

## **Consultation on future use of the 700 MHz band - Cost-benefit analysis of changing its use to mobile services**

### **About Arqiva**

Arqiva is a communications infrastructure and media services company, operating at the heart of the broadcast, satellite and mobile communications markets. Arqiva provides much of the infrastructure behind television, radio and wireless communications in the UK.

The company supports cellular, wireless broadband, video, voice and data solutions for public and private sector customers.

Arqiva is a founder member and shareholder of Freeview. Freeview is the largest TV platform in the UK delivering 50 digital TV channels and 24 radio stations free to the UK public covering 98.5% of UK households with the public service channels and around 90% of households with commercial services. Arqiva owns and operates the networks for all six of the established Freeview multiplexes and more recently has rolled out a further Freeview multiplex (making seven in total) to deliver additional high definition programmes on the platform for the BBC, C4 and other channels. Of these seven multiplexes, Arqiva holds the broadcast licences for three of them providing access to the Digital Terrestrial Television (DTT) platform for Broadcasters and content providers. Arqiva is also a shareholder in Digital UK who is responsible for coordinating the DTT platform's technical developments. We own Connect TV, the first company to launch a live IP streaming channel on Freeview. Arqiva was also a key launch technology partner for Freesat and is the licensed operator of Digital One – the national commercial DAB digital radio multiplex.

We are building and running a national Internet of Things (IoT) network, starting with 10 of the UK's largest cities. In addition our smart metering communications service, will connect 10 million homes using long-range radio technology, and will be one of the UK's largest machine-to-machine deployments.

Arqiva operates shared radio sites throughout the UK and Ireland including masts, towers and rooftops from under 30 to over 300 metres tall as well as a number of international satellite teleports. In Arqiva WiFi we own one of the UK's largest WiFi hotspot providers that enables us to build a unique proposition for WiFi hotspot and outdoor WiFi provision in the UK.

Our major customers include the BBC, ITV, Channel 4, Five, BSkyB, Classic FM, the four UK mobile operators, the emergency services as well as Airwave and the RNLI.

Arqiva is owned by a consortium of long-term investors and has its headquarters in Hampshire, with major UK offices in London, Buckinghamshire and Yorkshire.

## Consultation on future use of the 700 MHz band

### Summary

Arqiva welcomes the opportunity to comment on Ofcom's consultation on the future use of the 700 MHz band. The Freeview platform delivers TV to the majority of UK homes and utilises the 700 MHz band to deliver services to viewers. This platform is immensely popular due to its simplicity, coverage, and because it delivers great content for free. Changes to this platform therefore need to be considered and planned carefully so as not to cause disruption to viewing audiences.

Arqiva's view is that if a displacement of DTT out of the 700 MHz band is necessary to allow the further development of mobile services then it should happen as soon as is feasible to provide certainty to TV viewers and the industry. After the completion of the clearance process DTT viewers and the DTT industry should not be left in a worse position than they are today and the coverage, capacity and channel choice of the DTT platform should be, as a minimum, as it is today. In addition, in order to continue to serve TV viewers effectively, the platform should continue to have the ability to innovate and develop in the future. That will require 700 MHz clearance to be fully funded and properly planned.

Ofcom's analysis makes it clear that none of the benefits from a displacement of DTT out of the 700 MHz band will fall to either broadcasters or TV viewers whilst they face all of the disruption. This means that:

- Firstly, Ofcom must ensure that all DTT viewers who receive UK-wide, national, regional or local DTT services today should continue to be able to receive them after the loss of the 700 MHz band. This will require that the coverage and capacity of each multiplex should not be reduced after 700 MHz clearance. In relation to this we note that no solution has yet been identified for Local TV or the Northern Ireland Multiplex. A solution to these issues needs to be found in order to give viewers the services they value without impacting on other multiplex operators.
- Secondly, neither TV viewers nor the broadcasters should incur any of the costs associated with their displacement from the 700 MHz band. All TV viewers who face disruption to either their primary or their secondary viewing should receive support. It is important to note that on the basis of our legitimate expectations, none of the multiplex operators expect to pay for any aspect of the clearance process.

The process to move DTT from the 700 MHz band will be a very significant engineering challenge that will need planning and adequate funding. This will be a project of a scale that is comparable to Digital Switch Over (DSO). Ofcom should not under-estimate the costs involved with achieving the clearance and should not adopt the lower-end of the ranges provided by Arqiva in its planning as it has suggested it will. In any event the analysis that is used for a cost-benefit analysis is not the same as the analysis that will be used to develop a budget for 700 MHz clearance. It is important that the full costs that will be incurred are paid in order to leave those affected in no worse a position than prior to the clearance programme.

The timetable that Ofcom have included for the clearance programme looks challenging but realistic and there is no reason to unnecessarily delay clearance

once a final decision has been made. However, even to meet the current expectations requires the associated planning to be carried out in line with the timetable that Ofcom published in the consultation. Some elements of the programme have inflexible timescales that are not in our hands. These include the local authority planning processes and it would be helpful if Government could write to the local planning authorities to urge them to take a supportive role in the planning process as a result of national interests as it did for DSO. In addition, any timetable is contingent on the international negotiations being successfully concluded, this includes not just WRC-15 but the relevant bilateral and multilateral negotiations required to be able to develop reliable plans. While the international discussions are an important element in being able to finalise a plan there is a significant amount of necessary planning and preparation work that should begin immediately in order to ensure that the programme can meet the current timetable.

Ofcom appears to have prematurely dismissed DVB-T2 as an option to help deliver a successful 700 MHz clearance process. In particular DVB-T2 should be assessed to see how it may be used to minimise or avoid coverage losses and provide planning solutions in parts of the country facing international co-ordination problems. This is particularly important as Ofcom has not yet confirmed the final solution for replicating the DTT coverage that viewers receive today. DVB-T2 should be evaluated to understand if it makes DTT reception less susceptible to interference from 700 MHz LTE devices than DVB-T – another area where Ofcom have not yet had the opportunity to carry out the analysis to identify what the appropriate solution will be. In addition Ofcom does not appear to have considered whether a public policy intervention on DVB-T2 is appropriate at the same time as 700 MHz clearance in order to provide benefits to consumers and support wider public policy goals.

We welcome Ofcom's commitment to the future of the DTT platform and we look forward to responding to Ofcom's Free to View TV discussion document. In order to ensure that the clearance of the 700 MHz band is successful and allows a long term future of the DTT platform there needs to be certainty over the future of the remaining spectrum that DTT uses. Therefore Ofcom should ensure that the remaining 470-694 MHz is protected for long term broadcasting use.

## Detailed responses

### Section 4

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

The Analysys Mason approach seems to be a reasonable attempt to quantify the mobile network cost savings that may result from the potential use of the 700 MHz band for wireless broadband purposes. While the implications of their analysis are inevitably a function of the assumptions used, the range of assumptions and hence the scope of potential cost savings and performance benefits identified appear credible. Two inherently uncertain aspects that Ofcom should consider further are (a) the proportion of traffic carried over lower frequencies and (b) the growth in mobile data traffic over time. These aspects can be evaluated going forward based on 'real world' experience taking account of the lessons learnt from the deployment and use of the 800 MHz band and other bands such as 2.6GHz which will help to calibrate the projections in the analysis. We note that the identification of potential benefits does not, in itself, mean that the case for displacing DTT from the 700 MHz band has been made.

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

Arqiva's views on the various benefits that Ofcom have identified are summarised below:

- **Extending data coverage** – Ofcom observe that if the release of a cleared 700 MHz band is combined with obligations such as coverage targets then other benefits may be realised. If this is the case then the net benefit of these interventions should be considered given the cost of providing access to the band for mobile broadband services in areas that might otherwise be commercially unviable.
- **Improving performance** – the incremental benefit here is likely to be low given that the 900 MHz and 800 MHz bands are already available for the same services. Furthermore, the release of an additional 2 x 30 MHz of spectrum would constitute a relatively small additional increment of spectrum for wireless broadband
- **Consumer pricing benefits** – Ofcom does not provide evidence to justify the assumptions that cost savings will be directly translated into reduced consumer pricing
- **An easing of capacity constraints** – it is not clear what evidence Ofcom have used to conclude that there will be a material easing of mobile data capacity constraints with additional mobile spectrum at 700 MHz. Capacity constraints are concentrated in high volume areas such as stations or airports. Meeting demand in those areas will be most spectrally and financially efficient if higher frequency bands, WiFi offload or network topologies such as denser networks or small cells are used.
- **New services and technology** – the anticipated frequency plan allows for a 25 MHz duplex gap which can be utilised for additional / complementary services, e.g. PMSE, Supplemental Down Link (SDL) and PPDR as noted by Ofcom. DTT can also be deployed on a primary basis in the duplex gap and

this should also be included for consideration. In particular given that both mobile and broadcasting will be the primary users of the band under the Radio Regulations, broadcasting use should not be unnecessarily constrained. Specific observations for the possible services in the duplex gap are below:

- **PMSE** – as appropriate frequencies to support PMSE activities reduce PMSE provides a valuable use of the duplex gap particularly if it is aligned to the deployment of terrestrial broadcast services in the same spectrum.
- **SDL** – as the specific technical solution and commercial proposition of SDL is still unknown it is not possible to quantify the benefits.
- **PPDR** – whilst there is a clear demand from the public safety community for mobile broadband based systems, no harmonised European band plan for this service has been agreed. In the event that spectrum may be identified at some future point for PPDR in this band it will need to ensure that it does not compromise the provision of the DTT service in Channel 48 and below.
- **DTT services** – Ofcom proposals to clear the existing DTT services out of the 700 MHz band do not currently include a specific solution for the Northern Ireland Multiplex and the Local Multiplexes. The frequencies within the duplex gap should be considered as an option to continue delivering those services to the DTT consumers that value them today. However, in order to make this possible, appropriate operating conditions will need to be applied to the mobile broadband channel plan to enable the service.<sup>1</sup>

Arqiva encourage Ofcom to consider the full range of services that may be accommodated within the centre gap when formulating its policy and technical parameters for the gap to ensure maximum flexibility. In particular it should consider the needs of those DTT services that will be displaced by 700 MHz clearance for which Ofcom have not yet identified a solution.

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

The benefits that Ofcom identify may ultimately prove to be in the correct range but as Ofcom note there are significant uncertainties and assumptions underlying these values. In particular there are a number of benefits considered important but which are unverifiable or unquantifiable. Ofcom should therefore be cautious when formulating policy decisions that may have a lasting impact on existing services while there is still so much uncertainty. We note from Ofcom's 'Mobile Data Strategy Statement' that while there may be a compelling international move to displace broadcast services from the 700 MHz band, there is unlikely to be the need for additional sub 1-GHz spectrum beyond the 700 MHz band to support mobile broadband services before 2030. In light of the relatively modest potential cost savings that have been identified by Analysys Mason from the use of the 700 MHz band for mobile, this confirms the lack of need to further disrupt DTT viewers by clearing any part of the 470-694 MHz band that DTT services will continue to need.

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<sup>1</sup> Arqiva response to ECC draft report 53, August 13<sup>th</sup> 2014

## Section 5

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

We welcome Ofcom's objective to ensure the on-going delivery of the important benefits of DTT. Any 700MHz clearance must retain the coverage and the range of services provided to existing viewers following clearance, and the transition must be planned and funded appropriately.

The principles that Ofcom put forward in paragraph 5.12 for what would need to continue in the event of 700 MHz clearance are not precise enough. All TV viewers who have a local, regional, nations or national DTT service today should continue to receive that service after 700 MHz clearance. Ofcom refer to the continued delivery of 'near universal coverage for PSB services', and 'a broad range of services on six national DTT multiplexes with coverage *broadly matching* that achieved today'. This is not clear enough. Coverage and reach of the PSB and COM multiplexes must remain the same as today at 98.5% and 90% respectively. We also note the importance of the broad range of services delivered by the six national multiplexes and the new HD multiplexes, as well as the Local TV multiplexes and the Northern Ireland multiplex. The broad range of services delivered by the current network must remain in place after the change of use of the 700 MHz band.

Based on the current uncertainties around the likely success of Ofcom's international coordination process, it is not yet clear how the six national multiplexes would be able to achieve the same level of coverage as they do today. There would be a net reduction in the amount of spectrum available for the full range of DTT services following the change of use of the 700 MHz band. In contrast, in the case of the clearance of the 800 MHz band, there was no net reduction of spectrum available to DTT in the UK. Given that other countries are facing a greater challenge of accommodating existing DTT services in reduced spectrum, the risk of the international negotiations not delivering all of the UK's stated aims needs to be acknowledged. Ofcom should provide a fuller assessment of those risks, and also specify the alternative positions that could be adopted in the event of failure. Ofcom have not included costs in the Cost Benefit Analysis to mitigate any loss in coverage therefore it is assuming that it will secure an international outcome that does not lead to any coverage or capacity loss. Ofcom should make it clear that if the international negotiations do not deliver this outcome then mitigation costs will be incurred and will be a relevant cost in the cost benefit analysis. If any mitigation is required in order to continue to provide DTT services to those that have it today then TV viewers and the broadcasters should not be expected to pay for it.

In relation to the international discussions the success of the clearance of the 700 MHz band depends upon securing the long term future of the 470-694 MHz spectrum for broadcasting. This long term security for DTT is needed in order for Ofcom to be able to achieve the policy objectives in relation to broadcast that it included in the consultation. Therefore Ofcom should continue to work to ensure that the 470-694 MHz is protected for broadcasting use.

We are not clear what solutions Ofcom have in mind for Local TV. We are not aware of any realistic options that Ofcom have identified. In paragraph 5.26, Ofcom refer to 'a range of techniques' that it believes could maintain Local TV's coverage and

number of services. It is not clear how these techniques would be implemented and there is no evidence provided to show that it is possible to achieve all of these aims. It would not be acceptable for any of these techniques to be implemented at the expense of retaining the coverage and capacity of the existing national multiplexes. For example, the approach of ‘considering the local TV multiplex in the frequency planning process from the outset’ would not be acceptable if it led to a reduction in the spectrum available for the relay transmitters used by the PSB multiplexes, and a consequent reduction in coverage for those multiplexes.

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.’ Given the current uncertainties about the likely success of the international coordination process and the need to protect local TV, we have not yet seen evidence to confirm that this is the case. Until that evidence is published and reviewed, DVB-T2 should remain as a realistic solution to mitigate the risk of Ofcom’s policy objectives not being met and consumers being deprived of the TV services they have today. The adoption of DVB-T2 would provide more flexibility in the range of planning options available, for instance by enabling the use of larger SFNs, in the event that Ofcom’s favoured DTT band plan options cannot be agreed. Ofcom provide a range of DTT band plan options in Figure 4 of the consultation. Whilst we would not disagree with the advantages of options A and B as stated, Ofcom should make it clear that many of the alternative options in Figure 4 (including option E) would require the adoption of DVB-T2 to maintain coverage and capacity. The decision to adopt DVB-T2 in order to provide this flexibility cannot be left until mid-way through the planning and design process.

Ofcom’s analysis of the impact of 700 MHz LTE interference is based on the use of DVB-T2, yet the planning options do not mandate the use of DVB-T2. This is inconsistent. The characteristics of DVB-T2 mean that it is potentially less susceptible to 700 MHz LTE interference than DVB-T. The impact on DTT from 700 MHz LTE interference of not moving to DVB-T2 needs to be assessed, in particular when looked at in conjunction with the need to maintain the current coverage.

Finally we note that the intervention being considered by Ofcom in order to facilitate the displacement of DTT services out of the 700 MHz band clearly emphasises the fact that the multiplex licence holders have no ability to influence the utilisation of their licensed spectrum. As we have outlined in previous consultation responses dealing specifically with Administered Incentive Pricing this lack of influence and control by the licenced operators renders the application of AIP to licensed broadcast spectrum inappropriate and we encourage Ofcom to address this and recognise that there is no longer any basis to charge the broadcasters AIP for their spectrum.

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

Moving DTT services from the 700 MHz band will be a major engineering task and significantly more complex than the clearance of channel 61 and 62. This means that it is critical that the work is properly scoped, planned and funded.

The estimates that Arqiva provided for the DTT infrastructure costs under the two frequency plans remain our high level estimate based on what is currently assumed about the scope and duration of any 700 MHz clearance programme but it requires a detailed feasibility study in order to validate the costs. These costs were generated

against two variants of a potential frequency plan, however the detail of the final frequency plan remains uncertain, particularly in light of the on-going international discussions. From our analysis of two frequency plans that were considered, it is clear that the scope of changes required to DTT infrastructure will vary as the frequency plan changes.

On the basis of these frequency plans, Arqiva made a preliminary estimate of the impact of 700 MHz clearance on the transmit antennas. Given the difficulty and weather related impact of working at heights on the antennas, along with the requirement to maintain contracted levels of services with Multiplex Operators, the antenna replacement programme will be the significant driver of cost and time for the programme.

Arqiva provided Ofcom with two estimates for each frequency plan, a Standard Scope and a Reduced Scope estimate which was predicated on the Multiplex Operators accepting a reduction in the resilience of the service during the antenna works. The assumption that it would be reasonable for the multiplex operators to accept a loss in the resilience of the service from a change that was not of their making and that they gained no benefit from has not been tested with the multiplex operators. The acceptability, or otherwise, of any Reduced Scope proposals will be based on the length and severity of the impact to services. It will not be possible for multiplex operators to consider these issues until a detailed technical assessment is undertaken and a roll out plan against which timings can be defined is developed. Therefore it is not appropriate to base any costs on the Reduced Scope options until the analysis is complete and agreements have been reached with the multiplex operators.

Given the uncertainties regarding antenna performance outside of their original design frequency range, and the impact of cost and time on the programme of, in particular, antenna replacements, Arqiva recommended that a full Infrastructure Capability study was undertaken during 2014. Until that is complete, Arqiva are not able to say whether the final costs may be lower than those provided in the current estimates. We also note that Ofcom commissioned an independent consultant to benchmark Arqiva's estimates, and this concluded that these estimates are consistent and reasonable based on what is currently known. Significant further work is required by both Arqiva and Ofcom in order to validate the cost assumptions therefore we would recommend that Ofcom should not at this stage adopt the lower estimates until the analysis has been undertaken and conclusions reached from a detailed feasibility study.

Finally it is important to be clear that the re-engineering costs that will be incurred during the displacement of broadcasting from the 700 MHz band will have to be paid for and, given that TV viewers and the broadcasters do not benefit from 700 MHz clearance, Arqiva's view is that these costs should not be paid for by viewers, the multiplex operators or broadcasters.

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

If there is to be a clearance of the 700 MHz band then it is important for the good of all stakeholders that the programme ensures that the necessary design, planning and implementation work is carried out to the same high standards as DSO and 800 MHz

clearance. This will provide all stakeholders – including TV viewers, Government, Ofcom and the broadcasters – with comfort that the objectives of the programme, timescales and costs are reasonable and fully understood. It has been recognised that the cross industry assessment and rigorous planning was critical to the success of Digital Switch Over (DSO) and 800 MHz clearance, with both of these projects being delivered within time and budget.

Overall, the timescale presented by Ofcom in Figure 6 of the consultation is challenging, but realistic, noting that the issues indicated in our response to Question 5 are as applicable to timescales as they are to the costs. The timescales can be revisited when more information becomes available, including the frequency plan and roll out plan, as well as results of infrastructure capability assessments but, based on the information currently available, it is not yet clear how this timescale could be accelerated. In particular, Arqiva are not yet in a position to be able to support Ofcom's suggestion that based on their experience from previous broadcast infrastructure projects it may be possible to bring forward the timetable by up to two years. Currently there is no frequency and roll out plan available, and an infrastructure capability study to understand what is required to implement the changes to the DTT network to allow it to operate in the frequency range for channels 21 to 48 has not been carried out. More specifically in order to be able to consider if acceleration of 700 MHz Clearance might be possible the following would need to be in place:

- A locked down and internationally agreed main station frequency plan, with restrictions agreed.
- An agreed roll out order.
- Full antenna assessment, with agreement as to which antennas need to be replaced.
- High level agreement to the method of antenna replacement required for these sites, including which sites require temporary masts.
- High level agreement to the method of transmitter re-tune and combiner replacement.
- Scope of relay antenna replacement programme known.

Arqiva do not object in principle to the idea of accelerated clearance but it is important for all stakeholders that clearance is done in the most effective way. Once the elements above are in place then it will be possible to have a discussion in light of the evidence around what might be possible.

In order to appreciate the scale of changes required to DTT network infrastructure, We refer Ofcom to Annex 1 of this response which highlights the multiplexes currently operating in the 700 MHz band that will need to change frequency on each of the main transmitter sites carrying. Consequential changes will also be required, as less spectrum will be available to DTT after it has been displaced from the 700 MHz band, and as a result of international co-ordination. Additionally, at the relay stations, we expect the frequency changes will be required at almost all of these sites. This can only be done with visits to those sites to implement the changes. As these changes impact on viewers these activities will need to be co-ordinated with a public information campaign, and scheduled for specific dates.

Some elements of the programme have inflexible timescales that are not in our hands. These include the local authority planning processes and it would be helpful if Government could write to the local planning authorities to urge them to take a

supportive role in the planning process as a result of national interests as it did for DSO.

Ofcom's timetable in Figure 6 of the consultation shows DTT retune events taking place between 2019 and 2021. The changes required to DTT infrastructure will need a rolling programme of events in a similar manner to DSO. The length of this timescale will be dependent on the frequency plan, scope of changes required and the requirement for any consequential changes required as a result of the roll out plan that is going to be developed. The infrastructure capability study that was shown to be required across the course of 2014 is an important step in understanding the scope of the changes required for 700 MHz clearance. If that is delayed then the entire proposed timetable is at risk. In addition, until this is complete the multiplex operators are not able to consider any proposals regarding the required operational level of resilience.

To place into context the length of time required for major broadcast engineering programmes, the DSO programme commenced detailed design in 2005; antenna installation in the period 2006 to 2011; and transmitter installation from 2008 to 2012, in order to meet a public programme that delivered switch over on a region-by-region basis between November 2008 and October 2012.

In light of this it is important to note that in a situation where a site requires a temporary mast in order for antenna modification works to be carried out, and that site is at the beginning of a roll out programme in 2019, there is already a significant risk that Ofcom's proposed timescale in Figure 6 can no longer be achieved.

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

When considering the loss of value to DTT services Ofcom need to reconsider their base case. The situation today is that spectrum has been allocated for five DVB-T multiplexes and three DVB-T2 multiplexes. Whilst the new HD multiplexes have a bespoke notice period it has a formal end date of 2026 which is line with the majority of the other multiplexes. Ofcom note in paragraph 5.7 of the consultation "terms of the award [for the new HD multiplex] set out specifically that we would revoke the licence to enable change of use of 700 MHz if we made a decision in favour of such a change." That means that if the decision was made not to change the use of the 700 MHz then the licences would not be revoked. Therefore a situation with five DVB-T multiplexes and three DVB-T2 multiplexes is the most appropriate base case. It is appropriate to reference the viewers' perspective here – they will not be aware of any pre-stated intention by Ofcom to switch off the two new HD multiplexes at some point after 2018 – they will simply see that the platform is contracting and that HD services are being lost to make way for mobile services unless a complete platform upgrade is made to DVB-T2. This will damage the perception of the Freeview platform and deprive viewers of up to 10 HD channels.

Alternatively Ofcom should consider as the base case the situation that was in place ahead of WRC-12 i.e. the planned release of the 600 MHz spectrum on terms that would make it almost certain that it would be used for DTT services on a long term, rather than an interim basis.

In light of this Ofcom has not taken into account the loss of value to consumers from losing the TV services that would have been available to them were Ofcom to decide against displacing DTT from the 700 MHz band.

Ofcom have not included any loss of value due to a loss in DTT coverage as they are assuming that they will secure an international outcome that does not lead to any coverage loss. Given the uncertainty around this Ofcom will need to ensure that there is funding in place to ensure that any loss in coverage is mitigated should they not achieve the outcome that they hope for.

In addition, when considering the loss of value to existing DTT services Ofcom should also consider the impact on consumers from increased prices due to a reduced competitive constraint on pay TV if the ability of DTT to expand and evolve in the future is hindered by the loss of the 700 MHz band.

Regarding DVB-T2 more generally we believe that Ofcom has overlooked the valuable role a switch to DVB-T2 can play when combined with clearance and ask that it evaluates this issue in greater detail. In particular:

- DVB-T2 will drive consumer value which Ofcom has ignored in its evaluation and Ofcom has previously estimated that a platform-wide adoption of DVB-T2 could generate a 15% increase in the value of DTT to consumers – representing £15bn in consumer surplus.<sup>2</sup>
- DVB-T2 should be considered to see if it may be used to minimise coverage losses and provide planning solutions to accommodate international co-ordination requirements.
- This should also be looked at to see what impact it has on DTT reception being interfered with by 700 MHz LTE devices. In particular the interference analysis to date has been carried out on the basis of LTE to DVB-T2 not LTE to DVB-T.
- DVB-T2 supports wider policy objectives as it enables the connected / on demand hybrid future supporting the roll-out of broadband and broader e-Government initiatives.
- Ofcom note in footnote 30 of the consultation that “changing the transmission standard to DVB-T2 in some locations might have benefits in the case of the local TV multiplex”. Therefore, as Ofcom have not yet identified a solution to local TV DVB-T2 remains a credible option.
- It will protect the role that DTT plays in providing competition to other platforms, with increased scope to evolve in the future included the scope to offer more HD and potentially UHD in the long term.

In order for a switch to DVB-T2 to occur it will require government and Ofcom to make a series of decisions on licence changes, consumer support and funding.

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<sup>2</sup> Ofcom (2007), “The Future of Digital Terrestrial Television”, <http://stakeholders.ofcom.org.uk/binaries/consultations/dttfuture/summary/dttfuture.pdf>

## Section 6

### **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?**

Freeview is the largest TV platform in the UK covering 98.5% of UK households with the public service channels and around 90% of households with commercial services. The Freeview HD product has been hugely successful and is enjoyed in 3.7m UK homes just 4 years since its launch<sup>3</sup>. Hence the needs of DTT viewers are particularly critical here as they do not receive any benefit from 700 MHz clearance, only cost, disruption and most likely a reduced choice or withdrawal of high quality HD services. Therefore consumers should not pay any of the costs that will result from the process (such as the costs of aerial replacement or realignment). Ofcom must ensure that all DTT viewers who receive UK-wide, nations, regional or local DTT services today should continue to be able to receive the same services after any 700 MHz clearance.

The consumer impact is not trivial. While many viewers are now reasonably confident on re-tuning when they have the right communications and support, ensuring that they receive appropriate support is critical. In addition, re-tuning can be complex for some, e.g. manual re-tuning where there are overlaps, and in these situations a re-tune might take longer than the five minutes that Ofcom has assumed

Interference from LTE remains very poorly understood therefore further work needs to be done, e.g. both desk studies and pilots, to assess the implications of interference. This is likely to be a particular issue for those households that use indoor aerials for one or more of their television sets. We note that the impact of LTE interference has been assessed in CEPT on the basis of DTT networks using DVB-T2. Ofcom will therefore need to evaluate the impact of LTE in a world where DVB-T is still used.

### **Aerial replacement and re-alignment**

We have worked closely with Digital UK and the BBC on the analysis related to aerial replacement and re-alignment that is presented in detail in the Digital UK response. We support their conclusions and would particularly emphasise the following points:

- We question Ofcom's assumption on the penetration of wideband aerials. Ofcom forecast a wideband penetration of 80% in 2022, based on a low take-up case but the Digital UK analysis suggests a lower figure. In addition, given the proposed timetable for clearance we do not agree that Ofcom should cost against a wideband penetration in 2022 as aerials will need to be replaced well before this date. Furthermore, if as Ofcom is suggesting, the timetable could be advanced by up to two years, a second calculation should also be undertaken based on the accelerated timescale.
- Ofcom do not appear to have taken into account the fact that many households would receive less than the minimum standard of reception unless they re-align their aerial to a different transmitter after 700 MHz is displaced from the 700 MHz band. Ofcom should carry out their calculations

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<sup>3</sup> <http://www.freeview.co.uk/what-we-offer/freeview-hd> (accessed 28 August 2014)

again to reflect this (and we estimate over 100,000 households could be affected).

- Taking account of out-of-group aerials, aerial re-alignment and those households that would lose the ability to receive DTT to the minimum agreed standard altogether the total number of households where funds need to be made available to manage the mitigations is estimated at up to 400,000. Whatever the final number of affected households, funds will need to be in place to pay for the support needed for all of those who are impacted.
- All of these estimates assume that Ofcom are successful in reaching international agreement on the version of the frequency plan that has been used to derive them. Any changes to this plan could lead to an increase in the number of affected households and an increase to the consumer cost of 700 MHz clearance.

A large number of households using DTT (amounting to many hundreds of thousands) will be assumed to be continuing to use an inappropriate grouped aerial for the frequencies used in the new plan. These viewers will have a reduced reception margin which will make them more susceptible to some forms of interference. In particular, these households will be more susceptible to interference from White Space Devices using frequencies in the range that their aerial was originally designed for. If a solution is not provided for these households, then Ofcom should take account of this issue in co-existence calculations, by reducing the level of the wanted DTT signal relative to the level of the interfering signal from the White Space Device.

**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?**

DTT viewers will not receive any benefit from 700 MHz clearance, however millions of households will suffer disruption. In particular those households who view DTT on either their primary or their secondary sets and who have to replace an aerial will face significant disruption. Ofcom should ensure that any help scheme and funding covers all of the costs for all households affected. No TV viewers get a benefit as a consequence of the change so none of them should be required to pay.

In the next phase of work Ofcom should look at the practicalities of how consumer support would work. For example how those vulnerable consumers who require practical help with re-tuning (possibly including a home visit) will receive that help. There is the need for a thorough communications campaign and consumer support scheme for this work in line with what was put in place for switchover and as outlined by DUK in their response.

**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?**

In general we agree that Ofcom should encourage the use of equipment that is fit for purpose and future-proofed if possible. However this issue will need to be approached carefully as there may be cases where equipment that may be appropriate after broadcasting is displaced from the 700 MHz band will not be

appropriate, or even usable, before that displacement takes place. This could include the choice of aerial that a household makes or the filtering that is put in place.

## Section 7

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

PMSE is important to the broadcast, and other, industries and is already under pressure. As Ofcom identifies there is likely to be a material impact on the industry due to the clearance of 700 MHz. While any solution should not impact the spectrum available for DTT it is important that Ofcom develops an approach that will support the long term viability of this sector.

### **Question 12: Do you have any comments on the mitigations for loss of access to the 700 MHz 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?**

It is important to find appropriate alternative spectrum for the PMSE industry and we welcome Ofcom's attempts to do this. We would simply note at this stage that there is a lot of work that needs to be done before a spectrum solution for PMSE can be confirmed.

## Section 8

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

Based on the assumptions that Ofcom has made we agree that their analysis indicates that white space spectrum availability will be reduced after the proposed 700 MHz transition. Ofcom will need to look at this analysis again in the light of better understanding of the DTT plans. In particular this analysis is based on the single hop DTT plan that does not fully describe the likely scenario, for example it does not include the local TV services that Ofcom has stated will continue after the 700 MHz band is cleared.

The extent of the further reduction cannot be calculated without detailed network planning but, for example, the Local TV multiplexes are likely to operate at reduced power to be compatible with the national DTT network further constraining the white space spectrum availability. Understanding the full impact on White Space Devices (WSD) from relays and local TV should be part of Ofcom's next phase of work.

The impact of the reduction in spectrum may be most significant in areas of heavy PMSE usage. PMSE itself will be squeezed into a reduced number of channels by this change, leaving reduced spectrum for white space applications. Further analysis would be useful to determine the impact on WSD from PMSE, particularly in areas of high PMSE demand. This analysis will reveal the scale of the additional reduction in white space spectrum.

A further impact will be on those white space devices that will already have launched using white space spectrum. Given the planned timetable for 700 MHz clearance, services using white space spectrum may be installed and operating in the period before the clearance process starts. These white space devices will be automatically moved to new channels by the white space database system but the new channels may be less suitable due to lower available powers or increased interference from DTT and other white space devices. There is a risk that some white space devices which have been operating successfully will suffer disruption.

We also note, as mentioned under Question 8, that many DTT viewers will continue to use receiving antennas which were installed for the current DTT transmitter network. These may be inappropriate for the new spectrum plan and while they may still allow adequate DTT reception the interference rejection may differ when compared with antennas installed for the new network channels. It is important that the calculations in the whitespace database system ensure protection of both existing and new receiving antenna configurations.

## Section 9

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

Ofcom state that “where there are private costs but public benefits the Spackman approach is appropriate”. Ofcom’s analysis makes it clear that the costs of 700 MHz clearance affect broadcasters and TV viewers while the benefits lie with mobile operators. In section 11 of the consultation Ofcom lay out a range of options, both public and private, for the funding. Ofcom state that decisions on funding is a matter for government therefore the use of the Spackman method seems premature as it pre-judges where the funding of the 700 MHz programme will come from. For the avoidance of doubt, given that TV viewers and the broadcasters do not benefit from the displacement of DTT from the 700 MHz band they should not pay any of the costs.

### **Question 15: Do you agree with our approach of 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 believe that Ofcom should make several changes to its approach to estimating the cost of early replacement. When looking at the actual costs that will be incurred during 700 MHz clearance the full costs that are incurred will have to be paid.

For the infrastructure costs there is no certainty for the platform beyond the end of the multiplex licences. Therefore while we believe that there is a long term future for DTT we need to make any replacement decision in the context of what policy makers have said and therefore we do not currently have plans to replace the DTT infrastructure. The changes to infrastructure and the costs incurred are therefore attributable only to the current investment period, and there is no cost saving from a future replacement of equipment. In any event, given the timescales for any

equipment replacement, it is not possible to assess what infrastructure changes would be needed at this point in time.

If Ofcom were to pursue an early replacement cost approach it is important to break out the costs that Ofcom currently include under infrastructure between those that relate to equipment that may be considered to have been replaced early and those that are incurred as a result of the 700 MHz programme. The majority of the elements that are included under “infrastructure” are one off costs directly associated with this programme. Those include elements such as the labour costs or the costs associated with temporary structures such as the temporary transmitters. They will be incurred at full cost and are not relevant to the question of early replacement of the enduring physical infrastructure

Related to this is the residual equipment that may be considered to be suitable for early replacement, such as antennas. Antennas and other equipment have a useful life with suitable maintenance significantly longer than the useful life assumed by Ofcom. A major investment was made in this kind of equipment during DSO and 800 MHz clearance. Therefore it is not clear when looking at the discounted values that there is a material difference between the full cost and the early replacement cost.

Finally, there is a difference between the inputs used for carrying out a cost benefit analysis and the figures that are used in the exercise to agree the budget for any 700 MHz clearance. Whatever Ofcom conclude in their cost benefit analysis on this issue it is important that the real costs that will be incurred in any 700 MHz programme are those that are actually paid. Given that TV viewers and the broadcasters do not benefit from 700 MHz clearance they should not pay any of those costs.

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

Our comments on a number of the aspects of the cost of change of use of the 700 MHz band are below.

*DTT Infrastructure Costs*

While we believe that Ofcom has identified the correct range of costs, through consultation with Arqiva, the selection of the lower estimate for each band plan is inappropriate. Until the infrastructure feasibility study is complete we would advise Ofcom not to assume that the lower estimates are achievable given the current uncertainties around the rollout plan and the performance of the existing antennas on new frequencies.

*Co-existence costs*

Ofcom’s co-existence analysis is based on the presumption that the network post 700 MHz clearance will be DVB-T2. If the network remains predominantly DVB-T this may be more susceptible to LTE interference than DVB-T2 and so the impact and cost of interference will be higher. Ofcom will need to re-assess co-existence costs based on continued use of DVB-T.

Furthermore, we encourage Ofcom to revisit the activities that they carried out in order to determine the interference mitigation regime, and hence appropriate funding

arrangements, for the 800 MHz band. In summary, this would include activities such as:

- Interference impact assessment – taking account of the considerable analysis, both theoretical and practical that has been undertaken by the international community
- Trial deployments with monitoring of the interference that occurs and testing mitigation options
- Appraisal of the planned interference mitigation regime based on theoretical modelling and output from trials
- Consultation programme and stakeholder engagement to test and improve the plans

DTT loss of value from using the spectrum for mobile services

This approach does not adequately consider the impact on consumers. In particular the loss from those services that TV viewers would have received if DTT was not displaced from the 700 MHz band.

Consumer costs

There are various aspects of the consumer costs that Ofcom should consider further:

- Ofcom have scaled up consumer information costs for the clearance of channels 61 and 62 to arrive at the cost for 700 MHz clearance. Ofcom should carry out a more detailed assessment of the consumer information costs.
- The full costs of aerials for households that have DTT on either primary or secondary sets should be considered again in light of further refinement of the impact of aerial replacement and realignment.

WSD loss of value

Changes to the 700MHz band will reduce the amount of spectrum available for white space devices. The assessment will need to be revisited as the plans are developed e.g. if there is a further reduction if local TV services continue as planned. We also note that the reduction in spectrum could be particularly significant in areas of heavy PMSE use and the potential effect on those white space spectrum users that Ofcom expect to emerge in the coming years has not been quantified.

Additional categories of cost not included

Ofcom's analysis should include

- Costs to mitigate DTT coverage losses
- The impact on the DTT platform from the loss of homes resulting from 700MHz clearance
- Programme management costs for both Ofcom and multiplex operators

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

In general, and in order to give certainty to DTT viewers and the DTT industry, if 700 MHz clearance is to take place then it should take place as soon as possible consistent with a properly managed clearance programme. When deciding on the timing of the change of use of the 700 MHz band Ofcom will need to consider the potential impact on the increased costs and increased risks to the programme to move the DTT services from the 700 MHz band to the remainder of the UHF band.

In addition any timetable is contingent on the successful conclusion of the international negotiations including WRC-15 and the relevant bilateral and multilateral negotiations.

## Section 10

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

On the basis of the Analysys Mason modelling and the interest that is developing across European administrations such as France, Germany, Sweden and Finland<sup>4</sup> for a future deployment of mobile broadband services within the 700 MHz band the momentum is building towards a European Commission mandate that could require this band to be made available for mobile broadband services. Therefore it may not be a UK decision whether to make the band available. If 700 MHz is made available to offer new services of mobile broadband using next generation technology it should not be done at the cost of removing channel choice, or latest generation TV services (HD) by TV viewers. The DTT platform should be safeguarded from a loss of choice or coverage and should be allowed to provide TV viewers with the latest generation of technology.

However, if the band is made available Ofcom should ensure that the utilisation of the band is maximised. As we outline in our answer to question 3 alongside the 700 MHz band plan being adopted within CEPT for mobile broadband services there is also scope to deploy complementary services in the centre gap. We encourage Ofcom to ensure that maximum flexibility in terms of the band plan options that are available is secured in the international negotiation process. This should include the ability to deploy Local TV and PMSE services in the centre gap.

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

Any change will have to be done in such a way as to ensure that there is a managed migration of the broadcast services from the 700 MHz band. So while the 700 MHz clearance programme should take place as soon as is feasible it must be done in a way that reflects the international certainty that is needed and the need for a properly managed and funded programme with a realistic timetable.

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<sup>4</sup> These countries have all indicated an intention to release the 700 MHz band for mobile broadband purposes.

## Section 12

**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 the spectrum or earlier?**

Regardless of the timing of the auction there is an expectation that it will raise significant revenues. However this should not affect the need for there to be a properly managed and funded clearance process. If an early auction is held it should not affect the timing of the clearance of the spectrum that is auctioned.

### **Annex 1: Scale of the re-engineering work required at the 80 main DTT transmitter sites**

The following table shows the channels that are currently allocated to each of the six multiplexes at the 80 main DTT transmission sites. These 80 sites provide approximately 90% of the coverage of the households in the UK. The channels that are highlighted in yellow are those that, as a minimum, will have to change frequency as a result of the displacement of DTT from the 700 MHz band. In such circumstances around 50% of those main sites will require some form of re-engineering causing some degree of disruption to a large number of viewers.

In addition, as there will be less spectrum available to DTT services after it is displaced from the 700 MHz band, there will be additional consequential changes to the network in order to maximise coverage. There will also be changes to almost all of the 1,100 relay sites in the network which are required to achieve 98.5% coverage for PSB services. However until there is a relay frequency plan the final number cannot be known for certain.

The level of impact on the DTT network should be compared as being closer to the Digital Switch Over programme, rather than the 800 MHz Clearance programme, which only required changes to allocations on Channels 61 and 62, with consequential changes to allocations on Channels 49 and 50, along with no reduction in the spectrum available to DTT.

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Site ID	Site Name	PSB1	PSB2	PSB3	COM4	COM5	COM6
10100	Crystal Palace	23	26	30	25	22	28
10101	Guildford	43	46	40	48	52	49
10103	Reigate	60	57	53	21	24	27
10104	Tunbridge Wells	52	49	47	42	44	41
10105	Hemel Hempstead	44	41	47	50	59	55
10200	Sutton Coldfield	43	46	40	42	45	39
10203	Brierley Hill	60	57	53	50	59	55
10206	Bromsgrove	26	23	30	41	44	47
10207	Malvern	53	57	60	50	59	55
10208	Lark Stoke	26	23	30	41	44	47
10211	Fenton	24	27	21	25	22	28
10300	Winter Hill	50	59	54	58	49	55
10302	Pendle Forest	28	25	22	27	21	24
10306	Saddleworth	45	39	42	51	52	48
10307	Storeton	28	25	22	23	26	29
10335	Lancaster	27	24	21	25	28	22
10400	Emley Moor	47	44	41	51	52	48
10403	Sheffield	27	24	21	42	45	39
10405	Chesterfield	26	23	29	43	46	40
10407	Keighley	49	58	54	57	53	60
10413	Idle	24	21	27	42	45	39
10500	Black Hill	46	43	40	41	44	47
10510	Torosay	28	25	22	23	26	29
10600	Wenvoe	41	44	47	42	45	39
10601	Kilvey Hill	23	26	29	25	22	28
10606	Aberdare	24	21	27	25	22	28
10615	Pontypool	23	26	29	25	22	28
10700	Divis	27	21	24	23	26	29
10800	Rowridge	24	27	21	25	22	28
10801	Salisbury	57	60	53	50	59	55
10805	Whitehawk Hill	60	53	51	57	56	48
10860	Rowridge VP	24	27	21	25	22	28
10900	Pontop Pike	58	54	49	50	59	55
10903	Fenham	27	24	21	25	22	28
11000	Mendip	49	54	58	48	56	52
11007	Bristol Kings Weston	43	40	46	53	57	60
11008	Bristol Ichester Crescent	41	44	47	42	45	39
11100	Waltham	49	54	58	29	56	57
11101	Nottingham	27	24	21	51	52	48
11200	Durris	28	25	22	23	26	29
11300	Dover	50	51	53	55	59	48
11400	Tacolneston	55	59	50	42	45	39
11500	Sudbury	44	41	47	58	60	56
11600	Bilsdale	26	29	23	43	46	40
11700	Oxford	53	60	57	50	59	55
11800	Llanddona	57	60	53	43	46	40
11900	Carmel	60	53	57	54	58	49
12000	Belmont	22	25	28	30	53	60
12002	Olivers Mount	57	60	53	54	58	49
12100	The Wrekin	26	23	30	41	44	47
12300	Angus	60	53	57	54	58	49
12400	Sandy Heath	27	24	21	51	52	48
12500	Midhurst	55	56	58	54	59	50
12600	Hannington	45	42	39	41	44	47
12900	Presely	43	46	40	42	45	39
13000	Limavady	50	59	55	54	58	49
13100	Caradon Hill	28	25	22	21	24	27
13105	Plympton	54	49	58	42	45	56
13200	Stockland Hill	26	23	29	25	22	28
13400	Keelylang Hill	46	43	40	42	45	39
13402	Bressay	28	25	22	27	24	21
13500	Blaenplwyf	27	24	21	25	22	28
13600	Beacon Hill	60	53	57	42	45	51
13700	Caldbeck	25	28	30	23	26	29
13800	Huntshaw Cross	50	59	55	48	52	56
13900	Heathfield	52	49	47	42	44	41
13902	Hastings	25	28	22	23	26	30
14100	Redruth	44	41	47	48	52	51
14500	Moel Y Parc	45	39	42	51	52	48
14700	Craigkelly	27	24	21	42	45	39
14800	Rumster Forest	27	24	21	30	59	55
14900	Ridge Hill	28	25	22	21	24	27
15100	Brougher Mountain	28	22	25	21	24	27
15200	Danel	22	25	28	23	26	29
15211	Rosneath VP	49	58	54	53	57	60
15241	Rosneath HP	49	58	54	53	57	60
15300	Knockmore	26	23	29	53	57	60
15400	Eitshal	26	23	29	25	22	28
15500	Chatton	45	42	39	41	44	47
15600	Rosemarkie	45	39	42	43	46	40
15800	Bluebell Hill	46	43	40	45	39	54
16100	Selkirk	50	59	55	57	53	60