) or providing no such market solution.]

For the purpose of our analysis, we concentrate on the High and Medium Significance Scenarios, and resultant policy options, as represented in the figure below. Orange concurs with Ofcom's view that the Low Significance Scenario is unlikely. Ofcom does not then go on to analyse and conclude on the relative probability of the Medium and High Significance scenarios, which is demonstrated by its method of taking the simple average of the results under the two scenarios in concluding on net welfare benefits and thus forming its proposed policy. **[confidential]** As discussed, the cost and market advantage of 900 MHz spectrum over feasible alternatives is vast.

Orange considers the policy options of releasing different numbers of blocks of 900 MHz spectrum, against the counterfactual of liberalisation in the hands of the incumbent (which results in neither voluntary spectrum trading nor national roaming. This choice of counterfactual is not critical as it just provides a common reference point against which to measure the relative benefits of the different (factual) policy options).

Consumer Outcomes	Significant scenarios	Policy Options
1.No market solution	1.High. Demand for services only deliverable by 900/800MHz	1.Single spectrum block released
2.Market solution (traded spectrum)	2.Medium: Lower costs possible with 900/800MHz but limited demand impact	2.Two spectrum blocks released
3.Market solution (access / national roaming)	3.Low demand / market sensitivity to 900/800MHz.	3.Three blocks released
		4.No spectrum released

Released spectrum is allocated to either a RAN-share operator **[confidential]** and/ or a standalone operator **[confidential]**. Note that when Ofcom refers to RAN-share here it actually means spectrum share, as the operators are assumed to both benefit from any spectrum allocated to them.

A further element of Ofcom's analysis is that it adopts two variants of the Medium Significance Scenario:

- the first where both the standalone operator and the RAN-sharer have sufficient resources to justify rolling out 2.1 GHz to compete with the 900 MHz operators (described by Orange in the analysis below as 'Medium A');
- and the second where only the RAN-sharer has sufficient resources to rollout 2.1 GHz and the standalone operator instead waits for 800 MHz ('Medium B').

Different assumption sets are applied to each Significance Scenario. The rationale is that the higher Significance Scenarios are likely to be correlated with both higher demand and higher levels of cost difference between 2.1 GHz and 900 MHz networks.

In this Appendix, we make reference to Ofcom's base case. Rather than applying point assumptions, for each Significance Scenario the demand and site number inputs comprise a range under Ofcom's approach. The resulting outputs therefore also form a range, which incorporates a base case which is typically towards the middle of the range. To simplify the analysis we refer to this as Ofcom's base case, which we use as the basis for our analysis. This is shown in the table below.

Of the variants of the Medium Significance Scenario, Medium A (where either the sharers or standalone operator could compete with a 900 MHz network using 2.1 GHz alone) is assumed to be at a lower level of demand and cost difference than Medium B. The rationale is that the standalone operator, with an inherent cost disadvantage relative to the sharers, would have a lower threshold of Significance at which it could no longer compete than would the sharers.

The table opposite sets out the base case welfare (in £m), relative to the counterfactual of liberalisation in the hands of the incumbent:

- For each component of the welfare calculation (e.g. effect of competition, productive efficiency etc.);
- For each of the key Significance Scenarios;
- For each policy option (release of 1, 2 and 3 blocks).

Note that in each case the net welfare benefit calculation is relative to the policy option of liberalising the spectrum in the hands of the incumbent in that Significance Scenario, so the absolute net welfare benefits are not comparable across Significance Scenarios, only across different policy options within the same Significance Scenario.

Significance Scenario	Medium A			Medium B			High		
	1 Block	2 Blocks	3 Blocks	1 Block	2 Blocks	3 Blocks	1 Block	2 Blocks	3 Blocks
Cost / Benefit £m									
Level of competition				110	110		625	750	750
Productive efficiency of provision of service	475	800	800	800	800	800			
Cost of bringing forward low freq. network investment				(25)	(25)		(25)	(45)	(45)
Incremental cost of future clearance	(45)	(150)	(725)	(45)	(150)	(725)	(45)	(150)	(725)
Cost of release	(80)	(230)	(570)	(80)	(230)	(570)	(80)	(230)	(570)
Other	(90)	(103)	(106)	(45)	(58)	(61)	(45)	(58)	(61)
Net benefit	260	317	(601)	630	447	(471)	430	267	(651)

Ofcom's analysis shows that releasing 1 block is the best policy choice under both the High and Medium RAN-Share significance scenarios, in that it yields the highest net benefit of the 3 policy options in these Significance Scenarios (e.g. in scenario Medium B, 630>447>-471). In the consultation document, Ofcom presents a hybrid of the two Medium scenarios which also has releasing 1 block as the best policy choice.

The table below breaks these results down into the CBA components.

Significance Scenario	Medium A			Medium B			High		
	1 Block	2 Blocks	3 Blocks	1 Block	2 Blocks	3 Blocks	1 Block	2 Blocks	3 Blocks
	Medium demand, the perceived quality difference between 900MHz and 2.1GHz 3G is not sufficient to prevent 2.1GHz providers from competing. The cost differences between 900MHz and 2.1GHz are such that both sharers (MBNL) and standalone (Orange) can compete.			Medium demand, the perceived quality difference between 900MHz and 2.1GHz 3G is not sufficient to prevent 2.1GHz providers from competing. However, the cost differences between 900MHz and 2.1GHz are such that only sharers (MBNL), with the benefit of cost savings from sharing, can compete with 900MHz operators using 2.1GHz. Orange could only compete if it has 900MHz.			High demand. Perceived quality difference is such that only operators with 900MHz can compete.		
Cost / Benefit £m	1 Block MBNL is allocated the additional block. MBNL competes with 900MHz, Orange with 2.1GHz	2 Blocks Both MBNL and Orange are allocated blocks. All compete as 900MHz operators	3 Blocks MBNL and Orange are allocated 2 and 1 blocks respectively. All compete as 900MHz operators	1 Block MBNL is allocated the additional block resulting in 4 competitors	2 Blocks Both MBNL and Orange are allocated blocks resulting in 5 competitors	3 Blocks Both MBNL and Orange are allocated blocks resulting in 5 competitors	1 Block MBNL is allocated the additional block resulting in 4 competitors	2 Blocks Both MBNL and Orange are allocated blocks resulting in 5 competitors	3 Blocks MBNL and Orange are allocated 2 and 1 blocks respectively resulting in 5 competitors
Level of competition	No additional competition as 2.1GHz operators without blocks, and in counterfactual, compete using 2.1GHz spectrum			No additional competition as MBNL otherwise competes with 2.1GHz	110	110	625	750	750
Productive efficiency of provision of service	475	800	800	800	800	800	No productive efficiency from release as 2.1GHz operators do not roll out in counterfactual.		
Cost of bringing forward low freq. network investment	MBNL would otherwise use 2.1GHz so productive efficiency from 900MHz	Orange would otherwise use 2.1GHz so productive efficiency from 900MHz	No further competitors so no further productive efficiency	Only 2.1GHz operator in counterfactual is MBNL, and as MBNL receives 900MHz in each factual, productive efficiency benefit remains the same for 1, 2 or 3 blocks	-25	-25	-25	-45	-45
Incremental cost of future clearance	No operators would invest in 800MHz as in all factuals and the counterfactual, all operators rollout competing networks using 900MHz or 2.1GHz			MBNL does not invest in 800MHz in counterfactual as it competes using 2.1GHz.	Orange would invest in 800MHz in counterfactual so timing cost of instead investing in 900MHz	MBNL would invest in 800MHz in counterfactual so timing cost of instead investing in 900MHz	Orange would invest in 800MHz in counterfactual so timing cost of instead investing in 900MHz		
Cost of release	-45	-150	-725	-45	-150	-725	-45	-150	-725
Other	-80	-230	-570	-80	-230	-570	-80	-230	-570
Net benefit	-90	-103	-106	-45	-58	-61	-45	-58	-61
	260	317	(601)	630	447	(471)	430	267	(651)

[confidential]