Response to Ofcom Consultation

The future use of the 700MHz band: Response from Digital UK

29 August 2014

This response is submitted by Digital UK on behalf of its Members – the BBC, ITV, Arqiva and Channel 4 - the holders of the terrestrial Broadcasting Act and Wireless Telegraphy Act licences.

1. Introduction

About Digital Terrestrial Television (DTT)

Digital Terrestrial Television (DTT) is the UK's most popular TV platform. At the heart of DTT in the UK is Freeview – a universally available service offering a range of more than a hundred free-to-air TV, radio and text-based services. It is watched in more than 19 million homes, three-quarters of the total. Freeview is the sole television platform in more than 10 million homes (40 per cent).

Prior to digital switchover (DSO), more than four million UK households could not access Freeview and elsewhere signal strength was variable. Thanks to industry investment in excess of a billion pounds, switchover made Freeview available to 98.5 per cent of homes.

Viewers are overwhelmingly satisfied with the Freeview service, and post-switchover research demonstrated viewers enjoy the selection of channels, picture quality and functionality.

DTT use of spectrum also facilitates a thriving programme making and special events (PMSE) sector, which underpins the creation of original broadcasting content.

About Digital UK

Digital UK supports the UK's terrestrial TV service and its viewers.

The company is responsible for day-to-day operational management, including the Freeview electronic programme guide, and leads on developing platform strategy, working with its broadcast partners and industry. It also provides viewers with information and advice about terrestrial TV channels, services and reception.

Digital UK is owned by the BBC, ITV, Channel 4 and Arqiva.

2. Executive Summary

In its consultation on the future use of the 700MHz band, Ofcom proposes the displacement of Digital Terrestrial Television (DTT) – the platform which delivers Freeview and YouView – out of the 700MHz band and into the 470-694MHz band. Such a change would require the reconfiguration of the DTT network with a net reduction of 12 UHF channels (96MHz) available for DTT. It would require viewers to retune, and in some cases replace their rooftop aerials. It would also require a significant programme of broadcasting infrastructure changes.

We welcome Ofcom's firm support of the DTT platform both within this consultation and in the accompanying document *'The Future of Free to View TV'* and look forward to positive engagement with Ofcom on any 700MHz clearance and also the important questions raised in that discussion document. Ofcom suggests that making the 700MHz band available for mobile broadband would deliver 'significant benefits for citizens and consumers'[1] and we are pleased that Ofcom feels that this could be achieved while 'safeguarding the on-going delivery of the benefits which DTT and PMSE provide'[2].

Our response to this consultation reflects Digital UK's overriding responsibility to ensure that to DTT viewers are not disadvantaged as a consequence of releasing spectrum for mobile broadband. It is informed by our experience in planning and delivering significant changes on the DTT platform, including digital switchover and the clearance of channels 61 and 62 in the 800MHz band. While these changes have entailed considerable technical complexity and consumer impact, they have been widely acknowledged to have gone smoothly and been well managed.

Our objective is to ensure that displacement of DTT services out of the 700MHz band happens in a way that maximises benefits to all, ensuring free-to-air DTT remains attractive and competitive. To that end the clearance of 700MHz must be planned so that mobile broadband can co-exist alongside continued DTT and PMSE services, and the clearance programme is properly costed, funded and managed to protect the integrity of the DTT platform. A successful clearance in turn will deliver benefits to citizens and consumers from genuinely enhanced mobile data services using the released spectrum

To this end, we believe that Ofcom should set out '*DTT Mitigation Criteria*'[3] to protect the platform – as it did for 800MHz clearance – and it is vital that:

- **DTT viewers do not bear the costs that would result from any clearance process**
- **The multiplex operators who are the existing authorised users of the 700MHz band should be left no worse off than they would have been without 700MHz clearance and should not – including any use of the TV licence fee – be required to meet the extra infrastructure, consumer, communications or management costs that would reasonably be incurred in order to clear the spectrum**
- **Viewers are fully supported through the transition, any impact is minimised, and existing DTT coverage and capacity nationally, regionally and locally is maintained**
- **DTT is assured of continued access to the 470-694MHz band for the long term**

[1] Ofcom 'Consultation on future use of the 700MHz band', 28 May 2014, p 3, para 1.3
[2] Ofcom 'Consultation on future use of the 700MHz band', 28 May 2014, p 4, para 1.6
[3] Ofcom'800MHz Clearance Statement',30 June 2009, p 4-6

While we broadly agree with the thrust of Ofcom's analysis, we believe at this stage that allowance should be made for a wider range of costs, specifically:

- **Ofcom has unilaterally adjusted the infrastructure cost estimates to a lower figure which we believe is inadvisable at this early stage in the planning process**
- **A support programme for aerial replacement and vulnerable viewer support is not included**
- **The costs of restoring the equivalent service for consumers adversely affected by DTT coverage changes has not been accounted for**
- **Use of DVB-T2 to overcome coverage issues has been ruled out prematurely**

Our view is that the costs and benefits are therefore more finely balanced than indicated in the Cost Benefit Analysis (CBA). If the case for clearance of 700MHz is only marginal then there cannot be good grounds for a co-primary designation of the 470-694MHz band at WRC-15 which could pave the way for the transfer of further UHF spectrum to mobile broadband. We are pleased that Ofcom has confirmed its opposition to a co-primary designation of the 'lower bands' and look forward to responding to the separate consultation on this matter.

While we recognise that Ofcom is consulting on its CBA, the role of which is to assess the economic case for any clearance of 700MHz band, we have also highlighted some considerations for implementation and areas where the business case (and hence the budget) might require a different approach.

Due to the scale of the DTT platform and the popularity of Freeview, any change to DTT frequencies has the potential to adversely affect the television viewing of millions of people. As we set out in this response, it is already apparent that the impact of a clearance of 700MHz band could be significant and certainly greater than that of 800MHz clearance given consumer issues around aerial replacement. While switchover delivered significant benefits to TV viewers by extending digital television coverage, there are no direct benefits to viewers or the DTT platform as a result of a 700MHz clearance and these parties should not, therefore, bear the costs of the transition.

2.1 Assessing the costs and benefits of clearance

While we do not disagree with the conclusion that Ofcom reaches we consider the economic case for 700MHz clearance to be more finely balanced than is presented in the consultation. Below in summary, and in the following answers to the specific questions, we set out why we believe the costs are likely to be higher than Ofcom's estimated £470-£580m, and why the estimated benefits of £900 million to £1.3 billion (2014 NPV) are very uncertain and could plausibly be overstated.

2.1.1 The costs of clearance

The costs of clearance are likely to be higher than Ofcom has concluded for the following reasons:

DTT network infrastructure costs

Early replacement costs are oversimplified. As discussed in more detail in response to Question 15 we note that a proportion of network infrastructure costs are transitional costs (e.g. temporary masts) and for these it is not appropriate to apply an early replacement calculation as they are a function of the clearance process itself. For other categories, such as antennas and masts, parts already in place can have an expected asset life considerably

longer than the 25 years assumed in the CBA. We also note that the use of the Spackman method for discounting assumes that funding will come from private and not public sources. It is our expectation that multiplex operators will not bear the costs of being relocated further down the spectrum band.

Use of lower scope costs. We welcome Ofcom's commissioning of an early estimate of the infrastructure costs from Arqiva, and the forthcoming infrastructure feasibility study which will enable a better assessment of the likely infrastructure costs. Within the CBA Ofcom has adopted the lower 'reduced scope' infrastructure estimate based on 'experience gained through previous broadcast infrastructure projects[4]". The engineering aspect of 700MHz clearance is of a different nature to previous projects. Until the feasibility study is complete we feel that Ofcom would be unwise to reduce the estimates and Digital UK would advise using Arqiva's full scope costs as an appropriate guide.

Impact and costs to DTT viewers

The need for an aerial replacement support programme. While Ofcom notes the need for an information campaign, we believe this must be accompanied by a support programme to compensate DTT viewers in full for aerial replacement arising from 700MHz clearance – be it for their primary or secondary TV sets. Such a support programme should also offer practical help to vulnerable viewers similar to that provided as part of the 4G interference mitigation programme.

The retuning challenge. We agree that retuning is now manageable for most but some do find retuning difficult, while those in areas of signal overlap would have to conduct more complex manual retunes.

Accounting for coverage changes. Ofcom does not consider the potential for a reduction in coverage arising from a DTT replan, and for Freeview viewers to lose some or all of their channels. While we hope that Ofcom is able to achieve the required outcome in international negotiations – replicating the characteristics of the pre-clearance network on a like-for-like basis – there may nonetheless be localised areas where coverage losses occur. Ofcom will need to ensure that all those who receive DTT services now will be able to continue to receive an equivalent service after any 700MHz clearance, whether through technical solutions such as building relays or funding platform changes.

Contrasts with 800MHz clearance. While there are significant lessons that can be learnt, we would caution against simply extrapolating 800MHz clearance as a basis for calculating costs for 700MHz clearance, as Ofcom has done. The factors set out above – and in more detail below – would require a communications and support programme of considerably wider scope and scale, particularly to manage consumer issues around aerial replacement.

Impact and costs for PMSE

Ofcom has long accepted that the PMSE sector (of which Digital UK shareholders are a key constituency) makes a significant contribution to the cultural and social well-being of UK citizens and consumers. With that in mind, we welcome the acceptance that any 700MHz clearance will present economic and technical challenges to this key industry. For the purposes of this CBA, we seek to address those areas where we consider Ofcom has likely understated the impact on PMSE.

2.1.2 The benefits of clearance

The benefits of clearance are inevitably more uncertain than the costs and may be lower than Ofcom has concluded for the following reasons:

[4] Ofcom 'Consultation on future use of the 700MHz band', 28 May 2014, p 43, para 5.50

Uncertainty over mobile data forecasts. As we have pointed out in previous consultations, there is considerable uncertainty over mobile data forecasts and therefore the benefits which may be derived from additional low frequency spectrum allocation. There is a 50 per cent variance between the Analysys Mason and Real Wireless forecasts for mobile traffic in 2030 cited in the consultation, and the two differ hugely in their prediction of the levels of Wi-Fi offload. We welcome Ofcom's acceptance of this uncertainty, as set out in its recent '*Mobile Data Strategy'.*

The potential for technological advances and alternative solutions. It is unclear whether forecasts have fully taken into account all of the factors that would drive future mobile data demand, such as technological advances which improve spectrum efficiency and alternative solutions to spectrum to meet data demand.

Aside from the quantum of the benefits of clearance, Ofcom has indicated that consumers could benefit from reduced consumer prices. We believe that it is not clear whether mobile operators will pass some or all network cost savings from 700MHz clearance on to customers, as is assumed in the consultation document.

2.2 Timing and delivery of 700MHz band clearance

Ofcom recognises the need to ensure that the process for the displacement of DTT out of the 700MHz band is 'carefully planned and well-managed'[5] but also holds open the possibility of an accelerated timetable for clearance. Whether this is possible cannot be known for sure until after the international frequency planning process has completed – and hence the extent of changes needed to the current DTT infrastructure is known - and the funding arrangements have been agreed.

If Ofcom is able to begin the planning process in 2014 by commissioning Arqiva's capability assessment work (to understand the ability of the current network to operate in different frequencies) we believe that the 2019-2021 timetable is credible. If the Arqiva preparatory work is not commissioned this year then this timetable is in jeopardy.

Building on the lessons of switchover and 800MHz clearance, Digital UK and the multiplex operators are well placed to play a key role in the planning and delivery of clearance programmes. We are able to co-ordinate the necessary changes to the DTT network and have experience of communicating to DTT households and supporting them through change on the platform.

2.3 Next steps

We would wish to play a central role in securing the best outcome for the 700MHz band and anticipate, if necessary, discussing delivery structures with Ofcom and Government in due course.

We are already working closely with Ofcom in a number of areas and look forward to continuing our positive engagement. Working together we want to consider in advance how best to deliver any clearance, enabling the continued access to a strong DTT platform for the 19 million UK homes that enjoy Freeview services today as well as additional data capacity for mobile broadband.

[5] Ofcom, 'Consultation on future use of the 700MHz band,' p 53, para 6.1

3. Answers to questions

Question 1: Do you have any comments on Analysys Mason's approach to quantifying the network cost savings and performance benefits?

We would note four points relating to Analysys Mason's methodology:

- The commercial value approach does not balance Analysys Mason's assertions that network cost savings will be passed on to consumers with its assumption that ARPU will increase temporarily following reallocation of 700MHz to mobile operators. We say more about the assertion that consumer prices for mobile data will fall in our response to Question 3.

- The model does not account for the sort of technological developments identified in the Real Wireless report accompanying the consultation document. Again, we expand on this point in our response to Question 3.

- The model appears to assume no sharing of sites between mobile operators (whereas Real Wireless assumes that all new sites are shared). This is against the direction of the market towards greater sharing of sites (such as that between Vodafone and Telefonica and the impact of the merger of the T-Mobile and Orange networks within EE) which could have a substantial effect on the cost savings.

- The model does not explicitly account for the fact that a significant proportion of data traffic originates indoors as well as in transit (e.g. train/bus), which in turn makes it likely that Analysys Mason understate the potential for Wi-Fi offloading and small cells.

Question 2: Do you have any comments on the other benefits we have identified including the likely magnitude or how they may be quantified?

Beyond the mobile network cost savings and improved network performance that Ofcom does quantify, the CBA identifies five further types of possible benefit which Ofcom has chosen not to quantify. We agree that it would be extremely difficult to devise a robust and defensible means of quantifying these more speculative benefits of releasing the 700MHz band:

- As we highlight above and in our response to question 3, it is impossible to say with any certainty the extent to which 700MHz clearance will lower consumer prices for mobile data.

- The 800MHz band carries a 98 per cent coverage obligation but only for one of the three paired blocks, and while we welcome Ofcom's suggestion that it will explore a more strenuous coverage obligation for licensees in the 700MHz band the incremental difference is not certain.

- Whether and which new services and technologies can be developed and implemented in the 700MHz band is unknown and therefore cannot be quantified with any precision.

- The future use of the centre gap has yet to be decided and so again there is no meaningful basis for the quantification of this benefit.

- We agree that any decision to make some of the 700MHz spectrum available for PPDR should be the subject of a separate analysis and should not compromise the provision of DTT services in the sub-700MHz spectrum.

We therefore agree with Ofcom that while these speculative benefits may be noted, they cannot be quantified for the purposes of the CBA.

Question 3: Do you agree with our assessment of the likely benefits of changing use of the 700MHz band?

We would make three simple observations in relation to the benefits analysis within the CBA:

- There is considerable uncertainty over mobile data forecasts, and so by extension, considerable uncertainty over the scale of the benefits that will arise from the displacement of DTT from the 700MHz band.
- It is unclear whether the mobile data demand forecasts used by Ofcom have fully taken into account all of the technical advances and alternative solutions that would drive future mobile data demand, which in turn might usefully diminish pressure on spectrum as the primary tool for meeting future demand levels.
- We question Ofcom's assumption that 700MHz release will necessarily lead to lower consumer tariffs. This is not borne out by the recent history of the release of 800MHz.

We expand on these points below.

Uncertainty over mobile data forecasts

There are a number of long-term forecasts for mobile data demand in circulation, but it is naturally very difficult to predict future technologies and future consumer behaviour with any degree of certainty. Since it is these forecasts of data demand that drive the scale of the benefits of releasing 700MHz clearance for mobile use, then the benefits themselves are equally uncertain.

The two pieces of work done by Analysys Mason and Real Wireless in support of this consultation are a case in point: there is a 50 per cent variance between the Analysys Mason and Real Wireless forecasts for mobile traffic in 2030, and the two differ hugely in their prediction of the levels of Wi-Fi offload: 77 per cent in 2030 versus 50 per cent in 2035 respectively. Indeed, if one were to apply the Analysys Mason offload prediction to the Real Wireless traffic forecasts, one would halve the latter's 2030 projection.

The Wi-Fi offload assumptions are therefore also pivotal to any assessment of future demand for cellular data. Wi-Fi availability will only improve over time, and there is already some evidence that Public Wi-Fi will be very widely accessible, particularly in those urban areas where demand for data can be most intense. On 10 July 2014 Glasgow City Council announced that free Wi-Fi is now available across the city's streets and public spaces[6], courtesy of a partnership with BT. In less populous areas the Government Mobile Infrastructure Project is already aimed at filling commercially unviable 'notspots'. Should Wi-Fi become very broadly available then it is likely to significantly reduce the need for additional cellular capacity.

It is evident, therefore, that regulators should be cautious when planning for a future scenario over which there is great uncertainty and very real costs associated with securing that option. Ofcom does acknowledge the variance and uncertainty over forecasts at certain points in its document, but nonetheless arrives at a relatively narrow range of overall benefits from the release of 700MHz (£900 million to £1.3 billion in 2014 NPV). We believe it should go further to demonstrate the wide range of possible outcomes.

Technological advances or alternative solutions

We believe that within the CBA Ofcom should take fuller account of technological advances which might ease pressure on spectrum, and offer alternative solutions to spectrum as the primary tool for meeting future mobile data demand. Ofcom should ideally quantify these alternative scenarios to provide the counterfactual to its analysis of the benefits of releasing the 700MHz band for mobile use.

[6] https://www.glasgow.gov.uk/index.aspx?articleid=12292

The Real Wireless report (*Terminal Capabilities in the 700MHz Band*) submitted as part of the consultation includes a survey of equipment manufacturers that leads to a number of expected developments that will reduce the cost of deploying and running mobile infrastructure. These include *'technological advances which will make it simpler and cheaper to support a larger number of bands, technological advances to reduce the power consumption of supporting multiple bands, advances in cognitive or adaptive radio, which can move intelligently between bands, [and] the switch-off of 2G or 3G networks by some LTE operators, freeing up a band for an additional LTE option'.*[7] Analysys Mason's report considers spectral efficiency improvements[8] but not changes in terminal, site and mobile technology that are possible in the time spans considered (up to 2037). Such advances may include:

- Improved multiband or cognitive/adaptive radios, which will reduce the costs of network site deployments (i.e. more bands covered by fewer radios).
- Reduced power consumption (typically the largest part of site overheads) through the use of new technologies will bring running costs below the 10 per cent of capital costs assumed by Analysys Mason in its model.
- Re-farming 2G or 3G capacity (or both) in coming years will free up valuable low frequency spectrum that can be used similarly to 700MHz spectrum for improved coverage and/or capacity.
- Substantial quantities of higher frequency spectrum that Ofcom is committed to releasing (such as the ongoing Government spectrum release programme) which will be better able to address the predicted capacity shortfalls in the areas of high demand such as city centres, as acknowledged in Ofcom's *'Mobile Data Strategy'*.
- Taking full advantage of small cell technology, which we do not believe Analysys Mason has adequately accounted for. Analysys Mason's report[9] suggests that macrocells can be used as 'equivalents' to small cells in their model. We do not believe they have compared these in the correct context. Such comparison would reveal the lower in-building capacity of macrocells. Therefore small cells should be explicitly modelled to assess the claimed savings.

Full consideration should be given to these technological advances and spectrum use choices that could reduce the degree of 'network cost savings' being modelled.

<u>700MHz clearance may not lead to lower consumer mobile tariffs.</u>

The consultation document makes assumptions about operator behaviour and suggests that the benefits of network cost savings will be passed on to consumers in the form of lower mobile tariffs. While speculated on, this has not been properly modelled or benchmarked.

Instead, Analysys Mason very simply estimates the benefit to consumers of a 1 per cent decrease in mobile data ARPU to be £700 million[10]. We would note that the release of 800MHz has seen consumer tariffs slightly *rise* for two consecutive years, reversing a long-term trend downward, as shown in Ofcom's most recent Communications Market Report.

Furthermore, use of the expression *'reduction in consumer prices'*[11] in the report oversimplifies both operator decision-making around mobile tariffs and the ways in which those tariffs tend to be structured. In reality, operators make their pricing decision based not

[7] Real Wireless, 'Terminal Capabilities in the 700MHz Band,' p 64
[8] Analysys Mason, 'Terminal Capabilities in the 700MHz Band,' Fig. 3.9
[9] Analysys Mason, 'Terminal Capabilities in the 700MHz Band,' p 39
[10] Ofcom, 'Consultation on future use of the 700MHz band,' p29,para 4.64
[11] Ofcom, 'Consultation on future use of the 700MHz band' p 29,para 4.64

just on the cost of providing a service but also on a consumer's willingness to pay and competitive market dynamics. The consultation states that *'73 per cent of consumers would be willing to pay £10 a month more for improved mobile coverage and more data capacity'*[12]. Everything Everywhere charges a premium for 'Double Speed 4G', which offers improved speed over 4G but only at higher price points tied to higher usage bundles. This form of bundling, where there is no option to separate usage from bandwidth, is an example of tariffs designed to claim consumer surplus where possible.

Question 4: Do you have any comments on our analysis of the implications change of use of the 700MHz band would have for the DTT platform?

We are already working with Ofcom via the Digital Frequency Planning Board (DFPB) to assess the options available for a 700MHz clearance plan and we look forward to continuing that involvement as the discussions progress with the aim of achieving an optimal plan for the benefit of DTT viewers.

In the event of 700MHz clearance, we would expect that the characteristics of the post-clearance DTT transmission network will replicate those of the pre-clearance network on a like-for-like basis – including network coverage, capacity, regionality, number of multiplexes and resilience.

Based on this required outcome, we have concerns with Ofcom's interpretations of some of its objectives relating to the benefits of DTT, which we expand on in more detail in the response to this question.

Coverage

The BBC Charter and Agreement and multiplex licences issued by Ofcom together ensure that PSB multiplex coverage reaches 98.5 per cent of households. At DSO, the PSB multiplex operators were required to build out relays at their own cost in order to ensure this coverage target was reached. We would therefore expect Ofcom to be specific that any post-700MHz clearance DTT network will continue to reach this same coverage target in relation to PSB coverage.

We agree with Ofcom's objective that a broad range of services carried on the six national multiplexes should be maintained, but believe the second part of this objective should be reworded. Post-DSO coverage of the three commercial multiplexes was around 90 per cent and this remained the Ofcom policy objective for 800MHz clearance.

For a 700MHz clearance, we believe instead of aspiring to 'broadly match'[13] existing commercial multiplex coverage, the policy should be consistent with previous changes and therefore remain 'around 90 per cent'. To reduce the reception quality for any viewers that currently receive these multiplexes satisfactorily would create a negative experience for DTT viewers, and would not be acceptable.

This is not just a national (UK-wide) coverage question for either the PSB or the commercial multiplexes. The clearance of the 700MHz band is likely to affect the ability of individual DTT households to receive their chosen national or regional service. These households are unlikely to be identified through an assessment of national coverage figures which will not reflect gains and losses in each area. We would ask Ofcom to make clear how it will ensure that DTT viewers continue to receive their preferred national, regional or local services following any clearance, in a way that will not lead to any one-off or ongoing costs.

Any reduction or loss of coverage has potential implications for the broader competitiveness of the DTT platform. We therefore believe that this objective should be reworded to ensure coverage is **matched on a local, regional, nations and UK-wide level**. Ofcom should prevent geographic pockets of loss that could impact negatively on viewers' reception and, in

[12] Ofcom, 'Consultation on future use of the 700MHz band' p 26,para 4.41
[13] Ofcom, 'Consultation on future use of the 700MHz band' p 33,para 5.3

turn, the platform, and multiplex operators should not be required to pay any costs to maintain the current coverage levels.

Ofcom notes that based on spectrum planning work conducted by Ofcom's DTT Frequency Planning Group (DFPG) 'it should be possible to develop a frequency plan which allows for the continued delivery of PSB coverage, reach and range of services similar to today through six national multiplexes.'[14] We are yet to see a plan that is able to deliver the same level of coverage as today. As such, we believe the likelihood is high that viewers in some areas will be disadvantaged. Further work is therefore necessary to develop a clear evidence-based plan, including contingency options, to mitigate this risk. Until this plan is published we do not agree that it is appropriate to state that the risk of a reduction in DTT coverage is small.

Multiplex capacity

For clarity, no reduction in the capacity of the six national multiplexes in aggregate or individually would be acceptable to multiplex operators and the platform.

Spectrum allocation and frequency planning

We agree with Ofcom's approach to favour an evolutionary approach to DTT replanning on the basis that it is likely to be the least disruptive and most cost effective solution. This agreement, though, is conditional on meeting the objectives set out above - matching the coverage and capacity of the existing network, on a local, regional, nations and UK-wide level, for all six national multiplexes after international coordination agreements have been reached. If there is a suggestion that the objectives for all six national multiplexes are not able to be met with a 'minimal change' plan, we would expect Ofcom to opt in the interests of TV viewers for a more radical plan that does meet those requirements.

Ofcom's CBA describes a range of techniques that it believes could ensure that Local TV's coverage and number of services are maintained. It is not clear how these techniques would be implemented. While we support Ofcom's intention to ensure viewers of the Local multiplex, NI multiplex and the Manchester multiplex are not disadvantaged, for the avoidance of doubt, we would not consider it acceptable for any of these suggested techniques to be implemented at the expense of the objectives set out for the six national multiplexes.

Maintaining existing network capabilities

We note that it is Ofcom's view that 'change of use of the 700MHz band could be achieved without further migration to DVB-T2[15]'. Until evidence is available to confirm that the objectives set out above can be achieved, we believe DVB-T2 is still one possible solution that should be considered to ensure Ofcom's policy objectives are met, although clearly this is only one factor that would determine a decision on DVB-T2 migration. We expand on this point further in our response to the next question.

Development of HD Free-to-Air Services

The reduction of DTT spectrum from 320MHz to 224MHz will require the interim multiplexes (COM7, COM8) to be discontinued and some HD services will cease. Opportunities to develop new and more spectrally efficient, services or research new broadcast technologies may be limited by the lack of spectrum.

[14] Ofcom, 'Consultation on future use of the 700MHz band' p38, para 5.25
[15] Ofcom, 'Consultation on future use of the 700MHz band' p39, para 5.30

Question 5: Do you agree with our assessment of the likely costs of upgrading transmission infrastructure?

Assessment of likely range of costs for network engineering

Arqiva's High Level Estimate is structured to provide a range of costs against two variations of a 700MHz frequency plan – the Single Hop plan, and the PSB MFN, COM SFN plan. It is our view that by modelling these two plans it is possible to understand more clearly the likely variance in engineering requirements and hence costs, dependent on the final plan agreed. However, given the current uncertainties around the status of the frequency requirements from our continental neighbours it is important to note that this range is indicative only, and that the combination of the final frequency plan and the detailed rollout plan could see the infrastructure costs be outside of the range provided.

We note that Ofcom has described within each plan two possible approaches to implementing these infrastructure changes. These approaches are based on whether multiplex operators are prepared to accept any loss of resilience during the transitional works – these are stated as the Standard SLA (high scope) option, and the Reduced SLA (reduced scope) option. We do not believe it is appropriate for multiplex operators and viewers to be expected to accept any loss of resilience and therefore greater risk of disruption to television services due to engineering works required for 700MHz clearance.

Ofcom justifies the inclusion of these two approaches by drawing on previous experience from DSO and 800MHz clearance. It should be noted that a 700MHz clearance programme is a different project to either of the two previous engineering change programmes and should be treated as such.

Maintaining service levels and resilience

We do not agree with Ofcom's assertion that viewers and multiplex operators may be expected to accept engineering design solutions that are inferior to the current capabilities of the existing network.

We note that Ofcom's independent broadcast consultant agrees with Arqiva's cost estimates, given the levels of uncertainty over the final frequency plan and the transitional method applied. It is not acceptable that Ofcom has chosen to discount both Arqiva's assessment and that of the independent broadcast consultant when it has taken the lower 'Reduced Scope' costs for the two plans, based on 'previous experience' but seemingly without any evidence to support this.

DTT transmission contracts and carriage contracts typically contain penalty payments should SLAs be breached. If this occurs at any point during transition due to reduced resilience there is a possibility that as well as providing a sub-standard level of DTT reception to viewers, penalty fees (potentially running into millions of pounds) would be payable by multiplex operators and, should these emerge, would need to be recharged to the project.

With that in mind, and at this stage of the planning in the absence of an agreed frequency plan and rollout plan, in order to ensure existing levels of service, to meet existing commercial contracts and to mitigate the risk of incurring significant costs for compensation, the multiplex operators would expect an engineering solution that meets the contractual SLAs. We therefore believe that the infrastructure costs estimated for the Standard SLA solution - £410 million to £470 million - should be used as a basis for costs before financial treatments in the CBA. When using the Standard SLA solution and removing the early replacement effect (see response to Question 15) the result is a material increase in infrastructure costs of between £180 million and £205 million in 2014 NPV terms (once financial treatments are applied[16]).

[16] This variance increases slightly against Ofcom's CBA when an adjustment is made to account for Ofcom's use of slightly different infrastructure costs to Arqiva's High Level Estimate. For example, the

Ofcom notes that 'decisions taken regarding the approach to ensuring network resilience during the transition process would have a significant impact on the timescales and costs of implementing change of use of the 700MHz band.'[17] We agree with this statement, and, as noted above, believe that the CBA costs and timescales reflect the realistic requirements to meet the multiplex operators' current SLAs.

Coverage loss mitigation

Ofcom has set out its rationale for not including costs for a DVB-T2 migration in its CBA. We agree with Ofcom that there is a risk of a coverage reduction as a result of this 700MHz clearance, however as noted earlier, there is insufficient evidence to conclude that the risk is necessarily small. In the frequency planning process to date we are yet to see an emerging plan that matches existing coverage on a local, regional, nations and UK-wide basis. We feel therefore that there is a material risk that coverage will not be matched. It is not yet clear whether the impact will be great or small.

Given that uncertainty, caused by the unclear status of the international negotiations – a situation that we will not have clarity on for a number of months yet – we feel it would be prudent to retain further deployment of DVB-T2 as one possible tool to mitigate coverage losses which may materialise as a direct result of 700MHz clearance, although clearly this is only one factor that would determine a decision on DVB-T2 migration, and we recognise that any T2 migration would carry wider costs.

Furthermore, we note that Ofcom has not included *any* costs for mitigating a potential coverage reduction. As well as a possible DVB-T2 transition, other forms of possible mitigation to help overcome viewers losing services include:

- Aerial replacement or realignment
- Building new relays
- Rolling out commercial multiplexes to existing relays
- Funding platform changes[18]

On the basis that no coverage mitigation costs are included, Ofcom has implied coverage would be replicated, in which case as discussed earlier the objective should be made more explicit to match the coverage and capacity of the existing network, on a local, regional, nations and UK-wide level.

In the event that significant mitigations - as set out above - are required it is not clear how this will be captured in the Ofcom CBA process given decisions are due to be taken before the international frequency plan is agreed.

Local TV and programme management costs

Arqiva has estimated a cost of approximately £20 million to reconfigure the Local TV network – given the absence of an agreed frequency plan and a solution for Local TV post-700 clearance, it is not possible for us to comment on whether this cost is appropriate.

Ofcom has stated that it expects the cost of managing the infrastructure change programme to be approximately £20 million. Ofcom explains that this cost is calculated proportionately by comparing the cost of DSO programme management and allocating a cost of two-thirds

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Arqiva HLE sets out costs of £310m and £360m, whereas Ofcom deployed £306m and £353m in its modelling. The variance, post financial treatments across both the Reduced Scope and Standard Scope costs is between £4 and £7m. This produces a final CBA variance of £187 and £213.

[17] Ofcom, 'Consultation on future use of the 700MHz band' p 42, para 5.43

[18] During 800MHz clearance, Government agreed that up to £10,000 per affected household would be made available to assist those that required a platform change to restore some form of TV service. http://stakeholders.ofcom.org.uk/binaries/consultations/949731/summary/condoc.pdf

based on the fact that it estimates between 30 and 40 of the 50 main stations might require changes. We would again like to point out the risk of basing costing on experience gained from previous projects, and would also like to highlight the absence of any grants process in the DSO programme, which would be necessary for 700MHz clearance and would increase the proportional cost. We would expect the total programme management cost to include administrative effort for Arqiva, Ofcom and the multiplex operators. Without having sight of the breakdown it is difficult to assess whether the current cost does include costs for all parties but we ask Ofcom to ensure that it does.

Earlier replacement

As discussed in more detail at Question 15, we do not agree that, in these particular circumstances, the infrastructure costs should be discounted for earlier replacement. A proportion of network infrastructure costs are transitional costs (e.g. temporary masts) and, being a function of clearance process itself, it is not appropriate to apply an early replacement calculation; for other categories, such as antennas and masts, parts already in place can have an expected life considerably longer than the 25 years assumed in the CBA.

Question 6: Do you have any comments on our assessment of the timeframes within which it might be possible to complete a DTT replan?

We note that Ofcom's timetable shows a programme that spans from 2014 to 2022 and DTT clearance events running from 2019 to 2021. Ofcom notes that this is based on the timescale provided by Arqiva and we agree that this timetable appears feasible if there are no significant delays to any phase of the work and funding is made available as required. This timetable requires that the first phase of work – a full assessment of current DTT antennas – is completed in 2014.

Risk from delayed commissioning of preparatory works

We are aware at the time of writing that the 2014 work which was due to begin in January has not yet been commissioned. As explained in the 3 July 2014 letter from Digital UK to Ofcom, this delay means completion of the infrastructure assessment will now not be possible during 2014. This is likely to mean that at least some, if not all, of the heli-test programme will have to move to 2015 given its dependency on fair weather. This will, in turn, delay any conclusions related to antenna replacement requirements, which will have a direct impact on the scale and scope of the re-engineering programme, and potentially consequential delays to the expected date for release of the spectrum.

As well as being time-critical, this initial assessment is also vital. Without it, the multiplex operators will not be able to identify implementation options for their infrastructure that are appropriate to ensure they both mitigate the risk to DTT services and represent value for money.

Without this assessment, it would also not be possible for multiplex operators to consider any proposals regarding the required operational level of resilience during any clearance programme. This relates to the requirements for temporary masts at critical sites or other means of maintaining the services (such as split antenna working) which will have to be agreed before any clearance timetable can be confirmed.

Assessment of timeframes

We are therefore supportive of the timetable outlined in Ofcom's CBA, as long as there are no further delays to any phase of the programme, including its funding arrangements. If there are further delays, and some of the earlier sites in the implementation programme need temporary masts, the timetable will be put at risk. On that basis, we are not able to support Ofcom's suggestion that the timetable may be brought forward, 'possibly by up to

two years.' [19] We do not consider it realistic to suggest acceleration until Ofcom can provide evidence to show how such acceleration would be practicable.

Question 7: Do you have any comments on our assessment of the loss of value from existing DTT services in case of a change of use for the 700MHz band?

The 600MHz spectrum is currently used by the DTT platform to make a range of services available via DVB-T2 broadcast infrastructure on the new HD multiplex(es) licensed to Arqiva. In the event of 700MHz clearance, the new HD multiplex(es) would close.

In the light of the potential loss of this spectrum from DTT, Ofcom calculates the lost value as the difference between:

- The costs of transitioning the entire DTT platform to the DVB-T2 broadcast standard; and
- The operating cost saving of moving from 8 to 6 multiplexes

We believe that this approach fails to capture the full loss of value, as the calculation does not consider the lost value to consumers from change of use - i.e. the loss of services on the new HD capacity. This treatment differs markedly from the approach taken by Ofcom in assessing benefits where consumer willingness to pay is accounted for (as set out in paragraph 4.41).

More broadly, we note that in the absence of any plans for 700MHz clearance, the 600MHz spectrum would have been auctioned to new bidders, with a strong likelihood that it would have been allocated to DTT on a long-term basis. As a result, 700MHz clearance would remove the long-term potential for expansion of the DTT platform, resulting in a potentially significant loss of consumer value when compared to the counterfactual of no 700MHz clearance.

On this basis, and given the scale of the DTT platform, we consider that the value that consumers place on the lost services carried on 600MHz spectrum may in aggregate be higher than the £80-£100m estimate.

More broadly, any transition of the DTT platform necessarily results in some negative impact on the platform, as consumers are prompted by change to switch to other platforms which are not subject to such transitions. A poorly funded and executed transition plan runs the significant risk of material churn from DTT, which could start to undermine the ability of the platform to fulfil its important role in delivering key public policy outcomes.

Question 8: Do you have any comments on our analysis of the implications of potential changes for DTT viewers and for the platform? Are there any effects that may be important to viewers that we should consider further?

We are pleased Ofcom considers that the clearance of 700MHz would not negatively affect viewers' perception of the platform or undermine it in any material way. We trust this means that Ofcom and Government will put in place all measures necessary to guarantee that outcome including:

- Confirming that **DTT viewers will not be required to pay any of the costs** that will result from the clearance process (i.e. aerial replacement or realignment for any TV set - be it for their primary or secondary TV set; support where required with re-tuning; provision of filters where needed to mitigate interference; and any measures required to address a reduction in coverage of one or more multiplexes)

[19] Ofcom, 'Consultation on future use of the 700MHz band,' p 44, para 5.55

Ensuring any solution is consistent with existing policy objectives for DTT coverage, and the process should aim to **minimise the impact on viewers**We would anticipate that these measures are appropriately applied and the programme is well-managed, funded and planned effectively to minimise the impact on viewers, and we explain elsewhere why the costs of viewer information and support should not be borne by the existing authorised users of the spectrum. However we are concerned that in the consultation document Ofcom downplays the effect of 700MHz clearance for consumers in a way that minimises the very real impact the process will have on those TV viewers affected.

While we agree that retuning is now manageable for most (with some exceptions; see below) the prospect of more than 100,000 homes needing to replace their aerial is a substantial viewer impact, especially as older, vulnerable and low income households may be disproportionately affected by the need to replace aerials.

Ofcom describes the scale of aerial replacement as affecting only a 'small proportion of viewers'.[20] However, the homes that will need to replace their aerial will be scattered across the 50-75 per cent of the country based on Ofcom's own assessment, necessitating a very widespread (if not national) communications campaign.

Consumers will also find it very hard to determine if they have a wideband or grouped aerial that might need replacing. Many will require professional assistance to ascertain what kind of aerial they have. Enabling viewers to take pre-emptive action, rather than risk losing access to television, will pose challenges for both viewers and any co-ordinating body.

We elaborate on these points below, but first explain why care should be taken when drawing parallels with switchover and 800MHz clearance, and summarise the likely overall scale of the consumer impact of 700MHz clearance.

Care should be taken with comparisons to switchover and 800MHz clearance

The consumer impact of 700MHz clearance is different to that of either switchover or 800MHz clearance. While we would expect that any 700MHz clearance would be managed with the same level of detailed, timely planning and focus on the consumer, we would caution Ofcom against making certain assumptions based on the success of those two previous programmes.

Switchover delivered significant benefits to TV viewers as Freeview was rolled out to the whole country. 800MHz clearance offered no real benefit to TV viewers, but did not require any consumer purchases since it had no aerial impact. A 700MHz clearance will entail some of the costs and inconvenience of switchover but with none of the direct benefits of extending digital television coverage. It will also be hard to explain to consumers the somewhat remote prospect of increased mobile data capacity as justification.

For all these reasons it seems that 700MHz clearance has greater potential to generate disruption and dissatisfaction for DTT viewers. We believe that Ofcom underestimates the level of risk associated with the consumer impact of these changes.

Around one quarter of the country will need to retune and may need a new aerial

We broadly agree with Ofcom's estimation that 14-20 million homes (50-75 per cent of the UK) are in areas that would need to retune and that c.100,000 will need to replace their aerial.

However it will be impossible to identify in advance those homes that:

(i) are using DTT,
(ii) have a grouped aerial, and
(iii) have a grouped aerial that would stop working satisfactorily at clearance.

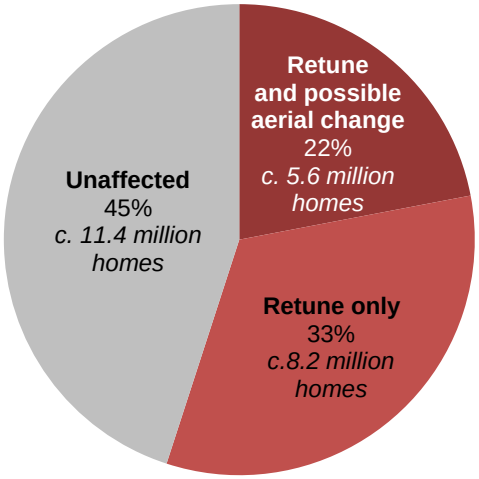
[20] Ofcom, 'Consultation on future use of the 700MHz band,' p 54, para 6.10

As such we expect that all homes in C/D aerial group areas – likely to be five to six million households – will need to receive communications explaining the issue and the potential need for aerial replacement.

We note that while the majority of homes in group C/D aerial areas are watching main transmitters, these frequencies are also used at a wide number of smaller relay transmitters up and down the country. These scattered clusters (in some cases just a few hundred homes) will be hard to target for communications. This will inevitably necessitate a wide-reaching communications campaign in order to ensure that all homes are captured. See below for further explanation of the geographical distribution of C/D aerial homes.

We estimate that in aggregate nearly one quarter of UK homes would need to retune and are in geographic areas that may need a new aerial; a further third would need to retune only; and around 45 per cent would be unaffected by 700MHz clearance.

Consumer impact of 700MHz clearance



Note: This assessment is based on analysis of an early (May 2013), draft version of the Single Hop frequency plan, which is not finalised and is expected to change. It accounts for homes served by the 80 6-mux main stations, and hence only 25.2 million of the 28.5 million UK homes, though we would expect the proportions of those needing to retune and/or possibly needing to replace their aerials to be similar for the remaining DTT viewer homes.

Retuning is generally manageable but not always straightforward

With appropriate communications and support we agree that retuning is now a manageable process for most, but Ofcom should bear in mind the following:

- That around half of the 700MHz clearance events[21] are expected to result in Freeview viewers losing all of their TV channels; i.e. viewers will be confronted by blank screens until they perform a retune. This is very different to 800MHz clearance where generally only one or two multiplexes changed frequency and so only a selection of channels disappeared. With this more severe impact at 700MHz clearance we expect viewers to react more rapidly, as there will be a more pressing need to restore their TV services. This in turn will drive, for example, higher spikes of calls to any contact centre, and hence higher costs. We return to this point in our response to question 9 below.
- Some viewers will require significant help to manage a retune. Less technically confident viewers will often require a local electrical retailer or aerial installer to come to their home to do the retune for them.

[21] Analysis of the provisional May 2013 Single Hop frequency plan shows that 46 per cent of homes affected would lose all six national multiplexes (excluding the 600MHz multiplexes). A further 13 per cent would lose at least one PSB multiplex and 41 per cent would lose commercial multiplexes only.

- Some types of retune are more complex than others. For example in areas of overlapping signals viewers may need to conduct a 'manual retune' to programme in the frequencies for their desired TV region. In these situations the process may take far longer than the five minutes Ofcom assumes (and generate more and longer phone calls for assistance).

Many homes will need a new aerial as a result of 700MHz clearance

The requirement for aerial replacements is a significant DTT viewer impact arising from 700MHz clearance that did not occur for 800MHz clearance. We are supportive of Ofcom's inclusion of the estimate for aerial replacements in its CBA, however we have comments around some of the assumptions used in the Ofcom modelling. As a result we believe the number of wideband aerial upgrades required is slightly higher than Ofcom's calculation of 80,000-90,000 homes, at just over 100,000.

In calculating this number we have used a 75 per cent DTT usage figure (we understand Ofcom has used 68 per cent in its analysis, although it discussed 75 per cent in the text within the CBA document) and a 32 per cent grouped aerial figure, taken from the Digital UK Wideband Aerial Penetration Model shared with Ofcom in April 2014. We also believe it correct to use 2020 as the point in time to model the wideband aerial penetration figure – Ofcom has used 2022 in its model, at which point we are expecting clearance to be complete and any impacts to have already been felt. We are happy to share the detail of our calculations with Ofcom.

In the same analysis we have also identified an additional number of households – omitted from Ofcom's calculations - that are predicted to experience a change in reception levels caused by 700MHz clearance. These homes would no longer meet the criteria for being 'served' by DTT[22] from their existing transmitter. In some of these cases, aerials could be redirected (which in cost terms we assume is the same as being replaced as many aerials once installed are unable to be redirected without damage) by a professional installer to pick up a reliable signal from an alternative transmitter. In other cases, no reliable signal may be available. We estimate the number of households in these categories to be up to 300,000 based on the current draft Single Hop frequency plan using Optimised Europe assumptions.

While Ofcom may wish to account for this omission in its analysis, we would acknowledge the high degree of variation in how such coverage changes may be experienced by viewers, including not being apparent at all in some cases.

In total our assessment shows between 100,000 and 400,000 homes that could require some form of intervention – either a new wideband aerial, adjustment to their existing aerial or additional measures to restore a reliable TV service. While we believe the actual number of homes requiring intervention to be towards the lower end of the range, we believe Ofcom should consider making provisions to cover a higher number, given the uncertainties over the final frequency plan, the international coordination outcome and likely number of additional homes seeking a replacement given the difficulties in communicating the messaging as set out below.

In the context of implementation, we would welcome the opportunity to discuss with Ofcom and Government how best to establish the actual scale of this issue with a view to identifying those homes that might need intervention and ensuring adequate resources are in place to provide support to those who need it.

[22] DTT coverage is based on households in an area of 100m x 100m being served 99 per cent of time at 70 per cent of locations

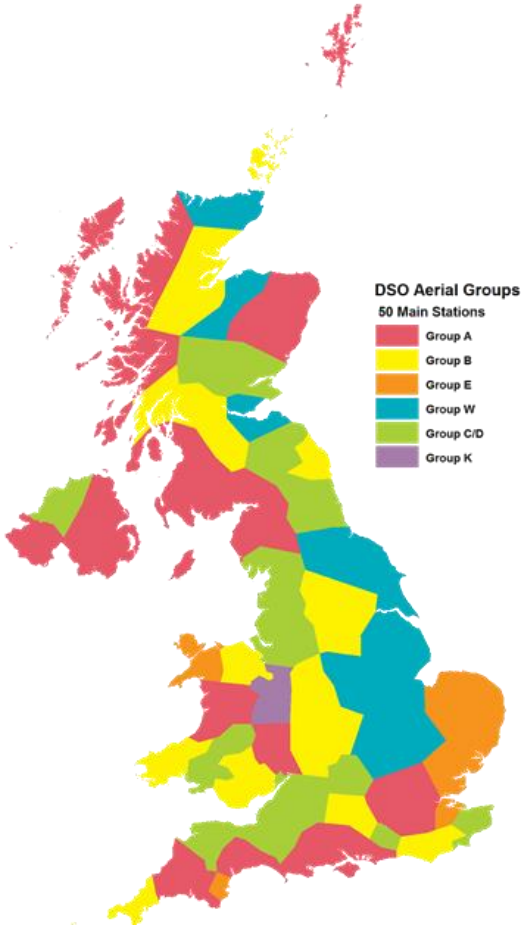
The requirement to replace aerials will be widely dispersed across the country

Even if the number of homes needing to replace their aerial is – as should be hoped – at the lower end of our estimates, then these homes will nonetheless be very widely scattered across the UK.

The areas covered by the 50 main stations where group C/D aerials are used (shown in green on the Ofcom map below) are themselves geographically diverse, but group C/D aerials will also be used at hundreds of the 1,100+ relays used to serve small populations of some hundreds or thousands of homes, often in more remote areas.

The distribution of C/D aerial use will therefore be a mix of larger blocks of homes where C/D frequencies are used at main transmitters, as well as a scattering of small clusters of relay homes all across the country. As discussed above, this is likely to necessitate an element of both nationwide communications and more targeted local information.

Map of C/D aerial areas (of main stations only)
Source: Ofcom



Consumers will not be able to identify their aerial type

As noted above, many will not know whether they have a wideband or grouped aerial. This is in marked contrast to switchover for which most viewers knew whether they were watching analogue or digital television.

Even if a communications campaign raises basic awareness of the potential for aerial changes, it will be hard without professional assistance for a typical viewer to ascertain (from ground level looking up at their roof) what kind of aerial they have.

This significant consumer uncertainty will have a number of effects:

- Both viewers with grouped and wideband aerials may not know whether or how they will be affected by the clearance event, and even those already with wideband aerials may need to consult a professional installer to establish that this is the case, potentially incurring cost in the process.

- Responding to this kind of consumer uncertainty is likely to require a different communications approach and arguably more sophisticated campaign than was required for 800MHz clearance.

- Unlike previous clearances, a 'wait and see' approach to aerial replacement would not be appropriate owing to the high numbers of households likely to lose access to most or all multiplexes, and therefore at risk of being left with a significant or total loss of DTT service.

- The combination of uncertainty and risk of serious disruption makes pre-emptive action by consumers to avert serious disruption both more important and arguably more difficult to deliver than with previous events.

In light of these factors we believe more work needs to be done by Ofcom in conjunction with the DTT stakeholders to consider practical measures which would help minimise viewer uncertainty and inconvenience. We look forward to working with Ofcom on these questions.

Particular risks to vulnerable viewers

We are also concerned that older, vulnerable and low income consumers will be disproportionately affected by the need to replace aerials. These individuals are less likely to be the early adopters who had wideband aerials installed in order to get Freeview before switchover. So it is likely that viewers with grouped aerials will be disproportionately older, vulnerable and on low incomes.

The planning process should also consider that measures are put in place to ensure any aerial replacement scheme is managed effectively with an accreditation process implemented to prevent any potential scamming issues and unscrupulous installers targeting vulnerable viewers.

Interference from mobile handsets remains poorly understood

It is clear from the lack of detail in the consultation document that the scale and impact of any interference from mobile handsets in the 700MHz band to Freeview remains poorly understood.

Whereas interference from the 800MHz band was from mobile base stations into rooftop DTT aerials, interference from 700MHz is expected to be primarily from mobile handsets into rooftop DTT and set-top aerials. This is much harder to model with any certainty, and will be harder to identify, diagnose and remedy in the real world. For example, should your neighbour in a terrace of houses be using a mobile handset which is causing interference to your aerial, then it will be difficult for you to identify the source of disruption and resolve it, i.e. ask your neighbour to remove the disruption. We also believe there is a material risk of interference from mobile base station transmissions to amplified DTT receiving systems.

Neither of these two scenarios has yet been sufficiently considered by Ofcom in its Annex 10 assessment and require further consideration. Mobile base stations may cause overload of amplified DTT receiving systems, and it should be borne in mind that overloading effects are cumulative and the addition of 700MHz services to a base station already operating at 800MHz may be sufficient to create overload effects where these were not apparent before.

We would also attach greater importance to set-top reception than Ofcom does in its Annex 10. It may be the case that the DTT network was not planned for set-top reception, but nevertheless approximately a quarter of DTT receivers rely on internal aerials[23], in many cases for the primary set, and have done for a great many years. Often such households use set-top aerials because they have no access to an external antenna system, and no realistic means of procuring such access. We do not believe that Ofcom would wish to disenfranchise such households by discounting such interference and removing a service that they have previously been able to freely enjoy. We would recommend that additional qualitative assessment of the impact of mobile handsets into set-top reception of DTT is commissioned to better understand the likely scale of this effect, and believe that Ofcom should make an allowance in the CBA for mitigating interference to set-top reception, noting that ceasing to use a mobile device in the same room as the set top aerial may not be a reasonable or practical mitigation.

With regards to handset transmit powers, we believe it is important to understand the worst-case impact since this gives an upper bound on the scale of any possible interference. We agree that the most likely scenario is that handsets will generally operate at much lower powers, but we cannot comment on the validity of assuming that all handsets operate at 9dBm since this is based on ITU document 5-6/81-E which is not in the public domain.

We agree that mobile devices are likely to operate within an implementation margin relative to the regulatory limit, but there is no certainty that they will. Given the resistance of manufacturers to the proposed tighter CEPT limits, it cannot be assumed that there will be much margin in any deployed handset performance. It is therefore prudent to model the worst case to obtain an upper bound on the scale of any possible interference.

We believe it is too early and inherently difficult to draw firm conclusions as to the scale of interference arising from the introduction of LTE services at 800MHz and to use this as any proxy for the scale of impact of mobile services operating at 700MHz. Currently the extent of the base station network is limited; not all blocks are in operation and bases station powers are typically much lower than the licensed limits. All these factors determine the number of interference cases reported.

The reasons for the perception that current coexistence models overstate the vulnerability of households to interference are extremely complex and still being understood. A significant factor is that the modelling is based on licensed base station parameters, rather than the much lower powers and better-performing base station equipment currently being employed. Were the MNOs to report the actual powers and ACLRs of the equipment in use, then the modelling is likely to become more representative of the observed outcomes.

We hope that it is true that the scale of noticeable interference will be low, and agree that where a household is able to determine the source of the problem, and is provided with adequate support, the resolution of the interference should be relatively straightforward. There will no doubt be useful lessons to be learned from at800 in this area.

The allowance for mitigating interference of up to £20 million appears reasonable providing this sits alongside a thorough and separately costed consumer support programme, as we discuss further in our response to Question 9.

We welcome Ofcom's commitment to do much more work done in this area – including both desk studies and then real-world pilots – before any mobile use of the 700MHz band can commence. As with the interference from the 800MHz band we would expect to work closely with the mobile operators to ensure that any such interference is carefully mitigated.

[23] Digital UK Report 'Domestic Receiving Systems Set-top and Loft Aerial Usage' http://www.digitaluk.co.uk/__data/assets/pdf_file/0009/86976/indoor_aerial_update_20120426.pdf

Ofcom does not consider the potential for coverage changes

As noted above, Ofcom makes no mention of the potential for coverage changes which our analysis suggests may affect up to 300,000 homes, in addition to the c.100,000 homes predicted to need to replace their aerials.

Any reduction in coverage in one area (even if offset by gains in other areas so that the UK-wide net effect appears minimal) could be manifested as a less reliable Freeview service or complete loss of one or more multiplexes; perhaps their whole TV service. Conversely, any households predicted to gain coverage (i.e. who were not previously served by DTT) will most likely have already sourced their TV service from an alternative platform, and so will not notice the benefit.

As the frequency plan is developed, Ofcom will need to analyse carefully the outputs to identify any locations of coverage loss and work with the multiplex operators to identify suitable solutions, which (as we describe in our response to question 5) might involve anything from building new relays to funding platform changes for households.

Question 9: Do you have any comments on our consideration of consumer information and support measures and on the factors we should focus on in the next stages of work?

Ofcom estimates that £30 million will be required to fund the consumer information and support necessary for 700MHz clearance. This figure is arrived at on the basis that 800MHz clearance information and support cost £5.3 million for the release of two UHF frequency channels, and 700MHz will release 12 UHF channels and so might cost six times as much.

In practice these costs are not driven by the number of UHF channels released but by the type and number of messages to be communicated, when and where they need to land, and what consumer support (financial and practical) will be required to see DTT viewers through the changes with minimal disruption.

In our response to Question 8 we have explained why the consumer impact of 700MHz clearance is markedly different to that of 800MHz clearance in both its scale and its nature. We would also note that whereas 800MHz clearance was completed in just nine months, 700MHz clearance is anticipated to take three years to implement, and as such the communications and support will need to maintain momentum and impact for a much longer period of time. While 800MHz clearance can provide some useful guidance we should be wary of drawing too close a comparison between it and a 700MHz clearance.

In response to this question we therefore elaborate on the scale and type of communications and support that will be required for 700MHz clearance; and the need for a scheme to provide financial support for aerial replacement and realignment and additional practical support for vulnerable viewers.

Communications and support will need to be widely available

Based on our experience of delivering communications and support for both switchover and 800MHz clearance we expect that the campaign for 700MHz clearance will need to include the following elements:

- Regional or national TV advertising to raise general awareness of the changes, where this can be sufficiently targeted to be cost effective;
- Local press advertising to convey the more specific messages, including the need to retune, and the possibility of aerial replacement;
- Direct mail to provide more detailed information particularly to those in group C/D aerial areas about the possible impact on aerials and what action they might need to take;

- On-screen MHEG messages which are particularly effective at communicating targeted messages to the DTT audience;
- An outreach programme to work with charities to support those older and vulnerable people who are not otherwise helped by the aerial support scheme discussed in further detail below;
- A viewer advice line and website support to advise consumers on how clearance might affect them and guide viewers through retuning;
- A postcode checker to support both the advice line and website, through which any agent or consumer can check whether or not a household is likely to be affected by clearance and so provide appropriate advice;
- A retailer, installer and communal housing campaign to raise awareness among professionals who will need to manage the change on behalf or others or enquiries from the public;
- Media, stakeholder relations, and public affairs (including a regional presence) to optimise media interest to help inform viewers and manage political interest; and
- Research to test communications and monitor consumer readiness and response to clearance in each region.

In addition there will be staff and overhead costs to deliver any clearance programme, including programme management and broadcast infrastructure co-ordination for frequency planning; rollout planning, engineering, design and implementation; and any related grant administration.

In advance of a fully developed implementation plan, we cannot accurately cost the communications and viewer support. However, based on the complexity of this event and our previous experience, Ofcom's estimate should be considered the baseline of a range of £30m-£40m. This figure does not include the costs of operating a scheme to provide viewers with new aerials and to deliver additional practical support for vulnerable viewers, set out below.

An aerial replacement support programme and practical support for vulnerable groups

We do not believe Ofcom has considered costs for an aerial replacement support programme and practical support for viewers in its CBA. We believe that it must be a condition of 700MHz clearance that DTT viewers do not bear the cost of change of use of the band. As such we believe that there should be an aerial support programme which could:

- Provide financial assistance to anyone needing a new aerial (for any TV set) as a result of 700MHz clearance; and
- Provide an additional level of end-to-end practical support to vulnerable groups.

For the general population, a simple voucher scheme to fund the £150 cost of an aerial replacement or realignment may suffice.

For the purposes of the CBA calculation Ofcom has used an early replacement cost for aerial replacement. In practice, viewers would reasonably expect to be reimbursed for the full cash cost of replacement and not a fraction of that cost based on when they may theoretically have replaced their aerial in the future.

For vulnerable groups, an additional level of end-to-end practical support should be available whereby the aerial support scheme will manage the process on behalf of the customer.

The criteria for eligibility to this additional level of support could be the same as was used for the Help Scheme during switchover: those over 75, on certain disability benefits, living in a care home long-term and those registered as blind or partially sighted. Eligible vulnerable

people might also be provided with practical support for retuning (and a home visit where necessary) where needed.

As outlined above, a pre-emptive approach should be explored to prevent serious disruption to viewers – especially in those areas with multiple multiplex frequency changes. The alternative might be that some people may lose most or even all their television services for an extended period while waiting for an aerial installer appointment.

We believe more work needs to be done by Ofcom and DTT stakeholders to consider practical ways to minimise viewer uncertainty and inconvenience. With that in mind, we are keen to engage constructively with Ofcom and Government to explore all options which would minimise disruption viewers..

Question 10: Do you have views on the activities that Ofcom and other stakeholders could undertake now to help ensure that DTT equipment that consumers might buy in the coming years is as future-proof as possible?

Since switchover, Digital UK has advised viewers seeking to replace their aerial to install wideband models. However we note that the drive to only install wideband aerials is not a complete solution. Current wideband aerial models either receive up to channel 68, or more recently, channel 60. Both designs will receive more signal from mobile base stations operating in the 700MHz band than is necessary, and neither is optimised for receiving DTT over the range of channels that will remain in use. If the 700MHz band is cleared for mobile use, it will become necessary to encourage the introduction of a new, narrower 'wideband' aerial covering the channel range 21–48; the range covered by the old aerial group K. Should the clearance of 700MHz be confirmed we would welcome the opportunity to work with Ofcom and the aerial industry to promote the development of a revised wideband standard, and encourage its manufacture and adoption by installers.

We support Ofcom's desire to improve the resilience of TV receivers to interference arising from services operating in adjacent bands, and also to improve mobile handset performance to limit out-of-band emissions. Such improvements will be increasingly necessary over time as spectrum becomes even more intensively used. New conformance tests will be required to reduce LTE terminal interference to TV and this carries an associated cost in developing the test waveforms, agreeing appropriate specifications and developing new tuner technologies to coexist with bursty LTE-UE waveforms operating at smaller frequency offsets.

Digital UK, Freeview and DTG are working together to lead the co-ordination of a programme of work in this area and, with support from the wider industry, it should be possible to identify innovation opportunities which seek to improve the overall experience for viewers affected by 700MHz clearance. As well as aerials and improvements to receiver performance, we are also exploring options for a more consistent retune experience for viewers, including those with connected sets.

Question 11: Do you have any comments on our assessment of the impact of change of use of the 700MHz band would have on PMSE?

Many DTT stakeholders have an interest in the future of the programme making and special events sector (PMSE), either as licensees or as organisations which rely on wireless audio for the making of programmes.

We welcome the thoroughness with which Ofcom has addressed this difficult question. We have considered for some time that the impact on PMSE of a clearance of 700MHz would be profound and the consultation appears to bear this out. It is striking that, in spite of the challenges facing PMSE after any loss of the 700MHz band, only now has necessary alternative spectrum been identified to support future productions. Regrettably, it is by no

means certain that this spectrum will ever become available for the sector as we are aware of opposition from existing users in the proposed bands to any sharing arrangements.

One obvious extrapolation of this is that, in the absence of any additional low frequency spectrum, any further incursion into spectrum sub-700MHz would risk serious consequences for PMSE and for the productions that it supports. For a number of years, Ofcom and policy makers around the world have been referring to the 'need for a solution' for PMSE. Proposals for a clearance of the 700MHz band mean that that answer now needs to be forthcoming.

The annex to the consultation demonstrates the problems faced by PMSE and the scale of the challenge that Ofcom must overcome if events of national prestige can be sustained in their current form. Effectively, the broadcasting of a number of landmark events, such as the BBC's Children in Need or Glastonbury, would be put at risk without urgent and yet-to-be-identified remedial action.

Moreover, the planning of the 2012 London Olympics required access to 392MHz of interleaved spectrum with the 2014 Glasgow Commonwealth Games requiring 320MHz. It is unclear how future events of this scale and prestige could be hosted when the quantity of available interleaved spectrum is reduced to 224MHz.

Ofcom has not yet taken into account expected increases in demand over the coming years to keep pace with broader technological advances and increased expectations of viewers and audiences of high quality production values.

We are concerned that a number of other high profile risks are not explicit in Ofcom's analysis. London's West End theatres, a major cultural and economic asset, have significant demands for spectrum. For instance, we understand that some productions can require in excess of 100MHz of high quality interleaved spectrum. Unfortunately this has been lost in an analysis where 'West End Theatre' has been treated as one amorphous whole, requiring 3038MHz of spectrum. We would strongly suggest that Ofcom unpacks what this means for each individual production so that the scale of the risk to PMSE is adequately understood.

We set out in our responses to section 9, our concerns relating to assumptions made which affect the costs of clearing PMSE from the 700MHz band. However, we dispute Ofcom's assertion that equipment choices made between the publication of this consultation and the clearance of the 700MHz band are unaffected by that clearance. Ofcom is repeating a similar error it made in the clearance of the 800MHz band before the completion of digital switchover. The notion that PMSE users can buy equipment using interleaved spectrum *as it is configured today* but that equipment will not be at risk of being rendered unusable after 700MHz clearance is demonstrably incorrect. The configuration of interleaved spectrum will change post 700MHz clearance. PMSE users cannot know the new configuration ahead of clearance. Users will be forced into buying equipment ahead of clearance with no guidance as to whether it will be usable afterwards.

Elsewhere, we welcome Ofcom's regard to the *quality* of spectrum for PMSE use. Historically, the only criterion for PMSE spectrum access through Arqiva PMSE (latterly JFMG) was avoidance of interference into DTT reception.

Question 12: Do you have any comments on the mitigations for loss of access to the 700MHz band including whether we have correctly identified the replacement bands suitable for further study and whether we have correctly identified actions that the PMSE industry could adopt to improve spectrum efficiency?

We appreciate the consideration that Ofcom has given to mitigating the loss of spectrum for PMSE.

However, these mitigations have been put forward by Ofcom a number of times over the last decade in its engagement with the PMSE sector namely:

- *Using spectrum more efficiently*: PMSE represent one of the most efficient of all users of spectrum. Apart from using spectrum on a shared basis with primary DTT use, it already deploys audio equipment in an acutely efficient way – as Ofcom accepts in paragraph 7.33;

- *Using digital technology:* There are some limitations on the use of digital technology that Ofcom are well aware of (principally, latency, battery life and cost). We note that digital PMSE equipment does not currently offer any improvement in spectrum efficiency compared to analogue equipment. There have, of course been improvements in digital microphones in the last few years but there will always be challenges to deploying this technology in certain environments; and

- *Managing demand centrally for large events:* Again, this is already common practice and will increase in the future due to the new spectrum leasing provisions. However, this, in itself, will not significantly alleviate the essential problem facing spectrum planners (we note that PMSE Arqiva already deploy skilled planners for special and major events).

We are encouraged that Ofcom has, for the first time since mobile demand for low frequency spectrum emerged, sought to identify new bands for potential future sharing arrangements for audio PMSE. Work on sharing in L-Band is ongoing and, we understand, shows some promise. However, while we stand ready to assist Ofcom and existing users in assessing the viability of PMSE sharing these bands, we would caution that initial feedback from existing users suggests that such provisions may be challenging.

The criteria for identifying new bands for future PMSE use on a sharing arrangement in Table 7[24] can be improved. First of all, the importance of internationally harmonised spectrum appears to be overplayed. PMSE users generally (though not exclusively) operate within national markets, as was set out as part of the reasoning behind Ofcom's decision to allocate channel 38 for exclusive PMSE use in 2008. Also, the criteria of spectrum not being identified as a candidate band for mobile appears to rule out 470-694 MHz, which is still under vigorous discussion in international fora ahead of the World Radiocommunication Conference in 2015. Moreover, PMSE is itself a mobile use of spectrum. It is, therefore, perverse that a mobile allocation of spectrum should preclude access to mobile services.

We do, however, strongly endorse the criteria that any spectrum should be allocated below 2GHz and are grateful to Ofcom for recognising the restrictive nature of spectrum which would be suitable for audio PMSE access.

[24] Ofcom, 'Consultation on future use of the 700MHz band,' p 66

Question 13: Do you have any comments on our assessment of the impact of the change of use of the 700MHzband on the TVWS availability?

We support Ofcom's view that the uncertainty surrounding the timing and extent to which White Space Devices (WSD) will be deployed using TV White Space (TVWS) means that no account should be taken of any change to the value of that use arising from the proposals set out in this consultation.

We welcome the extensive modelling and field work that industry and Ofcom is continuing to conduct to fully understand the likely impact of WSD on DTT reception and PMSE applications. We note that, until this work is complete and Ofcom has determined whether the currently proposed technical parameters for ensuring co-existence with DTT are appropriate, it is not possible to fully determine the likely impact of reducing the amount of spectrum by 96MHz on TVWS availability across the UK. However, we do agree that TVWS availability will vary region by region.

We support the omission of relay transmitters and Local TV from the post-clearance spectrum scenario since frequency planning is not yet at a sufficiently advanced stage to include these in a meaningful way. However, while Ofcom has made it clear that the comparison uses the current on-air DTT plan, including the additional multiplexes and Local TV services as a baseline, it is not clear whether this plan also includes the relays. We do not believe Ofcom has given adequate explanation as to the basis of the opinion that omission of the Local TV services from the Single Hop plan (and if included in the baseline plan, the relays), does not have a material impact on TVWS availability.

Additionally, we note that the Ofcom trials in Watford have shown that it may be necessary to protect more transmitters in some areas than is currently proposed in order to protect actual viewer choice, which will inevitably have an impact on TVWS. It has long been known that many households can satisfactorily receive DTT signals from transmitters outside their official service area. The reasons for such use are complex and varied, but it is often the case that the official coverage of a transmitter is constrained by an allowance for time-related interference from co-ordinated continental transmissions that may not be (and may never be) in operation, and hence the real-world coverage is much larger than predicted.

We welcome Ofcom's proposal to undertake additional work to develop and improve understanding of these findings.

We welcome the recognition that PMSE requirements may reduce the amount of TVWS in areas of high PMSE activity and believe this is inevitable. The complete absence of TVWS in spectrum in areas supporting dense PMSE may undermine the business case for some TVWS services.

Question 14: Do you agree with our use of the Spackman method for discounting both the costs and benefits of change of use?

<u>The use of the Spackman Approach</u>

We note from Ofcom's consultation documentation that the Spackman approach is used in analyses which result in a broader public benefit, but where capital costs are funded by private firms.

The use of the Spackman approach implicitly assumes that public funding would not be deployed in support of change of use. This is, as Ofcom sets out later in the document, is a matter for Government to decide upon.

Specifically, paragraph 9.15 of the consultation document sets out the categories of cost which are to be supported by private funding: 'Therefore, in the context of this CBA, using the Spackman approach only has an effect on the DTT infrastructure costs, PMSE replacement costs and DTT opportunity costs relative to discounting every cost at the STPR.'

However, later on, in section 11, Ofcom sets out the possible sources of funding for both DTT infrastructure costs and PMSE replacement costs as follows:

- DTT infrastructure costs: (a) DTT consumers; (b) DTT multiplex operators; (c) future 700MHz licencees; and (d) Government

- PMSE replacement costs: (a) PMSE users; (b) future 700MHz licencees; and (c) Government *(DTT opportunity costs are not assumed to be funded)*

Ofcom is explicit in setting out in paragraph 11.3 that 'any decisions as to whether or not public funding would be involved are a matter for Government'.

We therefore seek assurances from Ofcom that its approach does not pre-judge an ultimate decision from Government as to whether public funds would be involved.

Broader considerations on the source of funds for change of use

It is also important to note that the application of the Spackman approach on the benefits of change of use recognises that these may be private. The key categories of benefit which are subject to the approach include savings in mobile network spend to meet mobile data demand, and to deliver improved performance.

Ofcom recognises that some of these savings may accrue to the mobile network operators in paragraph 4.16, where it states: 'We would expect that a *significant proportion* [but not all] of the savings would either be transferred to Government as auction receipts, or passed onto consumers in lower tariffs (than otherwise might arise) or through improved performance and coverage'.

It therefore seems clear that there is a material chance that *at least some* of the benefit will flow to future mobile 700MHz licensees.

It is equally clear that the DTT multiplex operators and PMSE users, who are listed as potential private sources of funding, would derive no benefit whatsoever from change of use, and potentially material costs (beyond the direct costs of change of use).

We believe that it is entirely inappropriate to levy costs on one set of private organisations (multiplex operators and PMSE users) in a programme which appears likely to deliver at least some private benefits to another group of private organisations (future mobile 700MHz licensees). This is equally inappropriate where existing public funding (in the case of certain multiplex operators) is diverted away from agreed and defined public purposes for potential private benefit.

Moreover, any 700MHz clearance process must respect the legal rights of the DTT multiplex operators, who hold Ofcom licences and/or are lawful users of spectrum under the BBC Charter and Agreement. The licensees' substantive and legitimate expectations, including unencumbered use of their allocated spectrum, free from any interference, have underpinned their very significant long-term investments in DTT infrastructure.

The multiplex operators are willing to co-operate in a clearance process on the basis that they are left no worse off than they would have been absent any 700MHz clearance. It follows from this that – in the event of 700MHz clearance – broadcasters (whether commercially or licence fee funded), multiplex operators and consumers should not incur any additional costs that might result from this process. In particular, a 700MHz clearance programme would require costs to be incurred in order to re- plan DTT networks in such a way that maintains DTT coverage, number of multiplexes and the number of channels on the platform.

In conclusion, we suggest that any funding of change of use should come from eventual beneficiaries (future mobile 700MHz licensees), and that if public funding is sought this does not compromise other benefits delivered by existing publicly funded organisations. In

particular, the TV licence fee should not be used to fund clearance of the 700MHz band as this would have an impact on production and delivery of content to viewers. Any other approach risks distorting commercial outcomes, and trading one set of existing public benefits for another, This in turn would bringing about additional costs which would need to be properly considered within the CBA.

Question 15: Do you agree with our approach to estimating the cost of early replacement or should we be considering the full cost. Do you have any comments on how we have estimated the costs of early equipment replacement?

We do not agree with the approach to estimating the cost of early replacement and believe that, given the specific circumstances of this clearance, Ofcom should be using full costs in its analysis. Our response to this question is structured according to those categories of cost which are subject to this treatment.

Infrastructure costs

Arqiva has shared costs for two infrastructure implementation scenarios with Ofcom, for the 'Single Hop' plan and COM SFN plan. The costs of each of these plans are further ranges according to whether a standard or reduced SLA is assumed, as set out below.

DTT Intrastrutcure Costs (£m)	Single Hop Plan		COM SFN Plan	
SLA level	Reduced scope	Standard	Reduced scope	Standard
2013 cost pre financial treatment	310	410	360	470

Ofcom's analysis reduces these costs on the assumption that this investment represents a bringing forward of spend that would take place at a later date, driven by three high level assumptions, including:

- DTT having an asset life of 25 years
- The equipment having on average been installed in 2010 as this was towards the end of DSO and 800 MHz clearance; and
- A WACC of 7.7% (pre-tax real), based on the Analysys Mason report for Administered Incentive Pricing

The costs are then subjected to the Spackman approach as outlined above. The net effect of *both* the early replacement assumptions and the Spackman approach result in costs which are broadly very similar to the untreated 2013 real prices (outlined in the table below)[25]. These have been arrived at by flexing the cost input assumptions provided by Arqiva in the Analysys Mason model shared by Ofcom.

Removing the early replacement effect from the calculation results in a material increase in the costs of between **£60 million and £100 million**, as outlined in the summary table below[26].

[25] It is noteworthy that these outputs differ materially from the 2014 NPV referenced in paragraph 9.19 of Ofcom's consultation document which sets out a resulting 'NPV cost estimate of between £305 million and £355 million depending on the DTT band plan used'

[26] We note that Ofcom has used slightly lower infrastructure costs in its modelling than suggested by Arqiva's High Level Estimate (HLE) as referenced in Ofcom's consultation document (Reduced scope single hop £306 vs.

DTT Intrastrutcure Costs (£m)	Single Hop Plan		COM SFN Plan	
SLA level	Reduced scope	Standard	Reduced scope	Standard
2013 cost pre financial treatment	310	410	360	470
2014 NPV with early replacement and the Spackman discounting appproach	312	413	362	473
2014 NPV with the Spackman discounting appproach, but excluding the early replacement treatment	375	495	435	568
Delta	**- 62**	**- 83**	**- 73**	**- 95**

Furthermore, the DTT multiplex operators strongly believe that the application of the early replacement cost in this instance is inappropriate for four key reasons:

1. A substantial portion of the infrastructure costs relate to transitioning DTT from one frequency plan to another. These transitional costs, which include labour, the building of temporary masts are not consistent with any activity or expenditure that would be undertaken in the future to maintain or upgrade the DTT platform. In this regard these costs are exclusive to 700MHz clearance and should not be offset against notional later investment in DTT infrastructure. The precise level of these costs will depend upon the final transition plan that is agreed.

2. Ofcom's estimation of the asset life of DTT infrastructure is unduly short. While the remainder of the costs (beyond the transitional costs) will see new infrastructure deployed (including antennae, combiners etc), these items typically have an asset life of much longer than 25 years - commonly of 50 years.

3. The multiplex operators have no certainty as to the future of the DTT platform beyond c.2026, which represents the later point of expiry of the last of the multiplex licences. As there is no certainty of the future of the DTT platform beyond this point, there are no plans to replace DTT infrastructure in the future. We expect that the life of the existing equipment is sufficient to take the DTT platform to substantially beyond even this point.

4. Given the long lifespan of the infrastructure that would have to be replaced and that the infrastructure is relatively early in its lifecycle as it was installed as part of DSO and 800MHz clearance, we do not believe that the normal rate of maintenance would change substantially if new infrastructure were deployed due to 700MHz clearance.

We also note that programme management costs and Local TV costs are also subject to the early replacement treatment, which should be excluded for the reasons outlined above. The removal of this treatment increases these costs by a further £8m.

While an early replacement calculation may have validity as part of a theoretical exercise within the scope of a cost benefit analysis any business case for funding needs to consider the full costs of replacement, to explicitly account for all cash costs.

£310m and Reduced scope COM SFN £353 vs. £360m). The overall effect of using the published HLE numbers is to increase total infrastructure costs by £4-7m, which in turn increases Ofcom's published range of £370m to £420m for DTT infrastructure costs to £380m to £430m once rounding is accounted for. This adjustment is reflected in the pure DTT infrastructure costs in the table above.

Aerial costs

In line with our position on DTT infrastructure costs, we believe that assuming early replacement costs is inappropriate. It seems clear that where consumers require a new aerial due to 700MHz will expect full funding of replacement where funding is made available.

It is simply impractical to assess or audit the age of each aerial replaced as part of the replacement process, and assuming an average aerial age would unnecessarily penalise those consumers who had just purchased and installed a new aerial.

PMSE equipment

The asset life of PMSE equipment is clearly important in determining the impact of bringing forward spending to 2020-2022. Paragraph A12.24 refers to the Ofcom position on Channel 69 as being an assumed asset life of 15 years (with PMSE users themselves estimating a level of 16.8 years). Ofcom will be aware that the principal use of wireless microphones in Channel 69 was toward the lower end of the market and community use. However, PMSE use of interleaved spectrum is more toward the higher end professional user. We would expect this equipment to be more robust and to have a much longer asset life than the 15 years assumed for Channel 69.

Therefore, we would argue that Ofcom's assumption of a 10-15 year asset life for 700MHz and sub-700MHz equipment is too short. More robust professional or higher-end products would intuitively have a longer asset life than community lower end equivalents. Our expectation would be for an asset life of at least 20 years.

Question 16: Do you agree with our overall assessment of the costs of change of use of the 700MHz band?

We have set out our view of Ofcom's assessment of the costs of change of use, by category below.

DTT Infrastructure Costs

Please see our response to Question 5.

Aerial replacement and mitigating coverage changes

As set out earlier, our analysis suggests that between 100,000 and 400,000 households may be adversely affected by change of use of the 700MHz band, and could require an aerial replacement, realignment or improvement. We note the possibility that some of these households may need additional engineering measures, such as new relay sites, to restore DTT, but assuming all of these could be mitigated with an aerial, at an average cost per household of £150 this would amount to a cost range between £15m and £60m. While we expect that the number of aerial replacements *required* is likely to be towards the lower end of this assessment we believe Ofcom should consider making provisions to cover a higher number, and in the context of implementation, we would wish to discuss with Ofcom and Government how best to establish the actual scale of this issue with a view to identifying those homes that might need intervention and ensuring adequate resources are in place to provide support to those who need it.

In line with our response to Question 15, we believe that it is inappropriate to assume early replacement costs in the case of aerials and furthermore that the costs should be accounted for throughout clearance (and not at the end of the programme in 2022). We therefore believe that Ofcom should use a cost of £15m to account for the costs of aerials and their installation, with this cost felt at the mid-point of the clearance programme, before applying discount factors to arrive at a Net Present Value.

As set out in our response to Question 9, a further provision would need to be made to cover the administration of the aerial support programme and practical assistance to vulnerable groups.

Consumer information costs

Ofcom's estimation of consumer information costs of £30m, is at the low end of the £30-40m range we have estimated. Our estimation, based on the experience of both DSO and 61/62 clearance accounts for the differences between 61/62 clearance and the likely requirements of 700MHz clearance.

Consumer retuning costs

Digital UK's analysis suggests that the time taken for consumers to retune is between 6 minutes (for an automatic retune) and 13 minutes (for a manual retune). On this basis Ofcom's estimate of 5 minutes for re-tuning is likely to be optimistic, and we suggest instead that Ofcom uses a benchmark of 8 minutes (which is broadly consistent with average call handling times in the Freeview Advice Line).

More important, however, is Ofcom's assumption that consumers have just one television set. It is more realistic to assume that affected households have at least two television sets which would need to be retuned. Taken together with a longer retune time would increase these costs from £7-10m to c.£20-30m.

Co-existence costs

As set out in our response to Question 8, there are many unknowns around the scale and impact of interference from new mobile services and we cannot comment on costs at this stage.

We note that Ofcom appears to have omitted two categories of potential interference in its assessment – mobile handsets into in-home DTT equipment, and interference from base station transmitters to amplified DTT systems. We suggest that Ofcom tests the materiality of the omitted factors, to see whether the cost assessment for co-existence should increase.

DTT loss of value from using the spectrum for mobile services

Please see our response to Question 7.

PMSE equipment costs

We recognise the significant challenges of assessing the costs of PMSE equipment replacement, in particular the difficulty in assessing the amount of equipment that would be affected.

Recognising the challenges in this work, we believe the assumptions regarding PMSE asset life and the greater costs of more agile equipment could significantly increase Ofcom's cost estimate. Because of the general uncertainties of how many users will be affected by these changes, it is hard to quantify that increase with any great precision. However, an uplift of between 50% and 100% would be credible, albeit on costs which account for a much smaller proportion of the total change of use costs.

Due to the nature of the licensing arrangements for PMSE, we understand that it is extremely difficult to derive an accurate picture of how much audio equipment will need to be replaced as a result of any clearance of the 700MHz band. This was clearly the case, for example, with clearing channel 69 as part of the 800 MHz band release.

Therefore, we agree that the best (if limited) way of informing how much PMSE equipment is likely to be affected by any 700MHz clearance is through a customer survey, such as Ofcom has carried out.

We are unclear on the role of Channel 38 (606-614 MHz) within Ofcom's analysis and would be grateful if Ofcom could provide clarity on how it has taken account of this channel.

The asset life of PMSE equipment is clearly important in determining the impact of bringing forward spending to 2020-2022. Ofcom's position on Channel 69 was an assumed asset life of 15 years but it will be aware that the principal use of wireless microphones in Channel 69 was toward the lower end of the market and community use. PMSE use of interleaved spectrum is more toward the higher end professional user. We would expect this equipment to be more robust and to have a much longer asset life than the 15 years assumed for Channel 69 and our expectation would be for an asset life of at least 20 years.

We welcome Ofcom's approach of marking up the value of equipment to take into account the higher costs involved in deploying more frequency agile equipment. However, we consider that the 20-40 per cent level may understate the uplift required. The re low and mid-range equivalents to existing equipment may not be available in the market with sufficient frequency agility to meet the needs of PMSE users. Equipment with significant tuning ranges tends to be exclusively high end. Therefore it is perfectly plausible that to enable continued use of the more challenging spectrum environment, PMSE users will have to upgrade the level of equipment from, say, mid-end to high end by necessity. This will inevitably involve a far greater uplift than the 20-40 per cent proposed.

PMSE users will need to change equipment within the next eight years with no picture of the configuration of spectrum in a post-700MHz clearance. This will lead to a situation whereby some equipment in 470-694MHz will still need to be replaced as a result of clearance, even if bought in the knowledge that 700MHz clearance has been proposed for 2020-2022.

We recognise that it would be difficult to model the actual impact of this, but there will inevitably be a cost for some PMSE users because of this and this should be taken into account.

PMSE loss of value

We note the difficulties in assessing loss of value to PMSE users, and believe that Ofcom has taken a reasonable approach to assessing this. It seems likely that a greater number of events will require experienced RF engineer support, and we are comfortable with the range of £10-13m suggested by Ofcom's analysis.

WSD loss of value

We agree with Ofcom that given current uncertainty over the deployment and take-up of WSDs, it is hard to quantify the loss of value resulting from the reduction of interleaved spectrum, should 700MHz change of use go ahead.

700MHz and the role of administered incentive pricing for terrestrial broadcasting

In July 2013 Ofcom announced its intention to apply administered incentive pricing (AIP) to terrestrial broadcasting once it had made material progress on its UHF strategy. This followed a consultation process in which multiplex operators set out clearly why the underlying principle of AIP – namely the incentivisation of more efficient spectrum use - could not apply to DTT.

Those arguments focussed on the inability of broadcasters to unilaterally change their use of spectrum because of:

- The problems with changing to more efficient transmission standards (eg, DVB-T2) because of the large number of legacy receivers being used and the risk of a large number of viewers losing reception of all TV services;

- Obligations on multiplex operators to maintain a specified coverage level (98.5% for PSBs and around 90% for commercial) meaning that releasing spectrum to the market is not technically feasible; and

- The requirement to co-ordinate frequencies with other countries, which is led by Ofcom and cannot be assured of a desired outcome.

The validity of these arguments has been confirmed by this cost benefit analysis.

The level of regulatory-led coordination required to change the use of UHF broadcasting spectrum is shown to be very significant indeed. Yet, still uncertainties remain around how an optimal outcome can be achieved for either DTT or mobile. It is therefore unclear how broadcasters could ever be expected to affect such a change without the lead of Government and regulator. Our ability to unilaterally secure more efficient use of spectrum of the magnitude envisaged by AIP principles is shown to be limited in the extreme.

With that in mind, we expect the role of AIP for DTT to be part of the ongoing dialogue with Ofcom in the context of its *Free to View* discussion process. We look forward to that discussion in the coming months.

Question 17: Do you have any comments on our assessment of the impact of earlier or later change of use of the 700MHz band?

Ofcom sets out that earlier or later change of use is unlikely to materially change the scale of costs, primarily as the most substantial cost (DTT infrastructure) is not very sensitive to change of use.

We broadly agree with this assessment regarding a later change of use, as DTT infrastructure costs are unlikely to diminish much and even if other costs do decline materially, they are of a significantly smaller scale. However, we note that there are very significant challenges in accelerating change of use, and should this be possible it is likely that DTT infrastructure costs, as well as other cost lines would rise.

Question 18: Do you agree with our proposal that we should make the 700MHz band available for mobile broadband?

As made clear in our summary to this response, our concern is to ensure that any clearance programme is managed in such a way that it protects the integrity of the platform and minimises any disruption to the c.75% of UK homes which use DTT for television services. We support the continued development of the mobile communications sector and the important services it provides, which we believe can sit alongside the strong terrestrial television service that underpins the UK's highly regarded broadcasting industry.

Ofcom recognises the important role of DTT in its document *'Future of free to view TV'* - which we look forward to responding to in due course - and we are pleased that Ofcom concludes that the clearance of 700MHz presents no risk of any damage to the platform that could undermine DTT's competitiveness.

Ofcom adopted 'DTT mitigation criteria'[27] during the previous 800MHz clearance, and we believe that a similar approach will be necessary to deliver a 700MHz clearance programme.

[27]Ofcom 800MHz clearance Statement, (pp 4 – 6), 30 June 2009

We trust this means that Ofcom and Government will put in place all measures necessary to guarantee this outcome, including the following critical conditions:

- **DTT viewers do not bear the costs that will result from any clearance process**

- **The multiplex operators who are the existing authorised users of the 700MHz band should be left no worse off than they would have been without 700 MHz clearance and should not – including any use of the TV licence fee – be required to meet the extra infrastructure, consumer, communications or management costs that would reasonably be incurred in order to clear the spectrum**

- **The impact on viewers will be minimised with existing DTT coverage and capacity nationally, regionally and locally maintained**

- **The 470-694MHz band will be retained for DTT use in the long term**

We believe that any decision to proceed with the clearance of DTT from the 700MHz band must be accompanied by these criteria.

While use of the 700MHz band for IMT would likely take place in accordance with an internationally agreed mobile band plan, we recognise there are some frequencies, notably the guard band between 694-703MHz and the duplex gap, which might be suitable for other users. Ofcom should consider how this could be achieved in accordance with its statutory duty to promote optimal use of spectrum.

Question 19: Do you agree with our proposal that we should seek to implement this change at the earliest opportunity?

We welcome Ofcom's commitment to ensure that the process for the displacement of DTT out of the 700MHz band is 'carefully planned and well-managed'[28] but note Ofcom's interest in the fastest timetable for clearance. Whether it is possible to achieve clearance ahead of the 2019-2021 timetable cannot be known with certainty until an internationally agreed the frequency plan – and hence the extent of changes needed to the current DTT infrastructure – is in place and the funding arrangements have been agreed.

If Ofcom is able to begin the planning process in 2014 by commissioning Arqiva's capability assessment work (to understand the ability of the current network to operate in different frequencies), then we believe that the 2019-2021 timetable is credible. If the Arqiva preparatory work is not commissioned this year then this timetable is in jeopardy.

We believe that there should be at least two years allowed for preparing the consumer communications and support, including a programme of aerial replacement. If it were to take up to 12 months in advance of that to commission the appropriate parties to deliver the programme then we would expect that delivery bodies would need to be appointed in 2016.

[28] Ofcom, 'Consultation on future use of the 700MHz band,' p 53, para 6.1

Question 20: If, as a result of this consultation, we decided to go ahead with the proposed changes, what factors and evidence should we take into account when considering whether to hold an auction near to the time of availability of spectrum or earlier?

We have no particular view on the most appropriate time for the auction of the 700MHz band spectrum. We trust that whether the changes are funded by the future 700MHz licensees or Government then sufficient funds will be made available for the changes to the DTT transmission infrastructure and to support the scope and scale of consumer information and support we set out above. Clearly the decision on clearing 700MHz and funding that clearance predate any auction for these frequencies and sit independently of that process.

Ofcom suggests that an earlier auction could provide scope for mobile licensees to engage with DTT multiplex operators 'in ways which could accelerate change of use and thereby increase the benefits of the change'[29]. We would welcome Ofcom's views on how such an engagement might be structured and how it believes this could accelerate clearance.

[29] Ofcom, 'Consultation on future use of the 700MHz band,' p 89, para 12.3