



**Vodafone's response to Ofcom's consultation**

**"Future use of the 700MHz band"**

**July 2013**

**Non-confidential version**

Summary and Conclusions	3
Answers to Questions	
Assessing the costs and benefits of potential release	5
The timing of a 700MHz release – release date set by Ofcom	7
The timing of a 700MHz release – release date set by market mechanism	9
Consumers and equipment	11
Users of geographically interleaved spectrum	12

## **SUMMARY AND CONCLUSIONS**

Vodafone welcomes the opportunity to comment on Ofcom's ongoing work on the clearance of the 700MHz band. As the largest holder of mobile spectrum in the sub-1GHz bands, we are of course a key stakeholder in ensuring there is adequate supply of capacity to meet the demands of UK citizens.

The bands under consideration lie in the "sweet spot" in the radio spectrum that is suitable for both capacity and coverage. It is therefore attractive for a wide range of applications, and thus has the potential to provide substantial benefits to citizens and consumers, and consequently to the UK economy.

This call for inputs follows three other Ofcom consultations in recent months that also address the future demand for mobile broadband services and DTT, and future use of the UHF band (470-790MHz):

- Award of the 600 MHz spectrum band
- Spectrum pricing for terrestrial broadcasting
- Future demand for mobile broadband spectrum and consideration of potential candidate bands (in relation to 470-694MHz).

These consultations appear to have been managed in isolation, and don't appear to have taken account of each other (or indeed, of earlier consultations on related subjects). These consultations, and our responses to them, are relevant to the present consultation document and response.

As Vodafone highlighted in our response to the consultation on overall UHF strategy, were we to be in a greenfield situation, it is highly unlikely that any justification could be made for terrestrial broadcast television to use such a large amount of highly valuable spectrum, particularly as alternatives such as satellite, cable and IPTV over broadband are available and continue to grow in user adoption. However, we recognise that we do not have the luxury of a greenfield, so therefore must balance the demands of legacy services with the need to provide capacity for growth services such as mobile broadband.

We consider that Ofcom already has a substantial body of evidence regarding the demand for mobile spectrum, which worryingly were not referenced in this consultation. Ofcom's own studies highlight that for all but the very lowest demand scenario, capacity requirements for mobile broadband will outstrip the potentially available spectrum even assuming not only the 4G spectrum recently auctioned but also the availability of mobile use spectrum at other bands by approximately 2020. It is therefore imperative that Ofcom plays an active role in international fora to ensure that not only is the 700MHz band appropriately designated for mobile broadband usage, but also that robust foundations of technical band plans are in place, and the spectrum is cleared for mobile use as soon as possible. Vodafone will, of course, contribute our technical expertise.

Vodafone recognises the challenges of migrating Digital Terrestrial Television (DTT) to the alternate 600MHz bands, and that of course this will not be cost-free. Ofcom can, though, mitigate this by providing clarity of the timescales, and ensuring that the television industry is aware of the impending change so does not supply equipment with inbuilt obsolescence but instead actively encourages the takeup of more future-proof equipment.

We are not opposed in principle to the usage of incentive auctions, however at this stage are sceptical as to the value of their application in this case. The timescales between the earliest potential harmonised availability of the spectrum, and projected exhaustion of existing mobile capacity, are limited. Incentive auctions are typically used where there are existing licensees, and new ones with alternate applications, whose interests need to be balanced. While this may be the case for the 700MHz band, it is a moot point of whether such an approach would be fair where the current holders did not originally pay an economic fee for the capacity, and in any case may not be the primary stakeholder facing a cost for its clearance. Furthermore the mutually incompatible band plans for DTT and mobile may represent a significant obstacle to the orderly transfer of use implied by an incentive auction. Finally, both the existing users of 700MHz spectrum and the mobile providers seeking to use it form disparate communities where it would be difficult to reconcile a common position. For these reasons although Vodafone is not opposed to Ofcom carrying out further research, we consider a better prioritisation of scarce resources would be to concentrate on getting the conditions right for an orderly migration.

## **ANSWERS TO QUESTIONS**

### **ASSESSING THE COSTS & BENEFITS OF POTENTIAL RELEASE**

Vodafone is very surprised that Ofcom's analysis in this area appears to ignore research which it previously commissioned. For example, we would have expected to have seen extensive reference to the 2012 Real Wireless<sup>1</sup> and 2013 Analysys-Mason/Aegis<sup>2</sup> research: this appears absent. It is to be hoped that the evidence base sought in this consultation is intended to supplement that which Ofcom already possesses, rather than as a replacement for it.

***Question 1: Have we correctly identified and characterised the potential costs set out above, and what other costs – if any – should be taken into account in our assessment?***

***Question 2: What evidence, whether qualitative or quantitative, should we obtain and/or take into account in assessing each of these potential costs? Please identify any sources of specific evidence to which we should have regard.***

Vodafone considers that the outline cost categories have been correctly identified. We would highlight, however, that early measures by the DTT industry, backed if necessary by regulation, would mitigate much of these costs. For example, ongoing sales of receiving equipment which does not support DVB-T2 and band-specific aerials will only serve to increase downstream consumer costs.

A properly constructed DTT AIP might serve to restrain the demand for DTT channels, as discussed in our response to the DTT AIP consultation<sup>3</sup>. Future DTT/Mobile interference might be reduced by minimising the use of channels immediately below 700MHz. Furthermore, not all the costs that may be incurred in the future on DTT, for example costs associated with deploying DVB-T2 transmitters and consumer equipment, may not necessarily be relevant to an overall cost benefit analysis of 700MHz release if it provides benefits of improved DTT viewer experience. The counterfactual against which the incremental costs of 700MHz release should be measured will need careful design.

Ofcom suggests that there may be an opportunity cost in relation to the possible supplemental DTT use of the 600MHz band – we would suggest as we discussed in our response to the temporary licencing of the 600MHz<sup>4</sup> band for DTT use that if the temporary use of the 600MHz band frustrated rather than aided the timing of 700MHz release then there would be a cost arising from the delay in mobile use.

---

<sup>1</sup> "Techniques for increasing the capacity of wireless broadband networks: UK, 2012-2030", <http://www.ofcom.org.uk/static/uhf/real-wireless-report.pdf>

<sup>2</sup> "Opportunity cost of the spectrum used by digital terrestrial TV and digital audio broadcasting", <http://stakeholders.ofcom.org.uk/binaries/consultations/aip13/annexes/report.pdf>

<sup>3</sup> "Vodafone's response to Ofcom's consultation Spectrum pricing for terrestrial broadcasting", <http://stakeholders.ofcom.org.uk/binaries/consultations/aip13/responses/Vodafone.pdf>

<sup>4</sup> "Vodafone's response to Ofcom's consultation Award of the 600 MHz spectrum band", <http://stakeholders.ofcom.org.uk/binaries/consultations/600mhz-award/responses/Vodafone.pdf>

**Question 3: Have we correctly identified and characterised the potential benefits set out above, and what other benefits – if any – should be taken into account in our assessment?**

**Question 4: What evidence, whether qualitative or quantitative, should we obtain and/or take into account in assessing each of these potential benefits? Please identify any sources of specific evidence to which we should have regard.**

**Question 5: In particular, what is your view of the likely future demand for additional sub-1 GHz spectrum for the provision of mobile data services, and what evidence supports this view?**

Vodafone considers that the benefit categories have generally been correctly identified. What Ofcom may not however have fully taken into account is implication of 700MHz becoming a “first-tier” LTE band across Europe. As Ofcom discusses in paragraph 4.20, this will increase the penetration of 700MHz capability in mobile devices sold in the UK, and hence increase the proportion of mobile traffic that could be carried on 700MHz. This raises the priority of making available 700MHz for mobile use to avoid the “data crunch” above other potentially less widely used, second-tier LTE bands.

In our response to Q14 below, we set out how Ofcom’s own research has already identified a compelling need for mobile broadband spectrum in a 2020-2025 timeframe. There can be little scope for debate as to the requirement for mobile spectrum: for example the Radio Spectrum Policy Programme commits EU States to find 1200MHz of sub-5GHz spectrum for this application by 2015. Sub-1GHz spectrum is used for providing coverage, whether for extending coverage in rural areas or to provide reliable coverage in urban areas, and hence forms a key part of that additional spectrum.

It could be argued that cell splitting reduces the benefits of further sub-1GHz spectrum being made available. However, to the operator, such an approach increases the cost of network deployment, and to the consumer it increases the number of base stations and can increase the risk of ‘not-spots’. It is therefore highly desirable for the 700MHz band to be made available before cell splitting becomes necessary.

It is highly surprising that in considering this question, Ofcom does not reference its own research. The work carried out by Analysys-Mason/Aegis, for example, concludes that the 700MHz spectrum would deliver four times as much benefit to the mobile industry as it does in its current use for DTT.

One benefit that Ofcom may need to recognise is that the 700MHz release will potentially bring the 600MHz band into core DTT use, whereas the counterfactual would involve only supplementary, incremental, and potentially marginal DTT use – *prima facie* this is a more effective employment of scarce spectrum resources.

Additionally, as set out in our response to Q7 below, we believe that public safety applications could be accommodated with no impact on mobile broadband usage and minimal impact on DTT.

**Question 6: Should we place different weights on some costs and benefits than on others, for example depending on whether costs would be borne by consumers, DTT operators, or mobile operators?**

It may be appropriate for Ofcom to decide to give more weight to some factors than others. However, this should be done separately to any quantitative cost/benefit analysis, so that the economic impact of any such decision is transparent (i.e. there should not be weighting of inputs to the quantitative analysis).

**Question 7: Do you have any other comments on the work we are currently undertaking on potential costs and benefits?**

Paragraph 4.23 addresses emergency service use of the 700MHz band. Vodafone has proposed a frequency arrangement for the 700MHz band, which sits below the paired spectrum for mobile broadband. This would provide the added economic and societal benefits for public safety without reducing the benefits from mobile broadband. The impact on DTT would be relatively low, because the narrow width of this band would allow filters in terminals to have a rapid roll-off below the operating band: indeed, in the large parts of the country where DTT channel 48 is not used, there would be no cost.

We at present consider that given the level of uncertainty about the absolute level of mobile broadband demand in future years, but the general consensus as to the overall direction of travel, that some form of breakeven analysis might be the best way for Ofcom to conduct its cost benefit analysis. For example Ofcom could consider what level of future mobile demand<sup>5</sup> would give a neutral outcome of costs and benefits between DTT and mobile use for 700MHz, and then evaluate the probability, risks and opportunities of a level of demand that is higher than this breakeven point.

#### **THE TIMING OF A 700MHZ RELEASE – RELEASE DATE SET BY OFCOM**

**Question 8: Have we correctly identified the costs and benefits that could vary depending on the timing of release, and the impact of those factors? Are there other costs and benefits which would vary depending on the timing of release of the 700 MHz band which we should take into account?**

Vodafone broadly agrees the costs and benefits associated with the timing of the release. However, as our response to Q14 highlights, the concept of there being a window for the release of the spectrum is illusory. We are constrained in when spectrum can be released due to the timescales required to clear the band; but if release of the spectrum is delayed beyond the mobile spectrum crunch point, UK citizens will suffer poor mobile broadband performance relative to their European counterparts and mobile operators will face network costs which will have an impact on retail pricing.

---

<sup>5</sup> Or more realistically a profile of mobile demand growing over time

**Question 9: How quickly could the 700 MHz band be released? What would be the impact on DTT infrastructure costs of releasing at the earliest possible time compared to a later time? What would be the factors which affect these costs?**

Vodafone believes that the second EU Radio Spectrum Policy Programme and developments in DTT in Europe are likely to give momentum to the release. There is a strong possibility that a harmonisation measure for the 700MHz band will be included in the period of the second RSPP (which will cover the period up to April 2019), and we believe that the new international DTT band plan can be agreed in a timescale to make this possible.

Ofcom should also be mindful of developments in other European countries. We note, for example, that BNetzA has already launched a consultation in Germany<sup>6</sup> aimed at releasing the 700MHz band for broadband usage as soon as possible after WRC-15. Similarly, the French authorities are rumoured to be pushing for an early release<sup>7</sup>. Whilst acknowledging structural differences (e.g. in Germany satellite television broadcasting is more predominant than in the UK, with DTT accounting for only 10-15% of usage), there is a risk that the UK is left in the slow lane if efforts to mitigate the impact on DTT result in the 700MHz band being unavailable for mobile usage far beyond 2020.

Paragraph 4.33 describes “early release” as meaning “2018 or soon after 2018”. However, as we pointed out in our response to the 600MHz consultation, the proposals in that consultation would mean that the migration of DTT from the 700MHz band to the 600MHz band could not start until 1st January 2019 at the earliest. It would then take several years before this would be sufficiently advanced to allow the deployment of mobile broadband services.

We therefore believe that developments since Ofcom’s strategy statement “Securing long term benefits from scarce UHF Spectrum” must lead to the possibility of release of 700MHz spectrum at an earlier date (see the Vodafone response to the 600MHz consultation for more details).

**Question 10: How, and to what extent, are the costs for existing (PMSE) and potential (WSD) interleaved users of the 700 MHz band likely to vary depending on the timing of release? What would be the factors which affect these costs?**

The potential cost for WSD users would be reduced by an earlier release of the 700MHz, because this would reduce the possibility (albeit small) of the usage of WSD having grown to the point where it could not be supported by the reduced amount of TV white space after the release. See Question 24 for our views on costs for PMSE.

---

<sup>6</sup>[http://www.bundesnetzagentur.de/cln\\_1932/SharedDocs/Pressemitteilungen/DE/2013/130624\\_MobilesBreitband.html?nn=265778](http://www.bundesnetzagentur.de/cln_1932/SharedDocs/Pressemitteilungen/DE/2013/130624_MobilesBreitband.html?nn=265778)

<sup>7</sup><http://www.latribune.fr/technos-medias/telecoms/20130621trib000771698/bataille-des-frequences-telecoms-contre-tv-le-plan-du-gouvernement-pour-faire-passer-la-pilule-.html>

**Question 11: Should we consider any other cost-related arguments / evidence in favour of an earlier or later release date?**

See response to Q.14

**Question 12: What would be the impact on mobile broadband delivery and competition of releasing the 700 MHz band later rather than sooner?**

See response to Q.14.

**Question 13: Should we consider any other benefit-related arguments / evidence in favour of an earlier or later release date?**

Vodafone considers that the benefits to the provision of public safety applications (see response to Q7 above) by the usage of the 700MHz band should be factored into the analysis.

#### **THE TIMING OF A 700MHZ RELEASE – RELEASE DATE SET BY MARKET MECHANISM**

**Question 14: Is the range of potential dates for release likely to be wide enough to merit consideration of an incentive auction approach?**

Vodafone is highly sceptical that this will be the case. Notwithstanding efforts to release the spectrum earlier in some countries (see response to Q9), we consider a realistic earliest date for the UK is 2019, and only then if Ofcom were to redouble its efforts to clear the spectrum.

The 2012 Real Wireless Report predicted a “spectrum “crunch” between 2022 and 2025, when existing sites have been upgraded to their capacity, and the only option to meet demand growth is to increase the number of cells. More recent analysis by Real Wireless for Ofcom<sup>8</sup> in which the earlier forecast was combined with the ITU-R Recommendation ITU-R M.1768-1 methodology, appears to suggest that other than in the lowest forecast assumptions, spectrum demand starts to exceed demand as early as 2020. While Vodafone would assert that care must be taken when combining the Real Wireless assumptions with the ITU-R methodology, it is clear that there is highly unlikely to be a meaningful window between the earliest and latest dates for release of the 700MHz band to make an incentive auction worthwhile.

---

<sup>8</sup> “Study on the future UK spectrum demand for terrestrial mobile broadband applications” – DRAFT, Figure 1

**Question 15: If so, what are the challenges to designing an effective incentive auction in this case, and how might these challenges be addressed?**

As set out in the response to Q14, Vodafone is sceptical that the window for releasing 700MHz spectrum merits an incentive auction. Notwithstanding this, it is difficult to see how an incentive auction could equitably work in the scenario faced.

- The current holders of the spectrum did not acquire it on an economic basis; rather DTT was allocated the bands historically, and existing holders still continue to enjoy a spectrum fee “holiday”. Were the funds from the auction to be channelled to the DTT broadcasters, this would represent a windfall gain for something that wasn’t subject to an economic acquisition price in the first place.
- While DTT broadcasters would face some of the costs of clearance of the band, arguably the bulk of the cost may fall upon consumers. As such, unless broadcasters were compelled to compensate consumers, once again there would be a windfall gain. Even if such a compulsion was introduced to the system, the indirect nature of the current assignees having to assess the likely costs incurred by third parties would inevitably lead to the figures being “over-egged” to remove any commercial risk.
- The incentive auction approach implies a homogenous view of the worth of spectrum from each of the buyer and seller community. However, both the current spectrum holders and potential bidders in auction form diverse communities of interest. Some broadcasters could place a higher economic value on 700MHz spectrum for DTT than others. Some mobile operators will place a higher economic value on 700MHz spectrum than others.

If the sub-bands within the 700MHz spectrum could change use independently then this would not be an issue: a broadcaster placing a relatively low economic value could authorise a mobile provider placing a relatively high economic value on the spectrum to take over their capacity at a mutually agreeable time, while leaving broadcasters with higher valuations and mobile operators with lower valuations to defer their handover to a later date. However this is not the scenario we are faced with: the nature of usage of the spectrum is such that a universally co-ordinated clearance and subsequent re-use is required. As such it is difficult to see how diverse requirements would be accommodated within the incentive auction.

**Question 16: If we followed an incentive auction approach, how should we take account of wider costs and benefits – i.e. those not felt by participants in the auction?**

As stated in our response to Q15, it is difficult to see how the wider costs and benefits could be accommodated within an incentive auction: this is one of the reasons Vodafone considers it likely to be inappropriate.

**Question 17: Do you have any views at this stage as to the parameters of an incentive auction, such as the default date and payment mechanism?**

Vodafone feels this question is premature at this stage.

**Question 18: Is there a version of the overlay auction approach which could be suitable for 700 MHz release?**

For the same reasons as set out in our response to Q14 and Q15, Vodafone does not consider there is an overlay auction approach which would be suitable for the 700MHz spectrum band.

**Question 19: What are the benefits and risks of conducting an overlay auction in this case?**

In addition to the risks set out in our response to Q15, the difficulties with an overlay auction are:

- At the time of the first stage (i.e. traditional auction), the purchasers of the spectrum can have no definite indication of the likely costs or resultant timescales from the second stage. This means the value of the spectrum secured by Ofcom in that first stage will inevitably be depressed, as bidders will be forced to take a pessimistic view of the second stage.
- The complexity of heterogeneous DTT and mobile operator communities coming to a common position identified in Q15 could be amplified by the negotiations taking place in a commercial environment rather than in ring-fenced auction process.

## **CONSUMERS AND EQUIPMENT**

**Question 20: Have we correctly identified and characterised the potential impact of 700 MHz release on consumers accessing DTT? What other impact – if any – should be taken into account in order to identify pre-emptive measures to reduce this impact?**

The consultation document seems to identify the key aspects of the impact on consumers. As paragraph 5.10 suggests, different re-plans may give different cost estimates – the least cost solution may be the one relevant to the cost benefit analysis. We also note that the preliminary information from DMSL (at800) suggests that Ofcom might have over-estimated the impact of interference for the 800MHz band, and Ofcom should learn lessons from this for its future impact assessment of the 700MHz band.

***Question 21: Do you have any comments on the pre-emptive measures relevant to DTT identified above? Are there other pre-emptive measures we should be considering?***

The consultation document identifies two measures. However, other measures could be taken during the re-planning of DTT before release of the 700MHz band: for example upper channels (especially channel 48) could be assigned to transmitters in less populated areas, or to programme channels that are predicted to have lower viewing figures.

***Question 22: Have we identified the correct measures to support consumer adoption of DVB-T2?***

Given the benefits to the UK from the transition to DVB-T2, the measures being considered by Ofcom to support its adoption by consumers are not strong enough, in contrast with other EU countries where a more proactive position has been adopted. For example, Ofcom should give consideration to mandating that, after a specified date, all new receivers sold must support DVB-T2. We urge Ofcom to discuss such measures with the Government.

As Vodafone commented in its response to the 600MHz consultation, we are disappointed that the proposed terms of the licence for the temporary DVB-T2 multiplexes did not implement the objectives stated in the consultation for promotion of DVB-T2.

## **USERS OF GEOGRAPHICALLY INTERLEAVED SPECTRUM**

***Question 23: What regard, if any, should we have to wider technical evolution of the DTT platform, such as HEVC?***

Ofcom should have equal regard to technology evolution in all sectors of radio communications. It should therefore consider HEVC in the same manner as, for example, LTE.

**Question 24: Have we correctly identified and characterised the potential impact of 700 MHz release on PMSE users? What other impact – if any – should be taken into account in order to identify pre-emptive measures to mitigate this impact?**

The impact on PMSE users from long-term developments in the use of the UHF band is wider than just the 700MHz band. For example, it is likely that DTT, if it continues to thrive into the next decade, is likely to migrate towards single frequency networks. In our response to the consultation on the long term strategy for Band IV and V<sup>9</sup>, Vodafone suggested that the 2025-2090MHz band should be considered for this purpose.

**Question 25: Do you have any comments on the pre-emptive measures identified above? Are there other pre-emptive measures we should be considering?**

Consideration should be given to using the licence fee structure for PMSE to encourage the migration of equipment to more spectrally efficient digital technologies and to new frequency bands.

**Question 26: Do you have suggestions for how we can assess the impact on PMSE users and equipment if 700 MHz is no longer available for PMSE use?**

It is important to distinguish between the equipment replacement costs resulting from a change of frequency for PMSE and the wider costs to the TV production and live entertainment industries from a loss of spectrum.

Valdani Vivari & Associati (VVA) Consulting has recently carried out a study for the European Commission on "Assessment of socio-economic aspects of spectrum harmonization regarding wireless microphones and cordless video-cameras (PMSE equipment)"<sup>10</sup>. Although this study addressed a slightly different question, the results suggest that the equipment cost from moving PMSE to a different band is relatively small, provided that the available bandwidth does not compromise the live entertainment and programme production that relies on PMSE.

Ofcom should therefore consider a broader strategy for PMSE over a period of around a decade, with the objective of identifying bands where:

- PMSE can co-exist with the existing primary users.
- These users are unlikely to change in the foreseeable future.
- It would be difficult for other users to share with these primary users, so there is an expectation that the secondary use of the spectrum by PMSE will continue to be secure.

**Vodafone Limited**  
**4<sup>th</sup> July 2013**

---

<sup>9</sup><http://stakeholders.ofcom.org.uk/binaries/consultations/uhf-spectrum-band/responses/vodafone.pdf>

<sup>10</sup> [http://ec.europa.eu/information\\_society/newsroom/cf/itemdetail.cfm?item\\_id=10461](http://ec.europa.eu/information_society/newsroom/cf/itemdetail.cfm?item_id=10461)