


SDN

Joint response from the BBC, ITV, Channel 4, Arqiva and SDN to Ofcom UHF Strategy consultation[1]

1. Introduction and summary

The above-named organisations welcome the opportunity to respond to Ofcom's consultation on the long term use of UHF spectrum. As public service broadcasters and multiplex operators on the Digital Terrestrial Television (DTT) platform, we have a clear interest in Ofcom's decision-making about the future use of spectrum. We recognise that such decisions are inherently complex, will take up significant resource and time, and are already the subject of intense international debate – hence, we agree that it is necessary to begin now to think about the potential longer term strategic framework for spectrum use.

We welcome Ofcom's recognition of the public policy importance of the DTT platform. In thinking about the future use of spectrum by DTT and other services, we would emphasise to Ofcom the fact that DTT is a highly successful broadcast platform, which delivers very significant value to UK consumers:

- Television viewing remains one of the UK's foremost leisure activities, with viewers watching an average of 4 hours of television per day – with this figure being on an upward trend.
- Within television, DTT is the most popular UK platform, and is used in over three quarters of UK homes.
- DTT provides universal, free at the point of use access to the PSB services
- 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.
- DTT has evolved to meet consumer needs and to deliver spectrum efficiency. Hundreds of millions of pounds have been invested in a new universally available free to air platform, enabling the release of 112 MHz of UHF

[1] Ofcom, *Securing long term benefits from scarce spectrum benefits: a strategy for UHF bands IV and V*, published 29 March 2012 (referred to as the "consultation document" hereafter)

spectrum through the digital switchover (DSO) process, delivering HD within existing spectrum, and adopting the most efficient broadcast technologies.

Crucially, DTT will remain highly important to UK viewers for the foreseeable future – for instance, 3 Reasons forecasts that DTT will be the primary source of TV reception in 44% of UK homes in 2020[2], and will remain the most popular TV platform. Moreover, we note that internet protocol television (IPTV) services will not represent an effective substitute for DTT over the timeframe envisaged by Ofcom's current consultation, and that Free to air satellite does not provide a full substitute for DTT.

It is also important to be clear that – as with BSkyB's investment in its satellite platform – the success of DTT is the product of massive long term investment and market-based risk taken by DTT multiplex operators and broadcasters, particularly since the launch of Freeview in 2002, which followed the prior failure of the platform. It is also worth emphasising just how much UK consumers benefit from the very high level of choice and competition generated by the DTT platform, which drives the very high consumer take up of new digital devices, promotes investment in high quality UK content, and stimulates 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 almost 13m integrated digital (DTT) television sets and DTT set top boxes acquired in 2011 alone, and with a total of around 22m DTT set top boxes and 35m integrated sets installed in UK homes by the end of 2011[3].

However, despite being a key driver of competition and choice, and despite the very significant investments made by the DTT multiplex operators, DTT faces regulatory uncertainty. The satellite and cable platforms are not affected by regular Ofcom / Government sector-specific processes that revise their broadcasting infrastructure plans in a way that might affect their ability to deliver services to consumers; the prospect of spectrum pricing for DTT has created significant uncertainty for the multiplex operators; and Ofcom is proposing to license new 4G mobile services which will cause significant interference to existing DTT services. Moreover, only the DTT multiplex operators are subject to time-limited licences, the durations of which are considerably shorter than the long term investment horizons required for platform development – thereby increasing the risks and cost of capital for the multiplex operators.

In this context, it is important to be clear at the outset that the DTT multiplex operators do not agree that the case for 700 MHz clearance has been made – a view explained further in response to questions 1 to 5 below. In particular, we consider that:

- There is significant uncertainty in forecasts of future mobile demand, as is demonstrated by the very large differences in scale between the low and high case scenarios posited by the Real Wireless research for Ofcom

[2] Source: 3 Reasons LLP Spring 2012 market model.
[3] Source: 3 Reasons LLP Spring 2012 market model.

- Future growth in demand for mobile services does not necessarily translate into a requirement for additional spectrum on the scale suggested by Ofcom. Although mobile data demand is growing rapidly, it is likely that a substantial portion of this demand can be met through Wi-Fi on fixed networks.

- Mobile Network Operators (MNOs) still have significant scope to improve further the efficiency of their networks. This can be achieved, as appropriate, through denser network technologies or by optimising network implementations to make full use of the efficiency improvements in LTE 3GPP Releases 10 and beyond.

- Video is a significant driver of peak capacity demand. To further optimise efficiency, Ofcom should work with the mobile sector to implement 3GPP mobile broadcast standards – such as MBSFN/eMBMS – in bands allocated to mobile communications. Such approaches can offer a substantially more efficient means of meeting the demand for live mobile video than traditional unicast models.

- Alternatives to 700 MHz exist which have lower opportunity costs and, as higher frequency bands, arguably better address MNOs' use cases. Substantial amounts of new mobile spectrum will be released over the next few years (e.g. 800 MHz and 2.6 MHz as well as 2.3 GHz and 3.4 GHz) that should meet realistic demand forecasts.

In addition, Ofcom has not undertaken a cost-benefit analysis that demonstrates that the transfer of 700 MHz from DTT to mobile use would be in the consumer and citizen interest. Clearance would involve very significant costs and disruption for the DTT platform and for the millions of UK households who have selected it to access digital television services, often as a direct result of the Government's switchover programme. We are not convinced that the marginal value gained in addressing a relatively small proportion of total demand from mobile in 700 MHz (as opposed to other available spectrum bands) is greater than the potential loss of value from the DTT platform that currently relies on this band. There are strong reasons to suggest that the consumer benefits delivered from the DTT platform are substantially greater in the UK market than is the case in other major European markets. Therefore, Ofcom's default position should be that existing spectrum is retained for DTT.

However, we recognise that there are international pressures on 700 MHz use following the recent WRC-12 decision, and that 700 MHz clearance may be a possible (if not the optimal) outcome. In the event that 700 MHz were to be cleared, a number of conditions would have to be met to safeguard the consumer and citizen benefits delivered by the DTT platform, reflecting the legal rights of the multiplex licences, their long-term investments and the significant costs of changes to the spectrum plan.

With this in mind, we would emphasise at the outset our view that Ofcom's future UHF spectrum strategy should be underpinned by a number of important overarching principles:

- **Securing a long term future for DTT**: Any re-plan of UHF spectrum use needs to maintain a viable future for DTT as a key driver of consumer benefit. In this regard, we welcome Ofcom's conclusion that DTT has a long term future, and that

the existing six multiplex structure should be maintained. As set out in more detail below, this submission has been informed by a study conducted by Oliver & Ohlbaum (O&O), which confirms that DTT will continue to be of very significant importance to citizens and consumers for the long term. In this context, we also strongly support Ofcom's suggestion that DTT must be protected by intervention as needed – and we welcome Ofcom's willingness to adopt a managed approach and to intervene in spectrum allocation to ensure that public benefits are secured, and that platform competition and innovation are sustained, rather than to assume that auction is the only appropriate means of allocation.

- **Enabling evolution of DTT in viewers' interests**: In the event of any spectrum re-plan, the benefits to DTT viewers must be maximised. In particular:

    - The DTT platform must – as Ofcom recognises – retain the same levels of coverage and there must be no reduction in the number of channels carried. Failure to do so would severely limit the DTT platform's ability to deliver consumer benefit. As discussed below, we are very concerned that a number of Ofcom's options would create the potential of a significant reduction in coverage and reception of the commercial multiplexes.

    - DTT must be able to evolve – e.g. to enable far greater levels of HD delivery in the medium to long term, so as to remain competitive and commercially viable over time, particularly given growth in screen sizes and the trajectory of the pay TV platform operators towards increasing amounts of HD and even 3D content.

    - In the event of 700 MHz clearance, these objectives will require 600 MHz spectrum to be allocated to DTT through a managed Ofcom process, rather than through an auction. [✂]

    - Critically, we must also be confident that Ofcom and Government can secure a solution for DTT which can be delivered domestically and internationally through the WRC and other international spectrum negotiations and defended for the long-term beyond 2030

- **Respecting the legal rights of the DTT multiplex operators**: The DTT multiplex operators are lawful users of spectrum, hold Ofcom licences, and have substantive legitimate expectations which have underpinned our very significant long-term investments in DTT infrastructure. We would only be willing to cooperate in a clearance process on the basis that we are put in the same position in which we otherwise would have been absent 700 MHz clearance. In particular, we consider that – in the event of 700 MHz 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 700 MHz clearance programme would require costs to be incurred in order to re-plan DTT networks in such a way that maintains DTT coverage and the number of channels on the platform, and to address consumer issues. In our

view, such costs should be borne by the beneficiaries of spectrum release, or through proceeds from any auction of 700 MHz spectrum. [✂]

- **Delivering long term spectrum certainty**: As mentioned above, the DTT platform is subject to significant regulatory uncertainty. While we are willing to examine future options without prejudice, we note that any change to UHF spectrum use would need to be accompanied by greater certainty for DTT multiplex licensees that there will not be further encroachment on DTT spectrum allocations – in particular, the DTT platform would need extensions to the current multiplex licences beyond the current licence periods, certainty that 470 MHz to 694 (+) MHz spectrum would be protected for the long term. In addition, the multiplex operators also oppose the application of Administered Incentive Pricing (AIP) to broadcasting spectrum, irrespective of whether clearance of 700 MHz is undertaken.

- **Funding the transition:** Quite apart from our substantive legitimate expectation to be put into the position we would otherwise have been in, we note that any early release of the 700 MHz band would generate significant benefits for the likely licensees of that spectrum – the mobile network operators – as well as for the Exchequer in revenues from any spectrum auction. The costs of transition and related action needed to maintain the DTT platform should therefore be borne by the mobile network operators – as the major beneficiaries of this policy – or through auction proceeds (with public funds potentially used to cash flow the process prior to any auction). Critically, DTT consumers, broadcasters and multiplex operators should not incur any additional costs as a result of this process. Any funding decisions should also be designed flexibly in order to maximise consumer benefit while minimising cost. [✂]

- **Minimising consumer disruption**: Consumer inconvenience, cost and confusion – and risk of loss of confidence in DTT, with resulting implications for platform churn – must be minimal, and involve a clear, coordinated and reassuring communications plan. More generally, and in line with the principles set out above, we believe that any consumer transitional costs should be borne by the mobile network operators or funded out of auction proceeds. As discussed in more detail in the main body of this submission, this is likely to require consumer support for aerial installations – and whilst we agree that every effort should be taken to minimise aerial group changes, we consider that Ofcom may have significantly underestimated the extent and cost of aerial replacement works that are likely to be required as a result of 700 MHz clearance. DTT viewers should also not suffer from interference caused by new mobile services in 700 MHz spectrum – with the costs of interference (including filtering, guard bands and installation support) borne by the mobile operators or Government. [✂]

Our responses to Ofcom's specific consultation questions – set out in Section 2 of this submission – are informed by the principles set out above. In particular, Section 2 makes the following key points:

- We are not convinced of the case for clearance of 700 MHz spectrum for mobile broadband – as set out above, there is significant uncertainty in forecasts of

future mobile demand, a significant portion of any demand growth could be met through Wi-Fi (rather than mobile network) solutions, and there is further scope for mobile technology innovations to enable capacity improvements. However, as noted earlier, we are willing – without prejudice – to examine alternative future options for spectrum use, and so this response sets out our perspective on the steps that would need to be taken to maintain consumer benefit in the event that the 700 MHz band were cleared for mobile.

- In this context, we emphasise that the DTT platform will continue to be of very significant importance to citizens and consumers for the long term – a fact confirmed by the O&O modelling commissioned by the multiplex operators to inform this submission. DTT is the most popular UK television platform, and it plays an important role in providing free to air access both to PSB channels and to a range of other commercial channels. Going forward, DTT will remain a highly popular television platform in the longer term, provided that the channel line-up on DTT remains at least as strong as it is today. Moreover, we consider that further consumer benefit would be delivered in the medium to long term were DTT able to evolve to provide more HD services in the future, particularly given growth in screen sizes and the trajectory of the pay TV platform operators towards increasing amounts of HD and even 3D content.

- The O&O modelling demonstrates that a significant reduction in the amount of spectrum available for DTT – for instance through a clearance of 700 MHz but with no compensating spectrum – would lead to a material weakening in the platform's ability to deliver consumer benefit. In particular, consumers would switch away from DTT towards pay TV platforms, there would be a direct negative impact on investment in original UK content, and over time the DTT platform may become unviable. Ultimately this would reduce platform competition and would slow innovation, resulting in even greater dis-benefits for consumers. Therefore, in the event of 700 MHz clearance, DTT would require long term reservation of the spectrum in the frequency range 470-694 MHz (channels 21-48) including the 600 MHz band in order to remain viable.

  Reservation of 600 MHz spectrum for DTT in the event of 700 MHz clearance would also enable DTT to continue to evolve in line with viewer interests. [✂]. Reservation of 600 MHz for DTT would also deliver benefit to other users of spectrum – with PMSE, local TV and white space devices (WSD) users benefitting from access to interleaved spectrum in the 600 MHz band, alongside DTT as the primary user of the spectrum. [✂]

- Going forward, Ofcom will need to undertake a significant programme of work before making any decisions in relation to possible 700 MHz clearance. As well as the major re-plan of the DTT networks that would be required in the event of 700 MHz clearance, Ofcom will need to give significant thought to the transitional plan for consumers – including considering how the costs of aerial upgrades [✂] should be covered; defining a broader approach to managing and funding the DTT transition; and addressing the question of long term certainty – including both spectrum and licensing certainty – for the DTT multiplex operators.

The DTT multiplex operators recognise that Ofcom's consultation marks the start of what is likely to be a long and complicated process. This submission is therefore intended to provide an early contribution to that process, and we look forward to engaging with Ofcom on the work programme going forward.

2. Answers to Ofcom consultation questions

Future mobile broadband spectrum requirements

Question 1: Do you agree that meeting the future growth in demand for mobile broadband capacity will deliver significant benefits to citizens and consumers?

The DTT multiplex operators recognise the very significant citizen and consumer benefit that could arise as a result of the roll out of future mobile broadband services. Therefore, it follows that – if demand for mobile broadband capacity is likely to increase significantly – consumers and citizens would benefit if this demand were met. However, as we argue in response to this question and Questions 2 to 4 which follow, it does not necessarily follow that future demand growth will be as significant as Ofcom suggests, and/or that access to 700 MHz spectrum is the correct means of meeting this demand.

In particular, we consider that Ofcom takes a somewhat simplistic view in reaching the conclusion that the mobile network operators (MNOs) face a shortage of spectrum – i.e. that the growth in demand for mobile services necessarily requires a significant increase in spectrum for mobile networks. The issue of future demand for mobile broadband is complex, and we believe that Ofcom needs to consider the full range of relevant factors and take a wider perspective in seeking to find the right solution or solutions.

In particular, we note that there is significant uncertainty around the scenarios for future mobile demand, as is demonstrated by the very large differences in scale between the low and high case scenarios posited by the Real Wireless research for Ofcom. In particular, the high case seems to be very aggressive and projects a level of long term demand in excess of that posited by other forecasters. In contrast, the medium and low scenarios seem less aggressive and are more aligned with other forecasts – but nonetheless significant uncertainty remains in a number of areas:

- **Mobile device saturation**: The Real Wireless forecasts published by Ofcom appear to assume continuous growth in take-up of mobile devices and services. It is not clear whether the forecasts have taken into account the potential for mobile device penetration saturation – which would inevitably slow the future growth of demand.

- **Device vs. User Centric forecasts**: Whilst the Real Wireless forecasts seem to take a bottom-up approach, they appear to be device centric instead of user centric. A preliminary cross-check on a per user basis suggests that, if traffic growth is assumed to come predominantly from demand for video services, the forecasts suggest that in their highest demand scenario mobile video consumption (mainly non-linear TV) will be equivalent to linear TV viewing today. This would represent a major transformation in consumer behaviour which no

forecasters currently predict and is highly unlikely to occur. Moreover, the device and traffic per device projections do not seem to take into account that fact that a single user will use multiple devices – there is therefore likely to be some double counting.

- **Capacity or usage per device limits**: The forecasts also appear to be based on the assumption of continuous growth of consumption per device – however, there is a limit to the potential increase in capacity required per device. For instance, not all services require video as a support – and therefore a constant increase in bandwidth requirements should not necessarily be assumed. Moreover, even in a fixed environment there are limits to the benefit of increased capacity – for instance, the consumer benefit of moving to superfast broadband (say at a speed of 30 Mbps) from standard broadband (say 3-10 Mbps) is not clear, given the current bit rates and usage of VOD and other high bandwidth services.

- **Traffic on MNOs or fixed networks**: Different forecasters take different views about the extent to which mobile device and service traffic will be carried through fixed networks via Wi-Fi connections, rather than over mobile networks. As discussed below, the overall trend seems to suggest the majority of traffic will be carried via fixed networks, rather than on the MNOs' own networks. It is not entirely clear how the Real Wireless forecasts take this issue into account – with the potential that fixed network usage could drastically reduce future demand for further spectrum.

In this context, it is important to be clear that an increase in demand for mobile devices, services and applications does not necessarily correlate with a need for expansion of spectrum for mobile networks – in other words, just because consumers access data on a mobile device, it does not mean that they necessarily use mobile networks in order to do so. In particular, Wi-Fi solutions will continue to play a major role in meeting demand for mobile services and applications, thereby limiting the need for expansion in mobile spectrum. In practice, the proportion of traffic actually carried over the MNOs' own networks will be influenced by factors including:

- The extent to which mobile devices and services are used in fixed locations or in home and office buildings – in many cases, consumer behaviour could be described as nomadic (often using Wi-Fi networks) rather than truly mobile. For instance, Ofcom's research for the UHF strategy consultation found that more than 50% of mobile device usage takes place in situations where the user is not on the move, such as at home or in the office. Moreover, the research found that internet usage predominantly takes place at home – with 32% of respondents only using the internet at home, and with the home being the main source of internet use for a further 27% of respondents. These findings are also supported by other research – for instance, a survey of 1000 users by Analysys Mason found that 59% of traffic is handled through Wi-Fi and only 41% over cellular networks; Plum Consulting[4] research indicates that usage in the home on mobile devices is expected to increase as a percentage of total usage, providing further potential for bypassing mobile networks; and T-Mobile has revealed that most of its traffic is fixed-like in nature – 50% of users' traffic is generated in 1 cell and

[4] http://plum.hufs.ac.kr/hsn2011/pdf/3-3.pdf

80% is handled by 3 cells, demonstrating that the level of true mobility is low and therefore that Wi-Fi solutions can be a very effective means to handle most of the traffic generated by users.

- The availability of alternative Wi-Fi solutions in fixed locations – as users' traffic can be carried more efficiently on Wi-Fi in such locations. Such availability is likely to increase further as a range of players (both MNOs and communications businesses other than MNOs) enter the Wi-Fi hotspot market. For instance, in addition to Wi-Fi offloading by MNOs, non-MNO players are already using Wi-Fi solutions to meet consumer demand for mobile devices and services. For instance, BT has a well-established network of Wi-Fi hotspots; BSkyB recently acquired The Cloud, the largest Wi-Fi network in Europe; and Virgin Media has announced plans to deploy a free city-wide Wi-Fi network in London.

- The desire by content providers and consumers to minimise costs and maximise quality of experience is likely to mean that the majority of mobile device and services traffic is carried through fixed networks using Wi-Fi connectivity – as accessing, say, high bandwidth video services over mobile networks is likely to be more expensive than using fixed networks, and is more likely to suffer from an inferior viewing experience.

- Given that much future growth is likely to come from "in building" demand, high frequency licence exempt Wi-Fi solutions (using spectrum above 1 GHz) are likely to be more technically efficient than licensed low frequency (e.g. 700 MHz) spectrum to provide any additional required capacity.

Given the potential growth in "in building" demand, the particular problem identified by Ofcom seems to relate to demand for capacity, and not necessarily additional spectrum-related demand for coverage. The implications of this are as follows:

- Whilst there is significant consensus that mobile traffic is growing, the existence of universal capacity constraints is far less clear. Rather, constraints appear to be focused in dense areas where access to more two-way mobile spectrum may not be the optimal solution.

- Whilst low frequencies (such as 700 MHz and 800 MHz spectrum) can be part of a solution, some alternative solutions are also employed in other countries – such as spectrum sharing and pooling in order to reduce the cost of network deployment. Moreover, high frequency spectrum may be more suitable for addressing the particular capacity constraint in densely populated areas.

Overall, therefore, the reliability of the Real Wireless forecasts is highly uncertain, and the policy conclusion relating to 700 MHz release does not necessarily follow from the forecasts. Rather, if Ofcom is to consider further spectrum release, it needs to look at bands across a range of frequencies – rather than focusing solely on the 700 MHz band.

Question 2: Do you agree that additional harmonised mobile broadband spectrum will play an important role in meeting the future growth in demand for mobile broadband

capacity? What are your views on the overall quantity of harmonised spectrum that will be required to meet future demand? How does this compare with the expected increase in spectrum for mobile use discussed in this section?

We agree with the general statement that additional harmonised mobile broadband spectrum could play an important role in meeting future mobile demand, but – as noted above – licence-exempt high frequency spectrum is also likely to play an equally important role. Moreover, Ofcom should take into account the fact that, over the coming years, the UK will release and be able to use significant additional harmonised spectrum ideally suitable for mobile use in locations where it will be most needed, i.e. in dense urban areas. As noted above, we are not convinced by the most aggressive scenarios for mobile data growth – and therefore we are not convinced that significant additional harmonised spectrum will be required beyond that already planned for the next few years:

- As discussed in our response to Question 1, we are sceptical about the more aggressive long term mobile demand forecasts presented in the consultation document. Moreover, as well as scepticism about the level of data demand posited in the forecasts, it is not clear whether the forecast growth in demand will necessarily be associated with demand for low frequency (e.g. 700 MHz) licensed spectrum. Therefore, given the level of uncertainty, we consider that further work is required before decisions can be taken on the basis of long term demand forecasts.

- For the short to medium term, Ofcom should take into account that the UK will over the next few years release substantial amounts of spectrum suitable for mobile use, and which will have lower opportunity costs than 700 MHz spectrum – e.g. 800MHz and 2.6GHz to be auctioned by Ofcom, as well as 2.3GHz and 3.4GHz to be released by the MOD. All of these bands are internationally harmonised and so are ideally suited to mobile devices‘ traffic use. As such, they might be sufficient to cope with the levels of demand posited in some of the less aggressive demand forecasts. Additional spectrum might also become available over the coming years at high frequencies – e.g. in the unpaired 1.4GHz band – which can be expected to provide significant capacity to carry future mobile traffic, in particular the most asymmetric and capacity-demanding traffic types like video. The recent EC inventory study identified a total of 1205 MHz of spectrum that is currently unused or significantly underutilised – thereby suggesting the potential for further mobile spectrum across a range of bands e.g. spectrum at 1.4 GHz.

- In the short-term, technology innovations will significantly enable better spectrum utilisation within existing spectrum, and on spectrum soon to be released for mobile communications. The Real Wireless report states that technology improvements should to a very large extent mitigate against peaks of demand across cellular networks, such that only in very dense urban “hot spots” is there likely to be a capacity bottleneck that might require further spectrum.

- It should be noted in this regard that, if additional spectrum is only required in particular dense urban hot spots, then this suggests that:

i. 700 MHz spectrum is not likely to be the most suitable candidate for such areas – rather, higher frequencies would be more appropriate. The amount of spectrum available in 700 MHz would deliver insufficient capacity, and therefore other high frequency bands – with more bandwidth availability per operator – would be better suited for mobile broadband capacity purposes.

ii. Offloading data onto licence exempt Wi-Fi would offer an alternative, cost-effective, solution for peak demand – and one which is certainly cheaper for MNOs than acquiring more low frequency 700 MHz spectrum.

- Over the longer term, the evolution of the mix between mobile devices traffic carried over MNOs' networks and fixed networks using Wi-Fi connectivity will determine the balance between different harmonised bands and types of spectrum likely to be required. In particular, this will be dependent on the extent to which spectrum available or to be released in licensed low frequency bands is made available vis-à-vis that in licence exempt or licensed higher frequency bands. Given the significant benefits of the latter bands, the DTT multiplex operators suggest that Ofcom gives further consideration to higher frequency bands as a primary solution for meeting traffic growth in the short to medium term whilst more certainty and consensus is developed on long term future growth scenarios.

Question 3: Do you agree that additional harmonised spectrum provided by the 700 MHz band could play an important role in meeting the future growth in mobile broadband capacity?

Overall, the DTT multiplex operators are not convinced that the case has been made for clearance of the 700 MHz spectrum in the foreseeable future. As well as the inherent uncertainties in the demand forecasts, we note that there are other (higher) frequency spectrum bands (e.g. 800 MHz, 2.3GHz, 2.6 GHz and 3.4GHz) that could play a major role much sooner than 700MHz:

- Given that there is some 250 MHz of unused spectrum and a total of 1205MHz of underutilised spectrum (according to the latest EC study), we consider that high frequencies are likely to play an essential role.

- The higher frequencies would offer a similar benefit to mobile operators because we believe that congestion is likely to materialise in densely populated urban areas. The amount of spectrum available in 700 MHz would deliver insufficient capacity, and therefore other high frequency bands – with more bandwidth availability per operator – would be better suited for mobile broadband capacity purposes.

- In the short term, we consider that a combination of MNO investment in technological innovations, and release of MOD spectrum in combination with 800MHz and 2.6GHz should provide sufficient capacity to meet the challenges posed by the traffic growth.

We recognise that, if the more aggressive demand forecasts are correct over the longer term, then further spectrum may be required beyond the bands noted above. However, we note that the technical advantages of sub-1 GHz spectrum are for coverage, rather than for unpaired capacity. Given that the mobile demand growth forecasts are primarily based on growth in video services (involving one-way data traffic), it follows that unpaired spectrum such as 1.4GHz or other high frequencies may be more suitable to meet future demand than paired spectrum in the 700 MHz band.

Moreover, European regulation is progressively moving away from prescribing use of particular technologies in particular bands, and this benefits mobile operators by enabling them to 're-farm' spectrum previously used for 2G/3G networks, for use by 4G technologies (i.e. LTE and LTE-Advanced). Using 4G technology in bands previously used by 2G/3G technologies allows operators to increase the available capacity in existing bands, without requiring additional spectrum. Another benefit of re-using existing bands is that it enables re-use of parts of the existing infrastructure (e.g. sites and antennas). Ofcom has already proposed to liberalise existing 2G licences in the 900MHz and 1800MHz bands, for 3G use, and it is considered likely that further liberalisation will allow mobile operators to deploy 4G, rather than 3G, technology in 900MHz, 1800MHz and 2.1GHz bands.

Whilst this change of use for 2G and 3G bands has not been enabled as yet with existing mobile licences in the UK, we consider it highly likely that this will occur, and note that Ofcom recently consulted on the scope to vary Everything Everywhere's licence to allow it to deploy LTE technology in the 1800MHz band. We also note that the ECC has recently announced that it has agreed to modification of the 2GHz 'UMTS' decision (ECC Decision (06)01) to allow future technologies to be deployed in the 'core' 3G bands from 1920-1980MHz and 2110-2170MHz. We believe the option for mobile network operators to re-farm existing spectrum in this way provides them with a valuable source of 4G spectrum, to complement 'new' spectrum that they will potentially gain from Ofcom's 800MHz and 2.6GHz auction. Careful consideration is therefore required by Ofcom as to the need for further spectrum, over and above this, in future, and any such need should be based upon appropriate cost/benefit analysis

Question 4: Do you agree that the value of the role played by the 700 MHz band in meeting the future growth in mobile broadband capacity would be greater if it becomes available before other capacity enhancing techniques have been exhausted at existing mobile sites?

Overall, the DTT multiplex operators believe that, if 700 MHz spectrum release is required, its release should only take place after other capacity-enhancing solutions are exhausted and other frequencies are deployed. It is also more consistent with the substantive legitimate expectations of the multiplex operators to require the MNOs to invest in their networks and other sources of spectrum before requiring existing DTT users of 700 MHz to vacate the band.

We agree with the statement in the Real Wireless report that there is an inherent trade-off between investing in small cell technology and investing in more spectrum. We note in this regard that the MNOs still have significant scope to improve further

the efficiency of their networks. This can be achieved, as appropriate, through denser network technologies or by optimising network implementations to make full use of the efficiency improvements in LTE 3GPP Releases 10 and beyond. We believe that, in order to take advantage of the capacity gains associated with LTE Advanced, the mobile operators need to build these improvements into their networks at an early stage.

Moreover, video is a significant driver of peak capacity demand. To further optimise efficiency, Ofcom should work with the mobile sector to implement state-of-the-art 3GPP mobile broadcast standards – such as MBSFN/eMBMS – in bands allocated to mobile communications. Such approaches can offer a substantially more efficient means of meeting the demand for mobile video than traditional unicast models.

Overall, therefore, mobile operators in the UK should be encouraged to invest in the most efficient technologies. In its assessment of the future need for additional spectrum, Ofcom should take expected capacity improvements properly into account. Moreover, Ofcom should only give consideration to further spectrum release over and above 800MHz, 2.6GHz and MOD spectrum if these capacity improvements do not provide sufficient capacity for all future traffic. Moreover, we note that taking this approach would reduce the overall cost to society – 700 MHz clearance would impose significant costs on the MNOs (both in terms of acquiring the spectrum and funding the transition plan) which would need to be passed on to consumers; in contrast, further technology improvements and/or use of alternative lower-cost spectrum would reduce these costs.

Question 5: What timing of 700MHz release would maximise the benefits associated with its use for mobile broadband?

As set out in response to Questions 1 to 4 above, the DTT multiplex operators do not believe that the case for 700 MHz clearance has convincingly been made. Therefore, we do not offer a view on the "appropriate" timing for 700 MHz clearance.

Ofcom states that the 700 MHz band could not be cleared before 2018, and that there is "a high degree of uncertainty with this date"[5]. We note, however, that a significant programme of work will need to be carried out both in the UK and internationally, before any 700 MHz clearance can take place. There will be significant international negotiations both in the run-up to and after WRC-15, and associated standardisation work between 2012 and 2015 – with the decision of the WRC in 2015 being an input into Ofcom's decision in relation to future use of 700 MHz.

If Ofcom were to decide to clear 700 MHz, there would need to be clarification of associated proposals to ensure that the coverage and service proposition offered by the DTT platform remains competitive. More generally, in the event of a decision to clear 700 MHz, the necessary steps would include the following:

- The preparation of a provisional internal UK DTT spectrum plan.

[5] Paragraph 3.56 of the consultation document.

- The multi-lateral coordination of this UK DTT spectrum plan with the UHF spectrum requirements of at least a significant subset of the UK's Western European neighbours.

- The preparation of a detailed UK DTT spectrum plan.

- The bi-lateral coordination of this detailed UK DTT spectrum plan with spectrum regulators representing each of the UK's closest neighbours.

- The detailed design of the engineering changes necessary to change the transmission frequencies in use at the majority of the UK's DTT transmitting stations.

- The construction of new transmission antenna systems at a number of high and medium power transmitting stations – where it would otherwise be impossible to meet coverage requirements using existing antenna systems.

- The potential construction of temporary (or permanent new) structures at a handful of transmitting stations to facilitate the re-engineering of existing antenna systems. There may also be a need for construction of new relay sites to preserve coverage – this was necessary at DSO and is under consideration for 800 MHz clearance.

- The replacement of combiner systems at the vast majority of the UK's transmitting stations.

- The installation of temporary transmission systems to permit the re-channelling (re-tuning) of existing transmitters and the switchover to these frequency changed systems (and the subsequent removal and relocation of temporary systems) as part of a regionally phased switchover programme in order to ensure the continuity of DTT services throughout this complex transition.

- The identification and installation of the grouped receiver antennas which require replacement as a direct consequence of 700 MHz clearance.

- The provision of and support for the installation of 700 MHz mobile interference-limiting filters.

- A transitional plan would need to be defined in order to ensure that any migration of DTT away from 700 MHz spectrum minimises inconvenience to consumers, broadcasters and multiplex operators. As part of this process, a full analysis of the costs and benefits associated with 700 MHz clearance would be required, and appropriate arrangements would need to be put in place regarding the management of consumer and stakeholder communications to support any 700 MHz clearance programme.

- A process for funding any clearance programme would also need to be put in place. We note in this context that – given the potential size of the 700 MHz clearance task – we believe that clearance funding would need to be based on a

more flexible and efficient process than has been applied in relation to 800 MHz clearance. In particular, we consider that the Grant Application process that has been put in place for 800 MHz clearance has slowed down the programme in a number of cases. Should a similar grant application system be contemplated for 700 MHz clearance, then it would be prudent to assume that a minimum of 12 months would need to be added to the delivery timetable.

Clearly some of the above activities could start in advance of WRC-15. However, this will only be possible if funding is made available in the UK and neighbouring European countries to meet the costs of the spectrum planning and network design work which would underpin any subsequent co-ordination discussions and network build-out. Also, whilst some of these activities could take place in parallel, some of the planning and coordination steps would be highly iterative due to the differing (and sometimes conflicting) service requirements of European broadcasters, mobile network operators and spectrum regulators. Only once final post-clearance DTT spectrum plans are confirmed for most parts of the UK will it be possible to commence the network engineering works, at least some of which are likely to take more than 24 months to complete. The subsequent regionally phased frequency change plan (and roll-out of consumer aerial upgrades and interference mitigation provisions) is also likely to add at least another 24 months to the overall process.

Given the very significant programme of work that would be required – and given the inherent uncertainty in the forecasts published by Ofcom to date, and the lack of any comprehensive cost-benefit analysis – we consider that Ofcom's stated date of 2018 may well be too optimistic as a potential date for the start of 700 MHz clearance. In our view, it is vital that Ofcom takes the time to address the issues raised in its consultation document (and in this submission) properly and in full, rather than moving aggressively towards a 2018 clearance date regardless of the broader conclusions of its work.

Future DTT spectrum requirements

Question 6: Do you agree that DTT will continue to play an important role in providing universal low cost access to PSB content over at least the next decade?

The DTT platform plays a key role in promoting access to free to air linear TV services in general, and to PSB content in particular:

- According to Ofcom's own figures, viewers watch an average of 4 hours of television per day – i.e. around 28 hours per week – with this figure being on an upward trend. TV viewing therefore remains one of the UK's foremost leisure activities.

- Within television, DTT is the most popular UK television platform, and it has continued to grow as digital switchover has progressed. It now provides the primary source of viewing in around 40% of UK households, and – once viewing on secondary sets is included – DTT is used in over 75% of UK homes.

- DTT therefore plays a key role in promoting platform competition in the digital world – it is the largest free to air platform of scale, competing effectively with the cable and satellite pay TV platforms. It provides free to air access to a wide variety of channels – the core PSB channels, the PSB family of channels, and other non-PSB commercial channels – and also enables the delivery of regionality and localness in television services. DTT is therefore a major provider of both consumer choice and effective price competition, both through the PSB and commercial multiplexes.

- Ofcom and Government policy decisions have required DTT to play a particular role in providing access to the PSB channels – the PSB multiplex operators (BBC and Digital 3 and 4) have been obliged to build out the PSB multiplexes such that they will reach 98.5% of UK households after the completion of Digital Switchover (DSO), thereby replicating historical analogue coverage.

- Partly as a consequence of the DTT multiplex operators' infrastructure investments, DTT is the most important source of viewing to the PSB channels – for instance, total share of viewing to the five main PSB channels[6] in DTT homes is around 25% higher than in cable homes, and around 34% higher than in satellite homes[7].

- In line with its Charter commitments, a viable DTT platform allows the BBC to make its public service channels universally available, free at the point of use. For the commercially-funded PSBs in particular, a sustainable DTT platform is a key driver of future PSB delivery. As set out in Ofcom's recent report on the future licensing of Channel 3 and 5, access to reserved DTT capacity is one of the "principal benefits associated with the licences"[8]. In addition, Ofcom states that "assuming the DTT platform continues to represent a significant share of viewing over the next licence period [i.e. a period from 2015 to 2024], the benefits associated with reserved DTT capacity are likely in broad terms to be maintained"[9]. So Ofcom's own view is that a successful DTT platform is important in continuing to underpin commercial PSB delivery over the next decade and beyond. It is important to be clear that the logic of this analysis applies to Channel 4 as well as to Channels 3 and 5 – as commercially-funded broadcasters, access to reserved capacity on a sustainable DTT platform provides a key source of funding for investment in public service content including high levels of UK originations.

- Moreover, and as Ofcom's consultation document also makes clear, internet protocol television (IPTV) and Free to air satellite should not be considered as substitutes for DTT. Restrictions in the use of satellite dishes in domestic premises, and the significant up front costs associated with dish installation purely for Free to air satellite use mean that Free to air satellite is unlikely to be an adequate UK-wide substitute for DTT. In relation to IPTV delivery of linear channels, we note that (i) IPTV is not free at the point of use – as a broadband subscription is required; (ii) it is not economic to deliver 98.5% coverage for PSB

[6] BBC One, BBC Two, ITV1, Channel 4 and Channel 5.
[7] All individuals share of viewing for 2011, sourced from BARB.
[8] Paragraph 6.38 of Ofcom, *Licensing of Channel 3 and Channel 5*, published 23 May 2012.
[9] Paragraph 6.51 of Ofcom, *Licensing of Channel 3 and Channel 5*, published 23 May 2012.

services through IPTV; (iii) even if 98.5% coverage were achieved, there is no guarantee that IPTV would achieve universal take-up; (iv) IPTV is highly unlikely to service every TV set in the home; (v) contention in the backhaul network is a barrier to universal usage of broadband for TV distribution (given both TV and internet usage peak in the evening, this would require additional network costs to cope with peak usage – which would impose further costs on consumers); (vi) there is a risk of throttling of linear traffic, and other net neutrality related issues; and (vii) unlimited broadband is expensive and, unless consumers opt for bundles including both Pay TV and internet access, their TV viewing would count towards their broadband usage, forcing people to pay potentially large monthly fees – and effectively ending the concept of free-to-air TV.

Looking to the future, we note that Ofcom's own view is that the DTT platform will continue to remain important to viewers over the next decade – with the forecasts from 3 Reasons shown in Figure 11 of the consultation document suggesting that DTT will provide the primary source of viewing in 42.8% of UK households in 2020. In addition, the DTT multiplex operators have commissioned modelling from Oliver & Ohlbaum (O&O) to assess the future importance of DTT in the period to 2030.

O&O's study – which is attached as an annex to this response – was underpinned by significant consumer research, and concluded that the DTT platform will remain a significant television platform in the long term. In particular, O&O found that:

- **The DTT platform is forecast to account for 40% of primary TV homes in 2020, and to still account for around a third of all primary TV homes by 2030** – providing the channel line-up remains at least as strong as it is today and that VOD is introduced on the platform. The figures for 2020 are broadly in line with the 3 Reasons figures published in the Ofcom consultation document. As set out in response to Question 7 below, O&O also found that take-up of DTT would decline significantly if the channel line-up were weakened.

- **Further HD channel provision would strengthen the platform** – consumers value HD channels more highly over time and adding more HD channels to the DTT platform is forecast to lead to household penetration growth to 2030

- **The DTT platform is vital as a competitive counterweight to BSkyB and Virgin Media** – a strong DTT platform encourages investment in innovative new services and helps keep pay-TV prices lower than they would be absent a competitive DTT offering.

- **There are no technological substitutes for DTT and none are likely to emerge in the foreseeable future** – as noted above, IPTV is not an appropriate substitute for DTT. Moreover, future 4G/Wireless broadband delivered television is highly unlikely to be freely available while none of the alternative distribution options will offer near universal levels of household coverage.

Ofcom and external forecasters therefore agree that DTT will continue to be of significant value to consumers, and therefore that DTT will continue to play a critical and unique role in providing low cost access to PSB content – and supporting investment in the creation of that content – over the next decade and well beyond.

Question 7: Do you agree that, absent major changes in available spectrum, DTT would continue to remain attractive to viewers and deliver important benefits to citizens and consumers over at least the next decade?

As explained in response to Question 6, we agree with Ofcom's assessment of the continued importance of DTT over the next decade and beyond. The forecasts noted in response to Question 6 assume no significant change to spectrum allocations. Any change in spectrum allocations that would undermine the DTT platform's ability to maintain at least the existing level of services would therefore result in decline.

O&O's analysis considered the implications for consumer take-up of DTT services in the event that there were to be a significant weakening of services on the platform – caused, for instance, by a significant reduction in the amount of spectrum available. This aspect of O&O's study concluded that:

- **Consumers would increasingly switch to pay-TV alternatives** – consumer research shows that there remains a strong link between TV platform preference and the level of channel provision, a finding which echoes Ofcom's own research on the consumer appeal of a broad range of channels.

- **A weakened DTT platform would lead to a substantial loss of consumer value** – there would be a direct loss of consumer surplus.

- **Over time the platform may become unviable** – PSB channels would lose audience share and there would be a decline in the level of advertising revenue generated by the commercial PSB networks.

- **There would be a direct negative impact on the commercially-funded PSBs' ability to invest in original UK content** – the result of this would be a significant loss of public value which is associated with investment in and resultant viewing levels of PSB content, as well as a negative impact on the national economy.

- **Intervention may be required to address competition concerns, particularly to prevent the extraction of monopoly profits by pay-TV providers** – without a strong viable free TV alternative, consumers could increasingly be exploited given the concentrated nature of the UK pay-TV sector.

Therefore, a weakening of the DTT platform would create significant consumer and citizen detriment – and so we believe that DTT must retain the ability to deliver at least the range of services available to consumers today.

Question 8: What are your views on the future technical evolution of the DTT platform? Are there other relevant factors affecting future DTT spectrum requirements that we should consider as we develop an approach to secure benefits from UHF band IV and V over the long term?

We emphasise at the outset that the DTT multiplex operators are firmly committed to delivering greater DTT spectrum efficiency, in the interests of citizens and consumers. In particular, the multiplex operators agree that the DTT platform needs to evolve in order to embrace new technologies and to deliver on consumer needs. Indeed, the DTT platform has already demonstrated its ability to evolve in this way – adopting MPEG4 and DVB-T2, and reorganising the multiplexes in order to enable the roll out of a limited number of HD channels within existing spectrum, despite the very challenging economics of HD channels at present and the limited roll out of DVB-T2 devices to date. Going forward, the DTT multiplex operators are committed to further evolution and innovation, but note that any investments in the platform need to be economically rational and sustainable.

We note that, in the event of 700 MHz clearance, the amount of spectrum available for DTT would decline from 32 RF channels to only 20 RF channels of spectrum if no compensating spectrum were provided. Even if the currently vacant 600 MHz spectrum were reserved for DTT as partial compensation for 700 MHz clearance, the platform would have only 27 RF channels available. The amount of spectrum available to DTT would therefore decline significantly in the event of 700 MHz clearance under all clearance scenarios, creating potential barriers to the maintenance of the existing consumer benefits of DTT. Therefore, any attempt to maintain the existing DTT services in a post-700 MHz clearance world would require the DTT platform to evolve further. [✂]

Looking to the future, the DTT platform needs to retain the flexibility to evolve in order to continue to meet consumer needs. At this point in time, it is difficult to predict the precise shape of that evolution, but in our view the following matters need to be considered in relation to the future of DTT:

- Going forward, we believe that the DTT platform needs at least to maintain the number of services available on the platform. As set out in responses to Questions 6 and 7 above, a reduction in the amount of services on DTT would significantly reduce the attractiveness of the platform, and could create threats to DTT's ability to continue to deliver benefits in terms of consumer choice and platform competition.

  We note Ofcom's comments about the potential future transition to second generation (i.e. MPEG4/DVB-T2) DTT reception equipment. We also note in this context that consumer take-up of MPEG4/DVB-T2 equipment is increasing rapidly, and that forecasters predict that the majority of DTT primary sets sold could be T2-enabled within the next few years. As the O&O modelling (reported in response to Questions 6 and 7 above) has found, an increase in the number of HD services on DTT would be attractive to consumers, albeit much less so to channel providers at present. Moreover, as the pay TV platforms move towards offering increasing amounts of HD content – which appears to be the trajectory of Sky and Virgin Media – DTT will need to have the ability to enhance its HD offering over time to remain competitive. In order to deliver this without any significant increase in the amount of spectrum available, more multiplexes (in addition to Multiplex B) will need to transition to MPEG4/DVB-T2 over time. However, at the same time, we note that the costs associated with T2 transition are potentially very significant – in particular, while the long term endgame for

DTT is likely to involve a transition to T2, the appropriate timing of such a transition is highly uncertain, with that uncertainty increased further by the questions raised in relation to the future use of 700 MHz spectrum. [✂]

- DTT needs to embrace new technologies [✂], but also needs to keep in step with consumers. Therefore, any transition to future DTT technologies needs to take place in a manner which ensures that the costs and inconvenience borne by consumers are minimised, informed by equipment and aerial replacement cycles. Importantly, we do not envisage a shift towards HEVC video compression or MIMO-enabled television transmission or receiver aerial systems in the foreseeable future – as these technologies would be incompatible with existing DTT reception equipment (including DVB-T2 equipment), creating very substantial consumer costs and almost certain harm to the DTT platform. [✂]

Use of SFNs

- We note that Ofcom has suggested the greater use of SFNs has the potential to deliver greater spectrum efficiency[10]. Preliminary analysis carried out jointly by the BBC's and Arqiva's spectrum planners indicates that the maintenance of 6 multiplexes following a potential future 700 MHz clearance (even where supported by long term guaranteed access to 600 MHz) may be dependent on the adoption of regional SFNs. Whilst we fully recognise the improvements in spectrum efficiency which could be achieved through the use of SFNs, at this very early stage in the planning and network design process we are concerned that in some instances the use of SFNs could create significant technical, commercial and international co-ordination challenges.

- The issues highlighted by this initial analysis include:

    1. The use of regional SFNs, as opposed to national SFNs, may be necessary in order to maintain current coverage levels and maximise frequency reuse, whilst also coordinating the UK's DTT spectrum requirements with that of our European neighbours.
    2. The introduction of regional SFNs is likely to be practical at all main station transmitter sites which are already line fed – although incremental costs would be incurred.
    3. There are considerable technical and commercial barriers to moving PSB relay transmitters into regional SFNs. The rural location of many of these relay sites, and the lack of any existing telecoms connectivity (including fixed line telephone connections) could make integration of these sites into SFNs very expensive. For this reason we consider that any future UK frequency plan and international coordination process would need to make every effort to avoid moving PSB relay transmitters into regional SFNs.
    4. Self-interference (within the UK) from the use of SFNs could reduce the coverage of some post-clearance multiplexes, forcing the adoption of more

[10] Bullets under paragraph 4.35 and in paragraph 4.51 of the consultation document

robust DVB-T2 transmission modes with the downside of reducing capacity for the development of HD services or other innovations.

5. Coordinating UK spectrum requirements for 6 multiplexes with coverage levels equivalent to those delivered today will be a significant challenge. Provisional BBC and Arqiva spectrum planning assumptions suggest that the most spectrum efficient coverage would only be achieved were all of the UK's European neighbours to also adopt regional SFNs (indeed potentially T2 SFNs) following the clearance of 700 MHz. However, in the context of the differing requirements of other European broadcasters, mobile network operators and regulators, there is significant uncertainty that this will be the outcome of a future coordination process, and were the UK to be forced to stay within existing GE06 assignments, it is likely to prove difficult to replicate a 6 multiplex service proposition with coverage or capacity levels close to that provided by DTT today.

- The DTT multiplex operators are willing to work with Ofcom to explore in the implications of increasing the use of SFNs as part of a potential 700 MHz clearance processes. We recommend the existing Joint Planning Project is best placed and has the expertise necessary to carry out this work and suggest that it should be tasked with commencing preliminary work as soon as possible.

In the light of the comments above, we believe that any decisions about future spectrum allocations need to be made in the context of the DTT platform's commitment to innovate and evolve in order to deliver further spectrum efficiency and to continue to meet consumer needs. As explained later in this submission, in the event of 700 MHz clearance, we consider that DTT will only be able to deliver these objectives if it has a secure long term reservation of the 600 MHz spectrum – absent 600 MHz spectrum, the number of services on DTT would reduce, and/or platform coverage would decline, and DTT would have no ability to expand its HD offering. Consequently, the DTT multiplex operators are keen to work together and with Ofcom over the coming months to investigate possible routes to ensuring that – in the event of 700 MHz clearance – the interests of DTT consumers and the legal entitlement of the multiplex operators are properly safeguarded through longer term UHF spectrum allocations.

Question 9: Do you agree that a longer term approach to secure benefits from UHF band IV and V should consider how to safeguard benefits delivered by the DTT platform?

We very much support Ofcom's view that its long term strategy for use of UHF spectrum needs to be informed by a consideration of how to safeguard the benefits delivered by the DTT platform. We agree with Ofcom's statements in paragraphs 4.52 to 4.54 of the consultation (reproduced below for ease of reference):

> *"4.52 The current DTT platform is a successful consumer proposition and current evidence suggests that it delivers important benefits to viewers, not just in terms of making the PSB channels available on a universal basis at low cost but also in terms of supporting wider consumer choice.*

> *4.53 Improved video compression and transmission standards will provide greater DTT spectrum efficiency but the speed of adoption of these new standards is uncertain. It is therefore uncertain what amount of spectrum will be required over the next 10-15 years for DTT to support a range of services similar to today's.*
>
> *4.54 Against that background, we believe that it is appropriate to consider what measures we can take to safeguard benefits to viewers delivered by DTT over the longer term. This will be discussed in more detail in Section 6."*

As explained in response to Questions 6 to 8 above, the DTT platform is expected to continue to deliver significant benefits to consumers over the next decade and beyond, but these benefits will be threatened if the amount of spectrum available for DTT were to reduce. We return to the question of the appropriate long term approach in responses to Questions 15 to 20 below, where we argue that – in the event of 700 MHz clearance – reservation of the 600 MHz spectrum is a vital part of the long term future for DTT. [✂]

Other uses of UHF bands IV and V

Question 10: Are there other material factors affecting the future requirements of PMSE that we should consider as we develop an approach to secure long term benefits from UHF band IV and V?

As Ofcom will be aware, a number of organisations represented by this response also have involvement in Programme Making and Special Events (PMSE) services. The use of radio microphones in film-making and drama is now commonplace – virtually all sound recording is now wireless. In addition, regional and national news programmes, sports broadcasts and coverage of major events are critically dependent on radio microphones, radio talkback and wireless cameras both inside and outside the studios. In short, interference-free use of these devices is absolutely integral to modern television production and facilitates some of the UK's most distinctive and public service content – television which brings the nation together. Given Ofcom's view that DTT – and with it viewing of linear television – will continue to be of significant importance to viewers, it follows that PMSE services – as providers of key inputs into television production and broadcast – will also continue to be of importance.

Indeed, as Ofcom states in the consultation document, "There will be a continuing demand for access to geographically interleaved spectrum for PMSE"[11]. The key point to note here is that, if Ofcom does decide to proceed with a clearance of 700 MHz spectrum, but does not offer alternative spectrum to DTT in return, then the amount of interleaved spectrum available for PMSE use would reduce significantly – to the extent that major programme productions and special events may be threatened.

Given the significant value that the PMSE sector delivers to consumers, steps should be taken to ensure that PMSE has sufficient access to interleaved spectrum. In the

[11] Paragraph 5.6 of the consultation document.

event that 700 MHz is cleared for mobile broadband, we believe that the objective of delivering sufficient spectrum access for PMSE is most likely to be met if the 600 MHz spectrum is also reserved for DTT. However, we are concerned that even with continued dedicated use of Channel 38 and interleaved access to 500 MHz and 600 MHz DTT spectrum (which would inevitably be more intensely used than today) there may not be sufficient capacity to meet the current (or future) requirements of PMSE. We therefore suggest that Ofcom should consider a range of additional solutions which could support PMSE. This could include the possible use of the uplink and downlink "guard-bands"/"duplex gaps" within or between 700 MHz and 800 MHz 4G mobile assignments and the review of other UHF spectrum usage to see if there are any other assignments which could be geographically shared to support the needs of PMSE.

Question 11: Are there other material factors affecting the future requirements of Local TV that we should consider as we develop an approach to secure long term benefits from UHF band IV and V?

Delivering new commercial local TV services is a key Government policy objective, and Ofcom is currently working to implement Government policy in this area. As the Secretary of State for Culture, Media and Sport set out in the December 2011 Government policy statement:

> *"The vision of a new generation of local television services across the UK is about to become a reality as we introduce new legislation and put in place our innovative framework… My vision for local TV is one which contributes to future economic growth and social well- being in the UK. Local TV will be a driver of growth in the media and creative industries; helping to increase local employment and skills and boosting local businesses… Through this framework, we will now make local TV in the UK happen."*[12]

Since the publication of the Government's policy statement, Ofcom has consulted on the licensing arrangements for local TV, and has invited applications for the first 21 local TV channels.

As noted at paragraph 5.9 of the consultation document, "Local TV will make use of the spectrum used by existing DTT services on a geographically interleaved basis". Therefore, as with the PMSE sector noted above, if Ofcom does decide to proceed with a clearance of 700 MHz spectrum, but does not offer alternative spectrum to DTT in return, then the amount of interleaved spectrum available for local TV use would reduce significantly – thereby creating a potentially significant barrier to the delivery of one of the Government's key policy objectives.

Exchanging the 700 Mhz spectrum for 600 Mhz will clearly help to ensure there is a material amount of interleaved spectrum available for local TV. However, given the net loss of 5 channels under this scenario, there is likely to be significant potential congestion in the use of spectrum in some areas.

[12] DCMS, *Local TV: Making the Vision Happen*, published December 2011. See page 6 ("Foreword by the Secretary of State").

Question 12: Are there other material factors affecting the future requirements of WSD applications that we should consider as we develop an approach to secure long term benefits from UHF band IV and V?

We note the potential for White Space Device (WSD) applications to deliver benefits to consumers. However, as WSD applications are primarily intended to rely on unlicensed use of interleaved spectrum, we consider that it is vital that any WSD use does not interfere with or create barriers to the primary licensed use of spectrum.

We address these issues further in response to Question 19 below, but note at this stage that WSD applications would make use of interleaved spectrum in the bands where DTT is the primary use. Therefore, as with the PMSE and local TV applications noted above, if Ofcom does decide to proceed with a clearance of 700 MHz spectrum, but does not offer alternative spectrum to DTT in return, then the amount of interleaved spectrum available for WSD use would reduce significantly. Therefore, in the event that 700 MHz is cleared for mobile broadband, we believe that the benefits of properly managed WSD applications (which do not interfere with or otherwise impinge on licensed DTT use) are most likely to be realised if the 600 MHz spectrum is also reserved for DTT.

We also note that the potential for WSD applications seems to be limited in the short to medium term given that there is as yet no viable ecosystem for WSD:

- There is a lack of universally accepted standards: technical and operational requirements for white space use are being considered in CEPT SE43, although progress is slow.

- No regulatory framework: regulatory uncertainties are high despite early UK and US developments.

- There is currently a lack of devices ready to come to market.

- There is significant uncertainty over the business models for WSD applications.

Moreover, the development of white space applications in mobile devices – for instance, making smartphones and tablets able to access super Wi-Fi services in white spaces – is not likely to be completed quickly. Such a process might require another three years for standards to be defined, after which there may be a further two to three years for adoption into devices. It is therefore possible that wide adoption of WSD applications will not occur before 2018.

By way of comparison, we note that the deployment of Wi-Fi – another licence-exempt technology – shows that the process of setting standards, defining regulation and developing devices and services is a lengthy process. Notably, the first large-scale Wi-Fi deployment took place over 14 years after the FCC's initial grant of unlicensed spectrum. We therefore believe that Ofcom should not overestimate the potential for significant WSD roll out in the near term.

Question 13: Aside from WSDs, are there other innovative ways in which to use UHF bands IV and V to deliver services and, therefore, material benefits to users

We are not aware of any uses for UHF bands IV and V other than those identified in the consultation document. In relation to 600 MHz in particular:

- The 600 MHz band is not harmonised across the rest of Europe or internationally for any use other than broadcasting. It would therefore be very difficult for the 600 MHz spectrum to be used for anything other than DTT (and interleaved uses such as local TV, PMSE and white space devices).

- DTT and white space devices complement one another since WSD applications operate on a dynamic basis, and interference can be controlled via the geo-location database(s) that are currently under construction.

- It would therefore be appropriate to assume in spectrum planning – and in any WSD database construction – that the 600MHz band will in future be used for DTT.

Question 14: Are there other material factors affecting the future requirements of emergency services applications that we should be aware of as we develop an approach to secure long term benefits from UHF band IV and V?

We are not aware of any other material factors not already identified by Ofcom in the consultation document.

Securing long term benefits for citizens and consumers

Question 15: Do you agree that the approach that is most likely to secure significant benefits from UHF band IV and V over the long term is one that enables the release of the 700 MHz band for mobile broadband whilst also ensuring the role of the DTT platform is safeguarded?

As set out in our response to Questions 1 to 5 above, we are not convinced that the case for 700 MHz clearance has been made. Therefore, we should stress at the outset that our clear preference would be for Option 1, as set out in the bullets under paragraph 5.7 of the consultation – which would involve no 700 MHz clearance and retention of existing spectrum for DTT. As Ofcom states, this would be the least disruptive option for DTT – it would therefore be consistent with the legal rights of the DTT multiplex operators, and would cause least disruption to consumers of DTT services.

We also wish to emphasise that, even in the event that other European countries elected to clear DTT services from 700 MHz, Ofcom would continue to have the discretion to retain 700 MHz (and 600 MHz) for DTT use in the UK. There are strong reasons to suggest that the consumer benefits delivered by DTT services are substantially greater in the UK market than is the case in other major European markets. In reaching any future decision about the optimal future use of 700 MHz in

the UK, Ofcom must judge the net benefits for UK consumers of both the incremental advantages which would arise from mobile use of 700 MHz (as opposed to other licensed or unlicensed spectrum) against the consumer costs and other dis-benefits associated with the relocation of DTT services from this spectrum.

Nevertheless, we also recognise – and as Ofcom itself highlights in the consultation – that there is a significant international move, arising from strong lobbying by multinational mobile network operators, to implement 700 MHz clearance, and therefore that Option 1 may not be the eventual outcome.

In the event of a decision to clear 700 MHz spectrum, despite our substantive legitimate expectations to the contrary, we consider it vital that any clearance is subject to a number of conditions to ensure that DTT continues to be able to deliver citizen and consumer value. As explained further below, this would require the 600 MHz spectrum to be reserved for DTT. Therefore, in the event of a decision to implement 700 MHz clearance, we would support a variant of Option 3 as a second best solution, in which Ofcom confirms at an early stage that 600 MHz would be reserved for DTT for the longer term. In other words, if 700 MHz clearance does take place, it should be implemented in a harmonised and co-ordinated manner, and in a way which ensures that DTT has sufficient spectrum to continue to perform both its public policy role in providing low cost universal access to PSB content and its role in sustaining consumer choice in platforms, content and equipment – a role which would be furthered by at least maintaining DTT coverage and the number of channels on the platform.

We would also stress in this context that Option 2 – which would involve 700 MHz clearance but no compensating spectrum for DTT – would materially reduce platform and price competition and would limit any stimulus for innovation, thereby creating significant consumer detriment. Moreover, it would be contrary to our substantive legitimate expectations. The potential consumer detriment associated with this option is explained in response to Question 7 above.

Question 16: Do you believe there is a material risk that the DTT platform will have insufficient spectrum to continue to deliver important benefits (including providing universal low cost access to PSB content) if the 600MHz band is not used for DTT after clearance of the 700 MHz band?

In order for DTT to continue to deliver significant consumer benefits, it needs to remain as a full service platform – offering a range of channels, and delivering choice for all consumers. As explained in response to Questions 6 and 7 above, we expect DTT to remain of significant importance to citizens and consumers for the next decade and well beyond, provided that the platform can retain at least the same level of availability of services as it carries today. Moreover, in the event of a weakening of the platform – caused, for instance, by a reduction in the amount of spectrum available to DTT – O&O found that the consumer benefits of DTT would materially decline.

In the light of our objectives for the platform – and informed by the O&O study referred to in response to Questions 6 and 7 – we agree with Ofcom's analysis that:

- Consumer and citizen benefit would be maximised if the DTT platform were to continue to operate with six multiplexes.

- Coverage of those multiplexes is a significant contributor to the levels of benefit provided.

- In the event of 700 MHz clearance, the absence of 600 MHz spectrum would mean that the commercial multiplexes (which among other things carry a number of very popular digital channels from the main PSBs) would have to be sacrificed in order to maintain coverage of the PSB multiplexes. This would be a highly unwelcome outcome for consumers, and would run contrary to the substantive legitimate expectations of the commercial multiplex operators. In addition, such an outcome could lead to a significant increase in the transmission costs incurred by the PSB multiplex operators – as the PSB multiplex operators would have to bear the full Network Access costs for the 80 main transmitter sites – leading to a direct adverse impact on the amount of funds available for investment in content.

- A combination of the loss of 700 MHz and no 600 MHz replacement would make it impossible for the number of HD DTT services to grow in the medium to long term – this would reduce the appeal of the platform for consumers, lead to a reduction in take-up of DTT, reduce the revenues of DTT multiplex operators and broadcasters, and in turn would create challenges to continued commercial PSB delivery.

- Moreover, a clearance of 700 MHz with no 600 MHz replacement would reduce the amount of interleaved spectrum available, thereby making the provision of PMSE, WSD applications and local TV services more challenging. In the event of 700 MHz clearance, reserving 600 MHz for DTT would therefore also deliver benefits to other spectrum users.

Therefore, we agree with Ofcom's view that the DTT platform will have insufficient spectrum to continue to deliver important benefits (including providing universal subscription-free access to PSB content) if the 600MHz band is not used for DTT after any clearance of the 700 MHz band.

Question 17: Do you believe that using the 600 MHz band for DTT after clearing the 700 MHz band would reduce the risk that the DTT platform will not be able to continue to provide important citizen and consumer benefits?

Our response to this question follows on directly from our responses to Questions 6, 7 and 16. Specifically, in the event of 700 MHz clearance, we believe that long term reservation of the 600 MHz band for DTT is essential in order to enable DTT to continue to deliver citizen and consumer benefits – as such reservation, [✂] would be the only means of enabling DTT to:

- Continue to deliver at least the range of services available on the platform today.

- Maintain the consumer choice benefits delivered by the continued existence of both the PSB and Commercial multiplexes.

- Maximise the coverage of the DTT multiplexes, therefore delivering benefit to as many UK households as possible.

Expand the HD offering on the DTT platform, so as to maintain the competitiveness of DTT relative to the pay satellite and cable platforms in the medium to long term. [✂]

Question 18: Do you agree that the future benefits for citizens and consumers of enabling the release of the 700 MHz band whilst maintaining the role of DTT are likely to outweigh the loss in benefits of the 600 MHz band not being able to be used for other services in the long term?

We agree with Ofcom's analysis as set out in paragraphs 6.42 to 6.51 of the consultation document. Overall, we consider that the priority should be to secure the existing benefits already delivered by DTT – and that, in the event of 700 MHz clearance, 600 MHz spectrum will be required in order to deliver these benefits.

As Ofcom itself has identified, there are limited alternative primary uses for 600 MHz spectrum. While white space device (WSD) use represents a potential alternative, as Ofcom states "there are significant uncertainties at present about the future timing and availability of mass market devices"[13]. Moreover, Ofcom believes that it "is also uncertain to what extent licensed WSDs in the 600 MHz band could bring additional benefits compared to their licence exempt use in interleaved spectrum. In particular, licence exempt use would be possible in the 600 MHz band if it were used for DTT services following the release of 700 MHz spectrum."[14] As set out in response to Question 12 above, and as we discuss further in response to Question 19 below, we believe that WSD will be an important user of interleaved spectrum, but that it does not require – and would gain no benefit from – primary licensed access to the 600 MHz band.

As a result, reservation of the 600 MHz band for DTT would (a) enable the DTT platform to continue to deliver significant citizen and consumer benefit, and (b) create little if any downside loss of benefit associated with WSDs or other alternative uses. As such, we believe that, in the event of 700 MHz clearance, the 600 MHz band should be reserved for DTT for the long term.

Question 19: Have we identified correctly the possible short-term uses of the 600 MHz spectrum? Are there other short-term uses we should consider?

We believe that there is a false dichotomy between "long term" and "short term" uses of spectrum. Uses of spectrum tend to be long term in nature, involving significant long term investments – hence delivering long term certainty for DTT, by confirming at an early stage that 600 MHz will be reserved for DTT in the event of 700 MHz clearance, should be Ofcom's priority. In our view, the question of potential short

[13] Bullets under paragraph 6.48 of the consultation document.
[14] Ibid.

term uses of 600 MHz spectrum needs to be addressed in the context of the long term strategy for spectrum use.

Therefore, our key overarching principle is to ensure that any short term use of 600 MHz spectrum does not impede Ofcom's ability to license 600 MHz spectrum for longer term use by DTT. Arguably the most efficient way of meeting this principle would be for Ofcom to reserve 600 MHz spectrum for DTT as soon as possible – thereby providing spectrum certainty for the DTT multiplex operators, while also permitting potential short term use of the spectrum by DTT and by users of interleaved spectrum. In this context, we have considered the potential issues around potential short term WSD use of the 600 MHz spectrum. [✂]

We note that WSD represents a potential short term use of the 600 MHz spectrum – although, as noted in response to Question 12 above, there may be limited scope for WSD roll out in the period before 2018. Nonetheless, if 600 MHz were to be used for WSD applications in the short term, WSD application providers should not be permitted to deliver services as if they were primary users of the 600 MHz spectrum – e.g. delivering Wi-Fi hot spots at very high power, thereby maximising coverage of such services. Such high power services could cause significant interference to DTT in adjacent bands. Moreover, in the event of roll out of such high power services, there could be challenges to constraining such services once DTT becomes the primary use of 600 MHz spectrum – as WSD application providers may have to reduce or withdraw services offered to consumers during the interim (pre-700 MHz clearance) period. Therefore, any short term use of 600 MHz for WSD or other applications needs to be future-proof – i.e. there need to be explicit limits on short-term WSD use to reflect the fact that long-term use would be constrained by the fact that WSD is inherently an interleaved spectrum user.

In particular, we note that any deployment of WSD applications in the 600 MHz band would need to be consistent with its application in interleaved spectrum. As the 600 MHz band is adjacent to DTT broadcasting – with DTT services currently employing both 500 MHz and 700 MHz spectrum – there is the risk of blocking interference from WSD applications to DTT services. Moreover, there are no filters available to mitigate the potential inference from WSD applications. Therefore, primary deployment of WSD applications in the 600 MHz band would not be efficient, and would have an adverse impact on existing licensed DTT services. [✂]

Question 20: Which option(s) for releasing 600 MHz in the short term would maximise its value whilst supporting our proposed longer term objectives?

As set out in response to Question 19 above, we believe that Ofcom's primary focus should be to deliver long term spectrum certainty to the DTT multiplex operators – at a minimum, this would require 600 MHz spectrum to be allocated to DTT through a managed Ofcom process, rather than through an auction. [✂]

<u>The wider impacts of changing the use of the 700MHz band</u>

Question 21: Do you agree that the wider impacts of a future change of use of the 700MHz band could be managed to prevent them having a detrimental impact on consumers and the services operating in this band?

A number of the overarching principles set out in Section 1 of this submission are of critical importance to Ofcom's transitional planning:

- **Respecting the legal rights of the DTT multiplex operators**: The DTT multiplex operators are lawful users of spectrum, hold Ofcom licences, and have substantive legitimate expectations which have underpinned our very significant investments in DTT infrastructure. Therefore, we consider that – in the event of 700 MHz clearance – broadcasters (whether commercially or licence fee funded), multiplex operators and consumers should not incur any additional costs that might be incurred in order to re-plan DTT networks in such a way that at least maintains DTT coverage and the number of channels on the platform, and to address consumer issues. Rather, such costs should be borne by the beneficiaries of early release, or through proceeds from any auction of 700 MHz spectrum.

- **Funding the transition:** Quite apart from our substantive legitimate expectation to be put into the position we would otherwise have been in, we note that any early release of the 700 MHz band would generate significant benefits for the likely licensees of that spectrum – the mobile network operators – as well as to the Exchequer in revenues from any spectrum auction. The costs of transition and related action needed to maintain the DTT platform should therefore be borne by the mobile network operators – as the major beneficiaries of this policy – or through auction proceeds (with public funds potentially used to cash flow the process prior to any auction). Critically, DTT consumers and multiplex operators should not incur any additional costs as a result of this process. [✂] there are some very substantial heads of cost associated with the clearance of 700 Mhz – our view is that such costs need to be fully funded.

- **Minimising consumer disruption**: Consumer inconvenience, cost and confusion – and risk of loss of confidence in DTT – must be minimal, and involve a clear, coordinated and reassuring communications plan. More generally, and in line with the principles set out above, we believe that any consumer transitional costs should be borne by the mobile network operators or funded out of auction proceeds.

Overall, therefore, Ofcom's planning needs to be defined on the basis of the need for a transitional plan with gives all relevant parties the incentive to achieve the desired policy outcome in a way which (a) respects existing legal rights, (b) aligns incentives, and (c) provides long term certainty. In this context, we highlight a number of significant issues which need to be properly addressed:

- **Aerial changes**: We consider that Ofcom may have significantly underestimated the extent and cost of aerial changes likely to be required as a result of 700 MHz clearance. In particular, we note that Ofcom's initial estimates for the percentage of UK television homes that could need a new aerial to receive the commercial multiplex channels (as set out in paras. 7.6-7.9 of the Consultation) do not take account of households where the primary set is not reliant in DTT, but one or more secondary sets are.

We consider that aerial upgrades should be funded for all such affected households, and not just primary DTT households – as failing to upgrade aerials for secondary set DTT households would not only force such households to incur the cost of switching to a new broadcast feed to keep such sets in use (including not only equipment costs but also potentially secondary set feed charges from pay platform operators (Sky, for example, charges £10 per set per month for Sky multiroom), but would also create future barriers to those households wishing to switch their primary reception to DTT, and would therefore be detrimental to platform competition. Indeed, the impact in terms of potential platform competition could be regarded as applying even more broadly – as it would also affect the ability of homes with a presently unused aerial, using exclusively a satellite or cable feed, to unplug and switch to FTA DTT at some future date [✂]

This is a big issue which we look forward to working with Ofcom to address collaboratively. All that being said, however, the costs associated with aerial changes are likely to be significant. In line with the principles set out above, we believe that such costs should be borne by the beneficiaries of 700 MHz clearance or through auction proceeds. The potential scale of this issue also strongly suggests that further steps need to be taken to ensure that the consumer issues associated with aerial changes are managed properly, through a fully funded process – involving, for instance, a consumer information programme which would start as soon as Ofcom has made decisions on future use of 600 MHz spectrum, mandation by Ofcom of multiband only aerial installations, and an aerial replacement programme to replace the final set of non-multiband aerials still in place at the time of any future clearance. A critical objective of any aerial upgrade programme should be to ensure that viewers do not lose access to services on either PSB or commercial multiplexes as a result of 700 MHz clearance.

- **Coexistence**: Just as the clearance of the 800 MHz band has created the potential for 4G interference into DTT services in 700 MHz spectrum, we note the future potential for interference between mobile in 700 MHz and DTT in 600 MHz. Any such interference needs to be appropriately managed and paid for by the MNOs.

- **Network costs**: Any plan to clear 700 MHz spectrum will require a complete re-plan of the UK's DTT networks and a shift from 700 MHz to 600 MHz spectrum would create a significant increase in DTT network build costs. Consistent with our substantive legitimate expectations, the DTT multiplex operators should not bear any increased costs as a result of this process.

- **Licence certainty**: As Ofcom will be aware, the SDN and D3&4 multiplex licences expire in 2022, and the Arqiva and BBC Multiplex B licences expire in 2026. In the context of Ofcom's desire to pursue 700 MHz clearance potentially from 2018, Ofcom needs to consider (a) the legal rights of the multiplex licensees, (b) the long term investments that the DTT multiplex operators have already made in DTT infrastructure, under transmission contracts that run significantly beyond the current licence periods, and (c) the risk of inconvenience and potential

harm to the platform that could be caused by 700 MHz clearance. Securing long term certainty for the multiplex licence holders through licence extensions would deliver benefits to consumers – as, consistent with our legal rights, granting certainty to the multiplex licensees would be an essential pre-condition to any participation in a 700 MHz clearance process prior to the end of the current licence period; would safeguard our long term investments in DTT infrastructure; and would enable the MuxCos to take a long term planning perspective to mitigate the potential future risks to the platform.

- **Spectrum pricing**: The multiplex operators also oppose the application of Administered Incentive Pricing (AIP) to broadcasting spectrum, irrespective of whether clearance of 700 MHz is undertaken.

We consider that Ofcom needs to make a more detailed assessment of the above issues as part of this process – and indeed that a full cost-benefit analysis, including issues such as those noted above, is required before any decision is taken in relation to 700 MHz clearance.

Proposed approach for securing future benefits and next steps

Question 22: Do you agree that the approach set out in this consultation is likely to secure significant benefits for citizens and consumers over the long term?

As we have made clear in this submission, the DTT multiplex operators are not convinced of the case for clearance of 700 MHz spectrum for mobile broadband. Moreover, we note that Ofcom has not undertaken a comprehensive analysis of the costs and benefits associated with 700 MHz clearance. Nonetheless, while we do not endorse all of Ofcom's proposals in the consultation document, we recognise that the position is complex and has an international dimension.

In that context, we agree with most of Ofcom's proposals regarding the steps that need to be taken in the event of 700 MHz clearance. In particular, we welcome Ofcom's commitment to the future of the DTT platform – including the six multiplex structure and current levels of DTT coverage – and we support Ofcom's view that long term reservation of 600 MHz spectrum would be required in order to enable a viable future for DTT in a post-700 MHz clearance world. We therefore believe that Ofcom has identified the right set of issues that need to be considered in the context of a possible 700 MHz clearance.

Question 23: Have we correctly identified the main areas of future work that could follow this consultation process subject to its outcome?

We note the areas of further work identified by Ofcom at paragraph 8.19 of the consultation document:

- Use of 600 MHz – in both the short term and long term

- International engagement

- Preparing for a future DTT re-plan
- Licensing arrangements
- Managing impact on users of interleaved spectrum.

We broadly agree that these are the correct areas of future work. However, we note that Ofcom has identified "minimising disruption for consumers and any new coexistence issues" as a sub-set of the "Preparing for a future DTT re-plan" area of work. In our view, it would be more appropriate for Ofcom to separate out these issues, such that its streams of work would include:

- Preparing for a future DTT re-plan – focusing on the technical aspects of the network re-planning exercise.
- Developing the transitional plan – this would go beyond the specific technical issues, and would instead take a broader view of the appropriate approach to the transition for consumers, broadcasters and multiplex operators, including issues around future availability and take-up of appropriate aerials and DTT reception equipment. This stream of work would also put in place the necessary mechanisms to ensure that any transition is properly funded.

In addition, we note that any clearance of 700 MHz would also have significant implications for existing commercial contracts, including (but not limited to) the DTT multiplex operators' transmission contracts with Arqiva Transco. Ofcom's programme of work will also need to consider how such commercial issues are appropriately dealt with.

The DTT multiplex operators recognise that Ofcom's consultation marks the start of what is likely to be a long and complicated process. This submission is therefore intended to provide an early contribution to that process, and we look forward to engaging with Ofcom on the above and any other relevant aspects of the work programme going forward. [✂]