

digitaluk

arqiva

BBC



**Response to Ofcom
Call for inputs**

**‘Future use of the 700MHz band:
Implementing Ofcom’s UHF strategy’**

11 July 2013

[BLANK]

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

1.1 About Freeview

Freeview is the cornerstone of Digital Terrestrial Television (DTT) - the UK's most popular TV platform. Freeview is universally available and offers 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%)^[1].

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

Viewers are overwhelmingly satisfied with the Freeview service^[2], and post-switchover research demonstrated that Freeview viewers enjoyed the selection of channels, picture quality and functionality of Freeview^[3].

1.2 About Digital UK

Digital UK supports Freeview viewers and channels. It provides the public with information about their options for receiving terrestrial TV and advice on reception and equipment.

Digital UK led the implementation of DSO from 2008 to 2012 and during 2013 is overseeing clearance of DTT services from the 800MHz band to pave the way for the launch of 4G mobile broadband services.

Its day-to-day responsibilities have recently broadened to encompass platform policy and strategy. It is also responsible for day-to-day broadcast operations, including management of the electronic programme guide and the launch of new services on to the platform.

The company is owned by the BBC, ITV, Channel 4 and Arqiva.

^[1] Source: Ofcom Digital TV Update, Q4 2012

^[2] 84% of Freeview viewers surveyed between April 2012 and March 2013 reported that they were satisfied with the Freeview service. Source: Hall & Partners Freeview brand tracker; sample 5,200 homes.

^[3] See the Blinc / Digital UK research report 'Viewer Experiences of Switchover', available on the Digital UK Switchover Insights website.

2. Executive Summary

We welcome Ofcom's Call for Inputs to assess the costs and benefits associated with a potential change of use of the 700MHz band. As the case for this potentially highly disruptive change to the UK's most popular TV platform has yet to be made, it is important to robustly test whether and when there would be any net benefit to UK plc. of a clearance of DTT from the 700MHz band. It is also important to understand where those costs and benefits lie, given that they are likely to be unequally distributed across consumers, the DTT platform, and any incoming mobile users of the band.

This executive summary not only highlights our shared views on the specific questions posed in the Call for Inputs but also sets out broader considerations which we believe should inform the development of Ofcom's cost benefit analysis.

We support Ofcom's plans to license interim multiplexes in the 600MHz band, in helping to develop the range of HD services on Freeview, and to maintain the competitive strength of the platform. Making this band available reinforces the importance of spectrum in enabling the long term sustainability and development of the DTT platform.

In considering the future use of spectrum by DTT and other services, Ofcom should recognise that DTT is a highly successful broadcast platform which delivers significant value to UK consumers. In particular:

- Television viewing is one of the UK's foremost leisure activities with viewers watching an average of four hours of television per day – a figure which is on an upward trend¹;
- DTT is the most popular UK television platform and is used in over three-quarters of all UK homes;
- DTT provides universal and free-at-the-point-of-use access to PSB services;
- DTT has enabled a huge expansion of choice through new commercial services and free-at-the-point-of-use content to virtually all of the UK through open standards and a horizontal market;
- In doing so, DTT has driven platform competition and innovation. This has created material consumer and citizen benefit, including the promotion of consumer take-up of digital devices, investment in high quality UK content and the stimulation of platform and service innovation;
- DTT has evolved to meet changing consumer needs and to deliver ever increasing spectrum efficiency. Over a billion pounds has been invested in a new universally available free-to-air platform, enabling the release of 112MHz of UHF spectrum through the DSO process. Furthermore, DTT delivers HD channels within existing spectrum, adopting the most efficient broadcast technologies currently available; and

¹ Ofcom Communications Market Report, July 2012.

- As Ofcom itself has recognised in its recent UHF strategy statement, there is no viable substitute for DTT for the foreseeable future. Therefore, in considering the costs associated with a potential 700MHz clearance, Ofcom's cost-benefit analysis should explicitly note that it would be more cost-effective to move DTT from the 700MHz band to alternative spectrum, than to seek to shift broadcasting from DTT to an alternative platform.

We recognise that there may be a range of potential public benefits associated with services gaining access to the 700MHz band, including the potential for future 5G mobile services, however we remain unconvinced that the case for 700MHz clearance has been made. We believe that Ofcom should carefully isolate the incremental benefits of additional 700MHz spectrum especially in light of other ways of growing capacity, particularly the use of small cells and Wi-Fi offloading. The public benefits associated with DTT as set out above, need to be maintained. With that in mind, we note that there will be no increase in the benefits delivered to DTT viewers as a result of any move from the 700MHz band to the 600MHz band. Indeed, such a move would create significant disruption and a number of associated costs. We also note that those consumers likely to feel the greatest burden of removing DTT from the 700MHz band are also least likely to benefit from its proposed new use.

Ofcom's UHF Strategy statement has identified the long term policy objectives for DTT in the UK, namely 'providing low cost universal access to the public service TV channels and in sustaining viewer choice'. In order to achieve these objectives and deliver the associated benefits for UK citizens and consumers, Ofcom and Government will need to ensure that the cost benefit analysis is based on the following outcomes being secured through any 700MHz clearance process:

- i. Sufficient usable UHF spectrum for DTT to secure the six national DTT multiplexes with at least the same coverage and regionality as today, with no reduction in the number of channels carried on the platform;
- ii. A process to ensure that any clearance minimises and mitigates disruption to viewers, thereby protecting the consumer and citizen benefits delivered by DTT; and
- iii. Protection of the remaining DTT platform by securing use of Channel 48 (686-694MHz), including ensuring that such use is not subject to harmful interference from mobile services.

In securing these outcomes, there will need to be clear, early transition plans and a confirmed timetable to minimise any costs created by uncertainty. 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 would only be willing to co-operate in a clearance process on the basis that they are put in the same position in which they otherwise 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.

Ofcom should also take account of programme management costs and consumer issues, such as the provision of public information, support and equipment changes, including the cost of aerial changes for viewers with DTT on secondary sets. We will therefore require assurance that the full costs of clearance will be borne by the beneficiaries of clearance as opposed to broadcasters, multiplex operators and TV viewers – none of whom will benefit from the clearance process.

To make an informed decision about the timing of any transition there will need to be certainty in a number of areas. In particular there will need to be a stable frequency plan agreed with broadcasters. This frequency plan will need to be based on realistic and achievable international co-ordination assumptions. In order to minimise disruption and cost, early regulatory and Government decisions will be needed to develop and execute any transition plan. This will include decisions on funding.

We also urge Ofcom and Government to carefully consider the impact of moves to clear the 700MHz band on other affected stakeholders, including Programme Making and Special Events (PMSE), Local TV, White Space Devices and radio (which we discuss further below).

This response is, therefore, informed by the crucial outcomes set out above. We also set out key central points on the future of the 700MHz band below:

- i. The success of the Freeview platform must not be undermined. Therefore, at the conclusion of any changes to the DTT platform, Freeview must be at least as strong, appealing, relevant and competitive as it is today;
- ii. Any future clearance of the 700MHz band will be informed by the DTT frequency planning scenarios currently being considered by the Joint Planning Project (JPP). This planning work is still in progress, but we note that even with an optimal international outcome, none of the planning scenarios currently under consideration would maintain the same DTT coverage as today without a migration of Freeview to DVB-T2 broadcast standards;
- iii. For the purposes of this assessment, Ofcom should be prudent and adopt planning assumptions where there is a reasonable degree of certainty that these can be delivered at international negotiations;

- iv. Freeview viewers should not be disadvantaged by a decision to clear DTT from the 700MHz band or migrate it to a DVB-T2 platform (noting that a 700MHz clearance would require changes to consumer aerials, and that a DVB-T2 transition would require consumer upgrades to Freeview HD equipment). Therefore, any decision relating to 700MHz clearance or a DVB-T2 transition would have to be accompanied by careful planning and sufficient funding to fully support viewers. This would ensure that viewer benefits delivered by DTT are not compromised in the course of any platform changes;
- v. As Ofcom set out in its UHF Strategy Statement, DTT delivers key benefits “in enabling a wider consumer choice of channels, receiver equipment and TV platforms”². We consider that the development of further HD channels on the DTT platform would contribute to sustaining this consumer choice benefit and note that this would require a further adoption of DVB-T2 on the platform;
- vi. In the event that a migration of Freeview to DVB-T2/MPEG4 broadcast standards is required in the timeframes discussed for 700MHz clearance, disruption could be minimised by aligning the timing of this transition with clearance of the 700MHz band. Specifically, in an environment where Government and regulatory decisions to migrate to DVB-T2 *had* been taken, a later and fragmented transition could prove more disruptive for viewers than a single co-ordinated set of changes on the DTT platform. Such an transition could be aligned with the timing of a planned and funded clearance of the 700MHz band;
- vii. In addition, given the disruption to DTT that would be caused by a move from the 700MHz band, consumers and broadcasters will need certainty over the future of the platform. Therefore, amongst other things, DTT multiplex licences should be extended as part of any transition process and a firm commitment should be made by government for long-term broadcasting access to 470-694 MHz;
- viii. DTT’s use of multi-frequency networks enables the widespread use of wireless microphones whose output underpins much of the content provided by both broadcasting and mobile services. Mindful that wireless microphones cannot use spectrum otherwise used by mobile broadband without suffering harmful interference, any reduction in spectrum availability for broadcasting will be likely to seriously compromise this crucial section of the creative economy.

Finally, whilst we consider that Ofcom has broadly captured the key costs and benefits associated with any clearance of the 700MHz band, we would suggest that it also takes into account a further category, namely risks attached to a clearance carried out in a sub-optimal way – including a potential loss of coverage and quality, a reduction in the number of channels available and the potential for interference from mobile signals. We note in this regard that competing TV platforms are not subject to the uncertainty and possible disruption which DTT could face, and that this imbalance could adversely affect competition in an already rapidly transforming market.

² Paragraph 4.4 of Ofcom, “Securing long term benefits from scarce low frequency spectrum: UHF strategy statement”, published 16 November 2012 (“UHF Strategy statement”).

In this context, we are particularly concerned that a clearance process which does not fully take into account the interests of consumers could lead to significant reputational damage to Freeview. This, in turn, could lead to a loss of viewers and a wider risk to the future of the platform – resulting in a loss of DTT's key contribution to platform competition and innovation, which is particularly critical given Ofcom's own view³ that there is no viable substitute for DTT for the foreseeable future. Moreover, we are conscious that viewers may be asked to undergo additional disruption to their viewing experience. They could be faced with unwanted costs with the significant efforts and challenges associated with DSO relatively fresh in their memory. Ofcom and Government should therefore ensure that this sub-optimal consumer outcome is avoided.

³ See paragraph 1.26 of UHF Strategy statement.

3. Response to Consultation Questions

Understanding the costs and benefits of a change of use of the 700MHz band

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

We broadly agree with the cost and benefit categories set out in Section 4, namely those associated with:

- The DTT Transmission network;
- Consumer equipment: Aerials & reception equipment (set top boxes and integrated DTT televisions) as a result in change of band plan;
- Consumer equipment: Aerials, as a result of co-existence issues;
- Consumer information and support;
- The opportunity cost of additional 600MHz DTT use; and
- PMSE/WSD/Local TV costs of reduced interleaved spectrum.

However, we consider the additional direct costs of planning and programme management and equipment write-offs should be included, as well as the indirect costs of viewer disruption and platform uncertainty. We provide more detail on these below.

Planning and programme management costs

Costs will be dependent on the scope and scale of the changes required to clear the 700MHz band, and lessons could be learned in this regard from the DSO programme and the subsequent project to clear broadcasting from Channels 61 and 62. Clearing DTT from the 700MHz band – with or without an associated technology change – would be a lengthy, complex and resource-intensive process. As with the DSO and the Channel 61/62 clearance programme, a change on this scale carries risks and needs to be managed carefully by all relevant parties. Extensive planning and programme management resources would be required from all project partners, including (but not limited to) Digital UK, Arqiva, broadcasters, multiplex operators, Ofcom and Government.

Infrastructure costs should include equipment and capital write-offs

There has been substantial recent investment in capital assets which face being replaced or modified as a result of any clearance of the 700MHz band. For example, antennas and combiners will not have reached the end of their equipment lifecycle before the likely dates of any 700MHz clearance. This issue was less relevant for DSO than it is likely to be for 700MHz clearance, since DSO involved the replacement of analogue equipment most of which was approaching the end of the expected equipment lifecycle.

To the extent that additional costs and liabilities are created as a result of equipment and capital write-offs caused by any 700MHz clearance process, we would expect these to be considered a cost of clearance. We would welcome the opportunity to work with Ofcom to develop and quantify these additional direct costs.

Viewer disruption and platform uncertainty

In addition to these direct costs, we believe that consumers and broadcasters would incur a number of indirect costs and that these, in turn, would create a number of risks. These include:

- The inconvenience and potential cost to viewers may lead to considerable disruption on the platform, and a resulting loss of the viewer benefits derived from the DTT platform. This increases the risk of viewers incurring significant (but potentially avoidable) costs and switching to alternative platforms in response; and/or
- The DTT operators, channel providers and others may incur additional and potentially avoidable costs arising from any unnecessary uncertainty caused by another major change to the platform, particularly while funding and timescales remain unclear.

Again, we would welcome the opportunity to work with Ofcom, not only to quantify these indirect costs but also to discuss ways of minimising them.

Other costs

It should be noted that any clearance of the 700MHz band will not solely impact on broadcasters and viewers. Users of interleaved spectrum such as PMSE, local TV and (in the future) white space devices will be impacted. Additionally, one of the lessons learnt from DSO is that other users of broadcasting masts will be impacted by the engineering works required for the clearance of the 700MHz band. In particular broadcast radio transmissions will be disrupted by the move and so there will be an impact on radio listeners and radio broadcasters during the transition process. Ofcom must therefore ensure that these costs are properly taken into account.

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

For the categories set out by Ofcom we would suggest that any assessment of these potential costs should take a number of factors into consideration as set out below.

Changes to the DTT Transmission network: Any potential infrastructure costs must be considered provisional given:

- The dependencies on the final DTT band plan;
- Decisions taken at the WRC-2015;

- Successful international co-ordination of the DTT band plan (which is some years away); and
- The infrastructure planning principles which must be agreed between the broadcasters, multiplex operators and the network operator.

Ofcom has commissioned a high-level DTT infrastructure study to assess the level of work needed to facilitate a 700MHz clearance - an ambitious and complex piece of work. We recommend that Ofcom utilises the expertise from the existing DTT infrastructure planning groups that worked effectively for the DSO and associated clearance programmes. Given the significant uncertainties and the sensitivity of the assumptions underpinning this study, we would welcome the opportunity to work collaboratively with Ofcom over the coming months as it assesses these potential costs. However, for the purposes of this assessment, Ofcom should be prudent and adopt planning assumptions where there is a reasonable degree of certainty that these can be delivered at international negotiations.

Aerial Replacement and Realignment Costs: Ofcom may have underestimated the extent and cost of domestic aerial changes required as a result of any 700MHz clearance. Unlike DSO and associated clearance programmes (which were planned explicitly to minimise aerial changes), we expect that any 700MHz clearance will require a significant number of homes to change or realign aerials. This is because the previous programmes were able to optimise the use of existing aerial groups as a key requirement of the re-planning approach. Moreover, in the case of DSO, the market delivered (and viewers paid for) the relatively few aerial replacements required, due to the increase in the number of available and attractive channels. In this case, we believe that the scale of any 700MHz clearance will require more substantial re-planning. This is likely to require a larger number of households replacing their aerials in parallel to a substantial replacement of main station antennas used to broadcast DTT services. The scale of the change will be dependent on the final DTT frequency plan which will emerge from frequency coordination agreements with our continental neighbours. As stated above, Ofcom should be prudent and adopt planning assumptions where there is a reasonable degree of certainty that these can be delivered at international negotiations.

Ofcom should also assess the direct and indirect costs of aerial changes on all DTT homes affected, not just those using DTT on their primary set. Around a third of homes use DTT on at least one secondary set, many of whom would either incur aerial replacement costs to keep these sets in use or have to meet the cost of switching to alternative free-to-air platforms such as Freesat or multi-room fees from providers such as Sky.

Given DTT's importance as a second-set platform, these potential consumer costs have the potential to drive viewers to alternative platforms. This would undermine the consumer and citizen benefits delivered by DTT, and would be detrimental to platform competition.

As a result of our concerns on this key issue, we would request visibility of the ongoing Ofcom aerial studies and the underlying data. This should enable a collaborative approach in understanding the scale of these numerous issues and how best we can collectively resolve them.

DTT receiver equipment: Consumers continue to adopt Freeview HD equipment in increasing numbers. However, in the event that a migration to DVB-T2 is required alongside 700MHz clearance, Ofcom needs to take into account the scale of the challenge facing DTT in driving the take up of HD. Before DSO, the Department for Trade and Industry estimated that only 70% of homes would voluntarily convert to DTT. This carried a far greater consumer benefit (in taking viewers from 4/5 channels to 20/40+) than a 700MHz clearance – as the latter will not deliver increased benefits to DTT viewers. We also note the challenge in incentivising secondary set conversion where HD will be less of a driver given screen size – it is notable, for instance, that few small sets currently have DVB-T2 tuners.

In this context, in particular, we note that 3 Reasons LLP's Spring 2013 market model forecasts that almost 74% of primary set DTT homes (8.9m out of 12.1m) will have migrated to DVB-T2 by the end of 2018. In terms of secondary sets, c. 63% of secondary set DTT households will be using DVB-T2 at the end of 2018. As a result, in the event of a transition to DVB-T2, over 25% of primary set DTT households and almost 40% of homes with Freeview on one or more secondary sets would need to upgrade to DVB-T2 receiver equipment to access DTT HD services on their active DTT sets.

Co-existence between users and mobile broadband: The scale of interference and the cost of mitigation will be dependent on the nature of the new mobile services and the re-planned DTT network. However, the interference to DTT from mobile handsets using 700MHz will be significantly harder to mitigate than the interference experienced as a result of 4G services in the 800 MHz band. This is because 800 MHz interference from static mobile base stations is easier to predict and mitigate than that from mobile handsets – which are, by definition, peripatetic and therefore interference from which is unpredictable. As such, we welcome Ofcom's established position in international negotiations that Channel 48 should be protected from harmful interference from future mobile services in the 700MHz band.

While studies to improve both mobile handset out of band emissions and DTT receiver performance are welcomed, the actual impact of improved DTT receivers will vary depending on the timing of any clearance. This is because of the long lead times in bringing new DTT receiver equipment to market, consumer replacement cycles and the numbers of legacy kits in use. The broader European approach to these issues needs to be considered as the UK is just one of a number of countries which influences receiver designs and standards. We therefore recommend that Ofcom works more closely with other European administrations, the European Commission and international standards bodies (such as ETSI and CENELEC) to secure a broad consensus on minimum receiver standards. This may require robust support (and possibly mandation) for any necessary changes, given the short timetables being discussed for possible clearance of the 700MHz band.

Consumer Information and Support: Any clearance of the 700MHz band and associated technology changes would require significant consumer information and support. Digital UK has experience of communicating such platform changes – including DSO and associated clearance programmes. We would be happy to share lessons we have learned with Ofcom. These include ways in which vulnerable consumers can be most effectively supported.

The views and experience of industry, consumer groups and charities should also be sought.

In addition, we believe Ofcom should undertake research to fully assess the impact on consumers and their requirements for information and support. If not already covered in the aerial work commissioned by Ofcom, we recommend that this includes:

- An audit of existing aerial types and replacement cycles;
- Consumer attitudes to aerial and equipment upgrades;
- Consumer understanding of the differing types of aerial available (we expect that the level of understanding is likely to be low, and therefore significant effort would be required to promote the need for aerial changes to consumers);
- Consumer attitudes to DTT platform changes and costs incurred; and
- Vulnerable consumers' ability to manage changes to aerials and equipment.

Expanding on the above, we note that Ofcom will need to pay particular attention to costing the level of support required by vulnerable consumers – drawing on lessons, where appropriate, from the DSO Help Scheme. For the population at large, we note that there is significant public demand for information in relation to material TV changes. For instance, DSO generated two million calls to the DUK advice line and more than half a million (580,000) people visited a DSO event in order to get face to face advice.

Opportunity cost of 600MHz band: We note that the potential for 700MHz clearance has constrained Ofcom's options in relation to the award of the 600MHz band. We recognise that this may create opportunity costs, which Ofcom should take into account in its cost-benefit analysis.

Reduction in interleaved spectrum and PMSE: We discuss the issues related to this in response to the relevant questions below.

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

Ofcom has broadly identified the relevant categories of potential benefits. However these benefits are inherently uncertain and difficult to quantify. By contrast, if Ofcom makes a clearance decision then the costs and disruption to consumers and industry of moving DTT from the 700MHz band are significantly more predictable and certain to be incurred. Therefore, in the context of developing a cost benefit analysis, the uncertain benefits of clearance would need to be discounted more heavily when compared to the more certain and quantifiable costs.

In quantifying the benefits, Ofcom should be careful to make sure that these benefits are evaluated in light of the alternative ways of meeting demand for greater mobile broadband capacity, e.g. small cells, Wi-Fi offloading, and alternate bands of spectrum. The benefits attributed to using the 700MHz band should be the marginal benefits after other available methods of meeting demand have been exhausted.

In terms of characterising the potential benefits, there are a number of observations that we would make against each, namely:

- **Meeting demand for mobile data services.** While there is clearly increased demand for mobile data services, the magnitude of those future increases is more and more uncertain. In addition, emerging industry practice demonstrates ways of meeting that demand that do not necessarily (or even most effectively) rely on additional allocations of spectrum for macro-cellular use and can effectively be met through small cell off-loading such as Wi-Fi. This is particularly the case with sub 1 GHz spectrum. We discuss this in more detail in our response below to Question 5;
- **Improved indoor and rural coverage.** There is little evidence to suggest that meeting rural coverage demand cannot be adequately addressed through existing mobile spectrum holdings. This is particularly the case following the auction of the 800MHz band (including a coverage obligation attached to one assignment) and the liberalisation of the 900MHz and 1800MHz bands. DCMS implicitly acknowledged through its £150m Mobile Infrastructure Project that rural coverage issues can be effectively addressed with infrastructure investment;
- **Reduction in mobile handset costs.** Ofcom accepts in this Call for Inputs that there is a technical limit on the number of bands that can be supported in mobile handsets. Adding 700MHz to a handset will add cost and complexity, regardless of whether or not it is internationally harmonised;
- **Effective Competition.** Ofcom notes the potential competition issues associated with insufficient availability of spectrum for mobile broadband demand. However, as explained in detail in response to Question 5, if Ofcom accepts the assumption (which we would question) that capacity constraints are to be solved by additional spectrum allocations, then sub-1 GHz spectrum is unsuitable on a number of levels for meeting that demand;
- **Downstream market opportunities.** Greater development of web-based services is to be welcomed. However, this development is taking place today and it is not clear what correlation there is to spectrum release. In particular, it is not clear that there will be any significant *incremental* benefit of 700MHz being released compared to, for example, the impact of the 4G auction and the release of 500MHz of public sector spectrum;
- **Emergency service use.** Given the ongoing discussions in Europe around Public Protection and Disaster Relief (PPDR), the ongoing government Emergency Service Mobile Communications Programme and the allocation in the United States, emergency services use is a viable candidate should this spectrum be available. However there are alternative frequencies - such as those at 400MHz - being considered for this use. Cross-border emergency services and disaster relief issues mean that international harmonisation is particularly relevant here.

We discuss a number of these issues below in our response to Question 5.

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

As noted above in response to question 3, evidence for the potential benefits of 700MHz clearance are inherently speculative, and dependent on a wide range of outcomes which cannot be predicted at this stage with any confidence. The two studies that Ofcom has recently commissioned from Analysys Mason and Real Wireless, for example, suggest many orders of magnitude in difference in their estimates of the value of 700MHz for mobile broadband.

It is relevant in this context to consider the evidence from auctions of the 700MHz band internationally. For example, the recent auction of 700MHz spectrum in Australia resulted in one-third (30 MHz) of the available spectrum remaining unsold. A number of hypotheses were put forward as to why this happened. Yet the fact remains that the supply of spectrum in this instance exceeded demand. In other words, the mobile operators did not see a way to create value for themselves or their customers from that spectrum in the lifetime of that licence. Ofcom needs to consider such real world evidence of market demand alongside any of their uncertain demand forecasts.

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

The UK multiplex operators set out their views on this issue in response to Ofcom's April 2013 Call for Inputs on World Radio Conference agenda item 1.1. We continue to hold and endorse those views and summarise the key points in this submission.

Ofcom's recent publications suggest that it has subscribed to an assumption that mobile data demand will be subject to some form of "explosive" growth in the coming years and that this growth can only be met by ever increasing allocations of spectrum to mobile broadband. We believe that this assumption is premature. There is growing evidence – based on an assessment of real world mobile data demand measurements rather than theoretical forecasting – that the level of growth will not be of the magnitude some forecasters had previously suggested. In an environment where viewing behaviour is forecast to remain primarily static and with a preference for linear consumption, Mobile Network Operators have embraced small cell solutions, e.g. Wi-Fi (in reality, a fixed solution) in preference to cellular. In addition the impacts of data tariffs are becoming clearer with consumers showing price sensitivity to pricing plans⁴.

In this environment we note the benefits that Ofcom identifies for consumers in clearing the 700MHz band. It correctly states that any benefits would be dependent on alternative means of meeting demand such as Wi-Fi or using other spectrum. However Ofcom does not comment on how successful these alternative methods would be in meeting that demand but rather focuses on the benefits *to the mobile sector* of clearing 700MHz – cheaper network

⁴ See, for example, Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2012–2017

roll-out, cheaper handsets and access to the network for more operators. Whilst this may, in theory, lead to cheaper prices for consumers, mobile operators may choose to deploy the cost savings in other ways, such as investment in other countries, or M&A (such as Vodafone's bid of Kabel Deutschland), or greater returns to shareholders. We note that there is very little evidence that the release of this spectrum is being driven by any significant consumer demand for services that need access to this spectrum.

In terms of using low frequency sub-1GHz spectrum to meet indoor demand, Ofcom acknowledges in its July 2012 statement, *Assessment of future mobile competition and award of 800 MHz and 2.6 GHz*⁵ that:

Alternative technologies, such as small cells, can be used to deliver services indoor. For example, the use of Wi-Fi in particular is widespread and deployments are growing. Wi-Fi is currently extremely important in terms of delivering data to mobile devices, especially in the home. Such alternative technologies (especially Wi-Fi, but for example also other small cell technologies such as femtocells) are likely to be important for improving coverage in certain locations or scenarios (for example, in one's own home).

Ofcom does say that this does not completely remove the need for sub-1GHz spectrum but we note that, following the clearance of the 800 MHz band, there is now 142 MHz of low frequency spectrum available for mobile broadband use. Similarly, whilst we note and welcome Ofcom and Government's initiatives to meet rural broadband demand it is not clear that there is any evidence to suggest there is a need to add the 700MHz band to the existing 142 MHz of capacity – meaning that **236 MHz of sub-1GHz spectrum would be made available for mobile broadband**. This is taking place in an environment where even the European Commission acknowledges that small cell off-loading is rapidly developing to meet any increases in future data demand⁶:

*More than half of all smartphone traffic appears to be routed over Wi-Fi networks, **and this nomadic traffic is growing 4-6 times faster than mobile traffic** [our emphasis]*

Where additional spectrum needs for mobile services are substantiated, the technical characteristics of higher frequency bands make them more suited to meeting capacity requirements. The additional capacity provided by any release of 700MHz would be negligible compared to that provided by, for example, the spectrum planned to be released by the MoD in the next few years.

⁵ *Assessment of future mobile competition and award of 800 MHz and 2.6 GHz*, 24 July 2013, paragraph 4.80

⁶ *Promoting the shared use of radio spectrum resources in the internal market*, September 2012

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

Ofcom's cost benefit analysis should be an objective and neutral assessment of the costs and benefits associated with 700MHz clearance. However we emphasise that any policy decisions informed by this cost benefit analysis should properly reflect the fact that there is an asymmetry between the likely beneficiaries of 700MHz clearance and those who are affected by the costs.

We set out at the outset of the submission that there may be potential consumer benefits from the introduction of potential 5G mobile services but that in the specific and important context of maintaining the significant benefits provided by DTT, viewers will not gain any benefit from any clearance of the 700MHz band. Rather, they may be faced with significant and costly disruption. Moreover, those consumers who do have any incremental benefit from any future mobile services in the 700MHz band are likely to differ from those who would most acutely be affected by any disruption to DTT. For instance, older viewers may not be early adopters of new mobile services, but are more likely to be users of DTT – and so would face the disruption caused by any 700MHz clearance.

Elsewhere in the broadcasting value chain, broadcasters and multiplex operators will similarly not benefit. However, in line with their legitimate expectations, they would justifiably expect to be put into a position in which they otherwise would have been in the absence of any 700MHz clearance.

The primary beneficiaries of any 700MHz clearance will likely be mobile operators who would gain access to more spectrum, allowing them to roll out new services. Government will also benefit through the receipt of auction proceeds.

Therefore, any policy decisions resulting from Ofcom's analysis will need to be appropriately weighted to reflect the above asymmetry. It would not be justifiable, for instance, to impose significant costs on consumers and multiplex operators in order to deliver benefits to mobile operators and Government. Ofcom should ensure that any 700MHz clearance is accompanied by a programme to minimise and mitigate any disruption to DTT viewers, thereby protecting the consumer and citizen benefits delivered by DTT. Ofcom and Government should also provide assurances that the full costs of this process – including consumer advertising and support, consumer equipment changes and engineering costs – will ultimately be borne by the beneficiaries of clearance⁷.

⁷ Ms Neelie Kroes, Vice President of the European Commission responsible for the digital agenda, in her recent speech about clearing DTT spectrum for wireless technologies stated "And let's ensure that the costs incurred are not carried by the broadcasters. After all, spectrum below 1 GHz is valuable. Mobile operators can hardly expect to get those amazing opportunities for free."

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

As noted earlier in this submission, DTT has brought with it a huge expansion of choice through new services and content available for free to virtually all of the UK through open standards and a horizontal market - in so doing, it has driven platform competition and innovation. This has driven material consumer and citizen benefit, including the promotion of consumer take up of new digital devices, investment in high quality UK content, and the stimulation of platform and service innovation. Moreover, as a horizontal platform, DTT delivers significant benefits across the consumer equipment value chain, including to manufacturers and retailers - with around 10m integrated digital (DTT) television sets and set top boxes acquired in 2012 alone, and with a total of around 22m DTT set top boxes and 37m integrated sets installed in UK homes by the end of 2012⁸. In this context, we emphasise that Ofcom's cost-benefit analysis needs to take into account the potential loss of consumer and citizen benefit that would arise were the DTT platform to be weakened as a result of any 700MHz clearance process - this would include the potential loss not only of DTT services, but also the wider competition and innovation benefits identified above.

⁸ Source: 3 Reasons LLP Spring 2013 Market Model.

The timing of a 700MHz release

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

We welcome the fact that the cost benefit analysis will also be used to determine the optimum timing of a clearance of the 700MHz band (should that decision ultimately be taken), and that any related changes to transmission and compression technologies will be considered in tandem. We note that international discussions may mean that the UK's freedom in deciding its own timing is limited. Therefore we support Ofcom's desire to influence those discussions to achieve the best timing for the UK's citizens and consumers.

While it is too early to identify optimum timing, it is clear that the decision will have wide implications for industry and an impact on the levels of consumer-related costs.

The speed with which the necessary technical changes can be made to the DTT network and the resulting impact on consumers should be amongst the primary factors to be considered. Significant further work is required to assess the outcome and timescales of the various DTT band planning scenarios. This work is ongoing and being overseen by the JPP Management Board. As noted earlier, for the purposes of its cost benefit analysis, Ofcom should be prudent in this area and adopt planning assumptions where there is a reasonable degree of certainty that these can be delivered internationally.

The impact of timing on consumers will be considerable. Aerial replacement will inevitably be required for some viewers and there may be a need for reception equipment upgrades in the event that DVB-T2 technology is required to deliver the outcomes noted at the outset of this response. We believe more work needs to be carried out to make more credible predictions about aerial replacement timing. However, we do consider that the replacement cycle for aerials is significant and possibly not fully appreciated by Ofcom's reference to "several years". Consumers who are affected by any clearance of the 700MHz band should not be required to incur the resultant costs and their disruption should, where necessary, be otherwise minimised. Following the very recent investment that TV viewers and broadcasters have incurred due to DSO, further costs and disruption to the platform will increase the risk of DTT being unable to deliver the public policy goals set out in Ofcom's November 2012 UHF Strategy statement.

While consumers continue to adopt Freeview HD equipment in increasing numbers – currently on the main set in more than three million homes - current modelling indicates that universal take-up will not be achieved in the timescales likely for a 700MHz clearance. This is despite the welcome decision to make the 600MHz band available for new HD services on an interim basis, encouraging consumers to upgrade to T2 receivers.

Should a move to DVB-T2 be required, such a move would require support and commitment from both Government and Ofcom. In particular, in the event that a migration of Freeview to DVB-T2/MPEG4 broadcast standards is required in the timeframes discussed for 700MHz clearance, we consider that disruption could be minimised by aligning the timing of this transition with a 700MHz clearance. Specifically, in an environment where Government and regulatory decisions to migrate to DVB-T2 had been taken, a later and fragmented transition could prove more disruptive for viewers than a single co-ordinated set of changes on the platform, aligned with the timing of a planned and funded clearance of the 700MHz band.

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

The speed at which the 700MHz band can be released will depend upon the scope, scale and complexity of the re-engineering works required to modify the current DTT network to the final post clearance configuration. The cost will further depend on the scope and complexity of the programme, related to equipment, labour and the time over which the programme has to be completed.

In order to assess the scope and complexity of the programme there is a need for certainty in a number of areas. Key amongst those are the new frequency plan and the transition plan.

A stable frequency plan drives the design of high power transmitter stations. Antennas, transmitters, combiners and feeder systems are frequency-dependent. As a result, a site by site assessment cannot, in reality, start before the frequency plan is stable.

The following will need to be in place to be able to declare a frequency plan stable:

- Certainty on the band edge between broadcasting and mobile services, particularly on the degree of protection to broadcasting at the band edge;
- Progress on international co-ordination with all neighbouring countries (and within the WEDDIP⁹ Group) such that the main station frequencies can be confirmed; and
- Acceptance and agreement from all stakeholders that the frequency plan delivers against established requirements, thereby allowing detailed design and orders to be placed.

It is possible that a stable frequency plan may not be available until c. 2015, and possibly after WRC-15. Whilst an assessment *could* commence by considering the main station frequency plan only, the impact and subsequent re-engineering works for over 1100 relays cannot be dismissed. The relay network uses off-air signals from main stations and since such off-air links may be disrupted during transition (and impaired following clearance) a

⁹ Western European Digital Dividend Implementation Platform

detailed analysis of the relay network will be required to assess the impact on relay site design. Related to this, it is not yet clear whether rebroadcast links will be practical. If this is the case, then more sites will need to be line-fed which will add to the cost.

In addition to the frequency plan, an indicative order of clearance events around the country will be required. This transition plan will allow the potential impact of the works and changes at affected stations to be identified.

Transmitting antenna works are expected to be required on a significant number of the high power sites and the number of antennas which require modification will directly impact the overall duration of the clearance programme. These works will be complicated with requirements to maintain DTT services throughout the same re-engineering works. For most of these sites, work will be required on both the main and reserve antenna systems. As an indication of the time taken to do this work during DSO, a two and a half to three year design and build programme was required to ensure antenna works were completed before the required switchover date. This provided necessary contingency against inclement weather and potential engineering issues. In the event that new or temporary masts are required to allow antenna re-engineering to take place, the associated design and planning work would have to commence approximately five years ahead of any clearance.

A 700MHz clearance is likely to result in changes on a significant number of the 1,154 transmitter sites in the DTT broadcast network. The specific scale, scope and complexity of the re-engineering programme will become clear following a detailed assessment of the frequency and transition plan, taking into account the impact on existing services. Those visits to relay sites, required for frequency input and/or output changes will require a significant level of specialised resource and test equipment. Therefore, planning will need to have regard to the availability of such resources since these will limit the number of activities that can take place simultaneously.

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

PMSE

The costs for PMSE users will vary significantly depending on the timing of release and the proportion of spectrum remaining (including channel 38). Ofcom will be aware that as a result of the re-plan of the DTT network and the consequent change in the configuration of interleaved spectrum, frequency availability for PMSE has changed since DSO. This has meant that some users of wireless microphones, in-ear monitors and talkback have had to invest heavily in new equipment to ensure that they are in a position to use these new frequencies.

In its August 2010 statement, *Clearing the 800 MHz band*, Ofcom set out its assumption that PMSE equipment could be expected to reasonably operate for 15 years¹⁰. The most recent industry reinvestment in new equipment only happened shortly before DSO ended in 2012 (when JFMG published the new interleaved spectrum configuration). Therefore, any clearance of PMSE from the 700MHz band before c. 2025 would involve further write-off of equipment before the reasonable lifecycle of this equipment has expired. The earlier the clearance, the more acute the impact will be on this sector.

Furthermore, PMSE users of the spectrum between 470-694MHz will also be affected because the configuration of interleaved spectrum will change. So, for example, if a theatre has invested in equipment that uses (say) channels 21-24 but finds that these frequencies will be used by DTT in a new broadcasting re-plan, the theatre will likely need to write-off this equipment and re-invest once again.

To further complicate this picture, the actual picture of the new configuration of interleaved spectrum brought about by a clearance of the 700MHz band will only emerge several years into the future and close to the likely timing of an actual clearance itself (a consequence of the international re-planning process). This means that PMSE users, who need to invest in equipment in the period until that time, will be forced to buy equipment that operates on frequencies which may not be available shortly afterwards.

White space devices

The picture for white space devices (WSDs) is less clear than it is for PMSE. This is because the technology is still in development and it will rely on access to spectrum on an opportunistic basis.

However, WSD services that can be proven to work without causing harmful interference to the existing spectrum licensee could offer great benefits for consumers. The UK broadcasting community has supported past WSD trials and is currently engaging with Ofcom to support its existing pilot. Whilst it is unclear, at this stage, how the *timing* of a 700MHz clearance would impact future WSD services, it would be regrettable if the reduced amount of interleaved spectrum brought about by clearance (and which would likely facilitate the use of WSDs) was the cause of frustrating development of this technology.

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

This Call for Inputs conspicuously omits reference to Ofcom's plans (as set out in its April 2013 consultation, *Spectrum pricing for terrestrial broadcasting*) to charge DTT multiplex owners administered incentive pricing (AIP) for their use of spectrum. In that document, Ofcom sets out its intention to apply AIP to DTT from around 2020.

Clearly such a move could, in theory, influence timing of a 700MHz clearance. However, we would like to re-iterate our view in this response that Ofcom has not made a persuasive case for applying AIP to broadcasting – either before 2020 or afterwards. Accordingly, in the context of this cost benefit analysis, AIP will not assist and should not be used to assist (on the basis of Ofcom's own guidance) any future clearance of 700MHz.

¹⁰ *Clearing the 800 MHz band*, 5 August 2010, paragraph 4.68

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

We set out above in this response our view that the case has yet to be made that mobile operators actually need access to the 700MHz band. In that regard, we consider it difficult to have any view on the incremental benefits of an earlier or later release for mobile broadband services.

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

We have no further response to make on this issue.

Release date determine by market mechanism

Response to Questions 14-19

In respect to options for using market mechanisms to determine the date for release of the 700MHz band, we make some general points in response to the Call for Inputs questions 14-19. These are overarching points that address the general unsuitability of using the incentive and overlay auction methods suggested by Ofcom.

Although we recognise the need to investigate whether market mechanisms could be made to work in clearing the 700MHz band, there are a number of compelling reasons why Ofcom should discount these approaches. These are:

- Multiplex licences come with an array of regulatory obligations which restrict the ability of licensees to unilaterally change how they use spectrum. This particularly relates to the provisions on transmission mode, coverage and regionality. These obligations are for public policy purposes, yet the options set out by Ofcom imply that these will somehow become irrelevant once some form of bilateral agreement on spectrum use has been reached between broadcasters and mobile operators;
- Timing of release of the 700MHz band will depend, in no small part, on international developments and the ability of other countries to clear DTT from these frequencies¹¹. Clearly broadcasters have no direct control over those decisions even though they will directly impact on when mobile services could be deployed in the UK and in other European countries;
- Unlike other spectrum bands - such as those used by mobile broadband - DTT use of UHF spectrum is characterised by the spectrally efficient practice of multiple services sharing the same spectrum; namely DTT, PMSE, local TV and (in future) white space devices. One of the implications of this is that there is more than one constituency of user that would have to agree to the timing of release with mobile operators. The risk of coordination failure in this respect would be significant;
- Ofcom has stated in the context of AIP that if it determines that a spectrum band should be cleared then AIP would not be an appropriate tool. In its December 2010 statement, *SRSP: The Revised Framework for Spectrum Pricing*, It states “we would normally look to intervene and clear the band in a planned manner rather than looking to spectrum pricing to effect such a change”¹². Therefore, if Ofcom makes a decision to clear the 700MHz band, it would logically follow that this would be achieved through direct intervention as opposed to market mechanisms; and

¹¹ As an example, Austria announced in June 2013 that it would be unable to clear DTT from the 700MHz band before 2023. It is therefore difficult to envisage how mobile services could deploy in Europe if this were, indeed, to be the case.

¹² Paragraph 4.332. There is precedent of Ofcom following this policy with PMSE access to TV Channels 61-69 before 2012

- In the very possible scenario that timing of release of the 700MHz band is determined politically and on a pan-European basis, these market-based options would be superseded by that political process.

Collectively, we consider that the above factors mean that neither incentive nor overlay auctions would be viable options for determining the timing of a 700MHz clearance. It would therefore be unwise to pursue these as credible approaches.

Impact on consumers and equipment

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

We agree that the three areas Ofcom identifies in the Call for Inputs as likely to affect DTT viewers (change of aerial, interference from new mobile services and possible platform upgrade) are relevant to the costs and disruption affecting consumers as a result of a 700MHz clearance programme.

However, we also note that a large proportion of households will be expected to carry out a retune of their DTT equipment. Our experience from both DSO and the related clearance programmes demonstrate that a proportion of these viewers (especially those who are vulnerable) will need some assistance in managing this process successfully.

We also expect that, due to the specific technical challenges involved (including, but not limited to, the need for air works, antenna upgrades and international coordination), any programme to clear the 700MHz band and relocate DTT services into the remaining UHF frequencies would be more complex and disruptive than the previous clearance programme. This will likely require greater support, both advising and helping those viewers affected by the frequency changes.

More broadly, Ofcom needs to take into account the costs associated with market preparation activity for consumers – including the costs of marketing and promoting any retunes or equipment changes. We also refer Ofcom once again to our comments in response to Question 2 regarding aerial replacement and realignment costs; receiver equipment upgrade costs; coexistence issues, and the costs of consumer information and support. We look forward to engaging further with Ofcom on these and other consumer-related issues.

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

We support the pre-emptive measures proposed in this Call for Inputs as sensible measures which should help to control some of the likely interference from mobile terminals into DTT receivers.

However, we note the Region 1 or European mobile band plan has yet to be agreed and there is continued lobbying from the mobile operators and others for spectrum to be allocated to public protection and disaster relief (PPDR) in the proposed guard band above

694MHz¹³. We note in this regard that Ofcom has stated (in preparatory policy documents for WRC-15 and elsewhere) that Channel 48 is necessary for the continued delivery of DTT services in line with Ofcom's UHF strategy objectives. Any compromise on the quality of DTT service in Channel 48 would significantly affect the ability of the broadcasters to deliver a full DTT service. We therefore welcome Ofcom's insistence that Channel 48 should be fully protected from adjacent band services (including not only PPDR, but also licensed LTE).

Any use of the guard band for such additional PPDR or LTE services is likely to significantly increase the risk of harmful interference into DTT receivers by causing an insufficient separation of frequencies between mobile and DTT (as noted at paragraph 5.14 of the Call for Inputs). It is critical that Ofcom carries out further work to quantify this impact and continues to resist any proposal which could compromise the ongoing ability of Channel 48 to be used for DTT services.

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

We welcome Ofcom's robust support for the DTT platform's ability to continue to deliver near-universal PSB coverage and an overall number and coverage of DTT multiplexes as today. We note, in this context, Ofcom's position supporting a market led transition of the DTT platform to more efficient broadcast standards.

We discuss the issue of the integration of a DVB-T2 transition alongside a 700MHz clearance programme elsewhere in this response. The DTT broadcasters are supportive of the long term adoption of DVB-T2 and MPEG4 technologies more widely on the platform. Any future 700MHz clearance will be informed by the DTT frequency planning scenarios currently being considered by the Joint Planning Project (JPP). This planning work is still in progress, but we note that, even with an optimal international outcome, none of the planning scenarios currently under consideration would maintain the same DTT coverage as today without a migration of Freeview to DVB-T2 broadcast standards.

With regard to the correct measures to support consumer adoption of DVB-T2, we agree that appropriate measures to support consumer and industry messaging will be helpful. In addition a wider pan-European approach should be considered, as the UK market is not sufficiently large to be the sole or primary driver of key manufacturer decisions. We also believe that Ofcom and Government could help provide more certainty for the supply chain and consumers about the adoption of more advanced technical standards. This could be in a similar manner to that adopted in the transition to the 8k variant of the DVB-T standard at DSO. Similarly, 64QAM was adopted and implemented by Government and Ofcom to optimise switchover.

¹³ We note that the Electronic Communications Committee (ECC) project group FM49, set up to address spectrum requirements for PPDR in Europe, signalled its support for PPDR access to the 700MHz band at its meeting on 14-15 June in Berlin.

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

Whilst welcoming ongoing technical development demonstrated by the emerging HEVC standard, it is difficult to see how a further market led platform development at this stage could be possible within the likely clearance timescale. It is difficult for multiplex operators to manage and monetise these sorts of technical transformations whilst still maintaining the low cost universal access to its services that is required by Government policy, the respective multiplex licences and the BBC Charter.

More broadly, Ofcom will need to consider that any future move toward a HEVC standard would require sufficient spectrum to be made available for DTT use to facilitate MPEG2 or MPEG4/HEVC simulcasting. In that respect, it is hard to envisage how such a transition could be possible were anything less than 470-694MHz made exclusively available for broadcasting and auxiliary services.

Impact on users of geographically interleaved spectrum

While PMSE is under particular pressure in this context Ofcom must, as noted elsewhere, ensure that the impact on other interleaved users such as Local TV and White Space Devices are also considered.

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

Ofcom appears to have understated a critical part of the PMSE sector that will likely be affected by the clearance of the 700MHz band. Namely, those who operate in the spectrum between 470-694 MHz but will be faced with a changed configuration of interleaved spectrum. This changed configuration could mean that all – or, at least, a substantial proportion of – existing equipment bought in spectrum between 470-790 MHz (and likely to have been bought relatively recently in response to spectrum changes as a result of DSO) could become unusable and so would be subject to being rendered obsolete as a result of a 700MHz clearance.

We would caution against statements such as Ofcom's paragraph 5.28 where it refers to "equipment operating below the 700MHz band as less vulnerable to potential future changes in availability of GI spectrum." This may give a false indication to PMSE users facing investment decisions that spectrum between 470-694 MHz will provide a safe haven for future frequency availability when it is far from clear that this will be the case in all circumstances.

As stated in our response to Question 5 above, Ofcom will need to be aware of the uncertainty facing those PMSE users facing investment decisions as a result of any 700MHz clearance. This will take place in an environment where the future picture of interleaved spectrum will be unknown (as a result of international spectrum re-planning).

We welcome Ofcom's commitment to carrying out further studies on mobile interference to wireless microphone receivers.

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

It is not clear what message Ofcom is seeking to put to industry when it cannot give a picture *now* of what the configuration of interleaved spectrum will be as a result of any clearance of the 700MHz band. If Ofcom are seeking to warn PMSE users to avoid buying equipment in the 700MHz band because of the potential clearance of broadcasting from that band, it needs to be clearer now how it will advise these users in what frequencies they should be buying equipment instead.

As part of the forthcoming consultation on PMSE spectrum management, we would suggest that Ofcom address this issue as part of the long term challenges facing the PMSE sector.

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

Ofcom developed a thorough approach of assessing the likely impact on PMSE users when it cleared Channel 69. This included:

- A thorough analysis of the JFMG licensing database;
- Consultation with stakeholders; and
- Discussions with manufacturers.

We suggest a similar approach should be used in this instance. However, Ofcom may find that earlier engagement with the sector than was undertaken in the events surrounding DSO would be more fruitful in finding an acceptable solution.

As with other policy proposals in relation to this band, Ofcom will need to carry out a detailed impact assessment on all incumbent and potential users.