

Spectrum management strategy: Ofcom's approach to and priorities for spectrum management over the next ten years

About Arqiva

Arqiva is at the forefront of network solutions and services in the digital world and provides much of the infrastructure behind television, radio, satellite and wireless communications in the UK, with a significant presence in Ireland, mainland Europe and the USA.

Arqiva is a founder member and shareholder of Freeview, and was a key launch technology partner for Freesat. Arqiva is the licensee for 2 of the UK's 3 original Freeview commercial multiplexes, providing over 40 services to 20 million homes, and for the new HD multiplex which launched before Christmas. Arqiva also owns Connect TV, a company which integrates within the regular Freeview EPG "television" services provided over broadband with broadcast DTT services.

Arqiva also provides satellite uplink services on which many TV and radio services are distributed, and provides transmitter sites (16 700 marketable sites, 8 700 sites active with site share licences) on which mobile operators depend.

Our UK customers include major broadcasters such as the BBC, ITV, C4, C5, BSkyB, the commercial radio groups, major telecommunications providers (including the UK's four mobile network operators), and the emergency services.

Arqiva undertook the Digital Switch-Over of television from analogue to digital - a huge logistical exercise over 7 years which was successfully delivered to time and budget. At the request of DCMS, Arqiva implemented an accelerated timetable for the clearance by television of the 800 MHz spectrum auctioned by Ofcom in February for LTE mobile broadband - 5 months earlier than originally planned.

In 2012 Arqiva entered the WiFi market. Arqiva WiFi's network has since grown rapidly and now has about 25 000 access points across airports (including airline lounges), hotels, retailers, motorway service stations and marinas and a range of councils, including winning 9 of the 10 London Councils which tendered in 2012-13.

Through our 'Secure Solutions' business, Arqiva provides mission-critical communications services, including front-line emergency services, to a variety of government entities in the UK and Ireland, such the Maritime and Coastguard Agency and the 2 largest police forces, and also provides the RNLI with around-the-clock monitoring for our bespoke, secure solution.

And finally, last August DECC selected Arqiva to provide communications to support smart meters for the c10 million premises in the North Region.

Executive Summary

Ofcom has identified the spectrum management challenges which, with today's knowledge, should feature as a priority for the next 10 years. However flexibility in spectrum management will be essential as it is likely that at least one new disruptive use of spectrum will emerge and need to be accommodated.

Accommodating new uses will increasingly require either sharing alongside existing uses or clearing spectrum for re-use. In either case the needs of those existing uses, and their consumers, must be given full consideration. This puts an additional technical onus on Ofcom to respond to, and fully investigate, spectrum users' complaints of interference and to use whatever powers are at Ofcom's disposal to protect the legitimate licensed users service to its customers.

When considering how to accommodate new uses, It is all too easy to predict the imminent demise of an existing use of spectrum, only to be surprised by its enduring appeal to consumers. Linear television, is likely to be a high-profile example of this, it has been repeatedly written off by many over the medium term, however many millions of consumers still spend hours per day consuming and will very likely do so in 10 years' time.

Additionally new uses' spectrum demands, where there is a direct detrimental impact on existing uses (especially those with mass usage) must be fully challenged. The obvious example here is spectrum demanded for future mobile broadband capacity, where we agree that addressing the potential demands from mobile broadband must be a priority, but alongside other solutions: technology refresh, expansion of infrastructure deployment and more spectrum for WiFi (taking account of the seamless transitions to be offered by Hotspot 2.0 combined with the increasing prevalence of public WiFi hotspots). If spectrum is a solution to any capacity challenge then it must be appropriate for that, with higher frequency bands providing the bandwidth and capacity necessary.

Arqiva would also suggest that the potential impact of changes (i.e. spectrum clearance) to DTT should be uprated from moderate to severe, given the necessary re-tuning and aerial implications for moving multiplexes "out of group" (including at Winter Hill, the transmitter mast with the second largest population coverage), affecting millions of consumers; plus implications for PMSE users, local TV and any White Space device use.

If 700 MHz is to be cleared for re-use by mobile broadband, we agree that the balance of advantage may lie in regulatory action rather than market mechanisms to secure the optimal outcome for UK plc, which is to facilitate a platform-wide upgrade to DVB-T2, fully-funded by Government, to both protect continuing universal free-to-air access to PSB services and inter-platform competition in the supply of linear

television, and to increase flexibility in spectrum planning and enhance the ability to accommodate the outcome of international negotiations, thus increasing the likelihood of clearance not being delayed and the platform compromised.

Answers to Questions

Question 1: Have we captured all the major trends that are likely to impact spectrum use over the next ten years in this section and the separate Appendix on sectoral developments? Are there other market, technology or international developments that could lead to significant changes in spectrum demand and supply over the next 10 years?

The most obvious major trends appear to have been captured, including the international harmonisation essential to drive economies of scale for many spectrum uses, although Arqiva very much agrees that Ofcom shouldn't be forecasting the future (least of all, 10 years' out) and then seeking to engineer outcomes based on that forecast.

Consequently flexibility in spectrum management will be essential as it is likely that within the next 10 years at least one new disruptive use of spectrum will emerge and need to be accommodated. For example 10 years ago, when 3G services had just been launched and the cellular operators were seeking its USP, neither the impact of mobile data nor that its catalyst would come from outside the prevailing mobile industry could have been predicted. Likewise, M2M was scarcely on anyone's radar.

Demand for existing uses is likely to remain resilient and any disruption to existing uses caused by regulatory intervention will have a considerable detriment to consumers.

We would also point out that it is routine to predict the imminent demise of an existing use of spectrum, only to be proved surprised by its longevity. So just as TV was supposed to kill radio, it now seems that on-demand IPTV must be about to kill linear TV. Arqiva would suggest that both IPTV and linear TV will probably still be consumed by many millions in the UK in 10 year's time. Indeed, with imminent technology upgrades, Arqiva expects TV to be enjoyed in UHD and HD, rather than HD and SD as now, and to be broadcast with even greater spectrum efficiency than it is today.

Ofcom is right to highlight the likelihood that increasingly supply of suitable spectrum for a high value use will be obtained by clearing an incumbent use, perceived to be of lower value, from some or all of the spectrum that it uses and/or from increased sharing. As there are several ways in which the value – economic and societal – of any use of spectrum could be estimated, Ofcom is right to recognise that public

policy objectives may need to be considered and, in addition, that where the proposed change could have a considerable impact on the incumbent users, then market mechanisms alone may be unlikely to deliver the desired outcome, including the timescale.

Arguably the potential clearance of 700 MHz spectrum of TV for mobile broadband data is one such current example, where public service television (whose consumption is also increasing) has a range of policy objectives including universal coverage, free at the point of consumption; whereas mobile data, for all its obvious consumer attraction, is essentially devoid of policy objectives other than coverage obligations (not always applicable or even enforced).

Arqiva would also argue that the economic benefit to UK plc of a thriving television sector (which, *inter alia*, also underpins the UK film industry) is considerable, but some of it not always obvious. Indeed, a recent report¹ demonstrated that:

- DTT plays a critical role in the overall UK broadcasting and content ecology;
- The economic benefits of DTT are considerable and higher than previously estimated;
- DTT delivers more value than mobile broadband, when the amount of spectrum used by the respective services is taken into account;
- A strong DTT platform is critical to healthy competition in the TV market, and to the realisation of a wide range of social benefits.

This report also adjusted the 2012 Analysys Mason estimate for DCMS² of the surplus created by spectrum from DTT from £63.6bn to at least £79bn. But more importantly when considering alternative uses of the same spectrum, the report found that the marginal value of DTT spectrum is more than twice that for mobile data.

Question 2: Do you have any comments on this summary of our approach to spectrum management and on the principles discussed in Annex 5?

Arqiva agrees that consideration of downstream competition must be a factor in spectrum management. Although Ofcom has highlighted MNO spectrum holdings, we would also highlight the vigorous competition between DTT (both as a linear-only platform, and as the centrepiece of hybrid platforms), satellite and cable TV.

¹ *The value of Digital Terrestrial Television in an era of increasing demand for spectrum*, Communications Chambers, January 2014.

² *Impact of radio spectrum on the UK economy and factors influencing future spectrum demand*, Analysys Mason, 5 November 2012.

Arqiva also agrees that DTT remains the more appropriate method of meeting the objective of delivering universal free-to-air access to PSB services. Accordingly, if 700 MHz spectrum is to be cleared of TV for the benefit of mobile broadband then, taken together, the DTT platform must have ongoing access to sufficient spectrum and the most appropriate transmission and compression technologies to ensure both continuing universal free-to-air access to PSB services and inter-platform competition through a suitably diverse range of content being available.

Specifically in respect of any clearance of 700 MHz, we agree that the balance of advantage may lie in regulatory action rather than just market mechanisms to secure the optimal outcome for UK plc, which is to facilitate a platform-wide upgrade to DVB-T2 and, if clearance is confirmed, having the resulting harmonised band available for re-award for mobile broadband use when consumer demand is likely to require that spectrum's use. But there would need to be certainty of long term access by DTT to the spectrum 470 – 694 MHz beyond the current multiplex licensing arrangements to support such a change and ensure sustainability of competition over the long term. Also, any clearance of the 700 MHz band would need to be fully funded.

Finally, as a spectrum licensee, Arqiva would fully endorse the principle that:

“Rights to use spectrum should be unambiguous, unlikely to be changed without good cause, and as flexible as possible whilst respecting the rights of others.”

Arqiva interprets unambiguous rights to use spectrum as encompassing adequate protection from new additional co-channel use.

As outlined in Arqiva's response³ to the AIP consultation we reiterate the principle that additional future charges based on the administrative incentive pricing approach should not be applied to the spectrum on which National DTT Multiplexes depend.

Question 3: Do you think we have adopted the right approach to analysing future trends and developments that could raise the need for future regulatory action?

The approach adopted is quite comprehensive and, as stated above, Arqiva agrees that Ofcom shouldn't be forecasting the future and then seeking to engineer outcomes based on that forecast. We would also agree that the 7 areas identified for potential spectrum-related regulatory action are all important to address if the UK's spectrum is to be well managed.

³ Arqiva response to spectrum pricing for terrestrial broadcast spectrum – May 2013.

Question 4: What are your views on the results of our analysis of future developments summarised in this section and discussed in greater detail in the Appendix to this consultation? Please provide evidence in support of your views wherever possible.

In terms of the preliminary assessment of potential sectoral challenges (figure 11), Arqiva would agree that spectrum required for mobile broadband capacity is probably justified in being assessed as severe impact and high urgency, with spectrum demand from that source assessed alongside other capacity solutions (technology refresh, investment in infrastructure, WiFi offload). We encourage a balanced approach to spectrum release (both high and low frequency) to ensure that service provision is optimised. Ensuring that the Emergency Services will have access to sufficient suitable spectrum ought to be part of any analysis of mobile broadband capacity. We would also highlight the important role of C-Band spectrum in the 3.8 – 4.2 GHz range for satellite services.

Technology refreshes must be a major mitigation for demand for capacity spectrum. One only needs to compare what 3G/UMTS could offer consumers today in the same 5 MHz channel as it would have offered in 2003. We would also argue that investment in infrastructure should play a major role here, too. Broadly speaking, where spectrum is relatively expensive carriers deploy more infrastructure, where spectrum is relatively cheap carriers deploy more spectrum.

There are two further points Arqiva would also make in respect of mobile broadband:

1. WiFi is increasingly seen as a critical tool for cellular network operators for the delivery of high bandwidth services and to effectively extend data coverage indoors, with circa 80% of data traffic delivered by this means. The introduction of Hotspot 2.0 will also enable more seamless transitions between the two technologies. Therefore the increasing prevalence of public WiFi hotspots also needs to be factored into this assessment. Clearly the European Commission have recognised the importance of additional spectrum for WiFi and is targeting the 5 GHz range for this - Ofcom should take an active role in delivering upon this.
2. Ofcom is already working on planning clearing DTT from 700 MHz for potential re-use by mobile broadband. A fully-Government funded platform-wide upgrade by DTT to DVB-T2 would increase flexibility in spectrum planning and the ability to accommodate the outcome of international negotiations, thus increasing the likelihood of any clearance of 700 MHz not being delayed beyond when the MNOs are likely to require it. This is the obvious near-term candidate requiring regulatory action to co-ordinate major change to bring about the optimal solution.

In respect of DTT, we are surprised that potential changes (specifically, 700 MHz clearance and a co-primary allocation of 470-694 MHz to mobile in WRC 15) are

assessed to have only moderate impact. Given the necessary re-tuning, and aerial implications for moving multiplexes “out of group” (including at Winter Hill, the transmitter mast with the second largest population coverage), affecting millions of consumers; plus implications for PMSE users, local TV and any White Space device use; we would suggest that the potential impact be updated to severe.

In respect of increased spectrum sharing, and also potentially in respect of “de-fragmenting” public spectrum holdings such as those between 450 – 470 MHz, Arqiva would suggest that there would be a key management role that commercial band managers could assist in. Ofcom could probably do more to encourage commercial band managers (drawing a distinction here with sectoral band managers such as JFMG and JRC) into existence, for example by awarding blocks of spectrum with existing users where Ofcom is the principal source of spectrum supply to meet certain sources of market demand, such as for fixed links and for business radio use.

Given the considerable potential for future changes in many spectrum bands as shown in table 4, Arqiva wonders what the resource implications (including for the International team) are for Ofcom to avoid delays in addressing these.

Question 5: Do you agree that a consideration of mobile and wireless data demands should feature as a priority area in our work programme for the next ten years? Have we captured all the major issues that we should consider within this area?

As we said in answer to question 4 above, addressing the potential demands from mobile broadband (including to support emergency services) must be a priority, but preparing to clear and award ever more spectrum to mobile (with all the attendant disruption for incumbents and their users) isn’t the only solution: technology, infrastructure and WiFi must also play key roles (with WiFi demand for additional 5 GHz spectrum a factor).

Given the potential impact of awarding additional spectrum to mobile on millions of consumers of incumbent spectrum uses (specifically if mobile is awarded co-primary status for any of 470 - 694 MHz), and also increasing ingress of terrestrial data services into satellite bands, it is essential that Ofcom be adequately resourced and deeply engaged in the WRC process, including all relevant preparation sessions.

If 700 MHz is cleared and awarded to mobile broadband, then Arqiva would suggest that spectrum around 450 MHz (a 3GPP candidate band) - notwithstanding the current fragmented user base - and L-Band should be candidates to satisfy any additional demand for sub 1GHz mobile spectrum beyond that. By comparison, clearing DTT from 470 - 694 MHz would have considerable disruption to millions of consumers.

Question 6: Do you agree that the future of PMSE spectrum access should feature as a priority area in our work programme for the next ten years? Have we captured all the major issues that we should consider within this area?

PMSE plays an essential, but largely unsung, supporting role, not just in the production of television, film and radio, but also its extensive use in theatre and a range of outdoor events including music concerts/festivals. Arqiva is therefore pleased to see the attention accorded it in this consultation. We believe that the major issues have been captured.

Question 7: Do you agree that the implementation of our 700 MHz strategy and the longer term future of DTT should feature as a priority area in our work programme for the next ten years? Have we captured all the major issues that we should consider within this area?

Arqiva agrees that the longer term future of DTT should be a priority for Ofcom. However we are surprised to see that Ofcom's previous forecast that DTT would remain an important platform for the universal delivery of PSB services until at least 2030, this consultation now implies that Ofcom sees that role continuing only into the 2020s.

It is not obvious to Arqiva why the viable lifespan for DTT should now be assumed by Ofcom to be shorter than when the UHF Strategy was consulted on only last year. Moreover, Ofcom re-enforced the 2030 date in a recent submission prepared for CEPT TG6.⁴

The number of consumers using DTT continues to grow, as does average time spent watching DTT per week. Even though most UK homes now have PVRs, almost all viewing is still live, and most catch-up viewing is very soon after first transmission.

In addition, broadband continues to require a subscription on top of line rental and the television licence fee (i.e. unlike DTT it is not free at the point of use), and there are many consumers who could take up broadband now but decline to do so.

Universal take-up of broadband at any speed and reliability – far less *superfast* – remains a long way off.

Just as linear TV didn't replace radio, and cinema survived both, so there seems no reason to assume that without regulatory intervention on-demand programming provided by IPTV would replace linear TV. A more likely future scenario is that this

⁴ ECC TG6, UK's National Statement on securing the future benefits for the UHF spectrum, ref TG6 (13) 41, 3 – 5 December 2013, Lisbon, Portugal.

complements linear TV, with “TV” increasingly a hybrid platform rather than the either or choice proposed by some commentators.

In a mostly hybrid scenario, it will be essential that linear TV continues to thrive and, with DTT as the most popular delivery option chosen by UK consumers, that means that DTT must continue to offer a compelling consumer proposition.

That means that Ofcom should ensure that, if 700 MHz has to be given up by DTT for re-use by mobile broadband, then the platform continues to have access to sufficient spectrum that it is able to continue to offer an attractive range of services, (including an increasing number in HD to maintain inter-platform competition), universally available.

To ensure that this is possible in a substantially reduced amount of spectrum, it is highly likely to require a platform-wide upgrade to DVB-T2, in which case cost and consumer disruption would be minimised if the platform upgrade were fully Government-funded and implemented simultaneously with the clearance of 700 MHz.

In addition to offering improved spectrum efficiency, such that the current DTT service line-up plus more HD simulcasts could be accommodated in less spectrum, DVB-T2 also offers greater immunity to interference for the same data rate as DVB-T, providing greater flexibility in spectrum planning to accommodate the result of international co-ordination, and therefore reducing the risk of a delay in clearing 700 MHz in time for when the MNOs believe that they would need it to meet subscriber demand.

Question 8: Do you agree that a consideration of competing demands for spectrum at 450 -470 MHz should feature as a priority area in our work programme for the next ten years? Have we captured all the major issues that we should consider within this area?

Arqiva agrees that this should be a priority, with adequate protection from interference of the broadcast services above, i.e. at 470 MHz. If 700 MHz is cleared and awarded to mobile broadband, then Arqiva would suggest that any legitimate demand for additional mobile spectrum (once the contribution of technology refreshes, additional infrastructure investment and WiFi offload have been taken into account) beyond that could be met in part by spectrum around 450 MHz (a 3GPP candidate band), in conjunction with L-band, with less overall disruption than attempting to clear DTT from any spectrum between 470 - 694 MHz.

Question 9: Do you agree that spectrum sharing should feature as a priority area in our work programme for the next ten years? Have we captured all the major issues that we should consider within this area?

With increasing demand for spectrum, spectrum sharing must be treated as a priority, alongside public sector spectrum release (which the market has seen very little of so far) and incentivising more efficient commercial use.

However it will be essential that primary uses are protected from undue interference, particularly when the primary use is licensed and the secondary uses aren't.

Spectrum sharing will put an additional technical onus on Ofcom to respond to, and to fully investigate, spectrum users' complaints of interference and to use whatever powers are at Ofcom's disposal to protect the legitimate licensed users' service to its customers. If Ofcom does not police the bands then services and businesses will collapse due to low availability and quality of service and this will reduce companies' willingness to invest in new wireless technologies.

Arqiva would point out here that, in addition to extensively re-using spectrum across all multiplexes, DTT has long shared spectrum with PMSE and Local TV, and subject to satisfactory trials, in due course expects to do so with White Space devices (although given that the technology for TVWS is as yet unproven, Ofcom might look at other bands for DSA in addition to UHF broadcast spectrum).

Also there is a key role to be played in facilitating sharing by commercial band managers, market players which don't really exist yet.

Question 10: Do you agree that, in future, we should consider whether and how to play a greater role in supporting improvements to the performance of RF transmitters and receivers? What are your views on the potential future role for regulation in this area?

Arqiva believes that this is a sensible suggestion, although given the international nature of equipment supply and the array of standardisation bodies we expect it to be challenging for Ofcom to affect major change here, and there would be resource implications for Ofcom if it were to take more of an active role in European standards development.

Question 11: Are there other issues or potential future challenges that you consider should feature as a priority in our work programme for the next ten years? Please provide evidence in support of your views wherever possible

Arqiva believes that Ofcom has identified the spectrum management challenges which, with today's knowledge, should feature as a priority for the next 10 years.

Question 12: Do you consider that tracking these metrics could be a useful way to help monitor the effects that our spectrum management strategy has on the nature of spectrum access and how this changes over time? Are there any other indicators that we should be seeking to track for these purposes?

Arqiva agrees. Tracking the metrics in Table 13 should be both a useful means of assessing the success of Ofcom's spectrum management strategy and provide an indicator of problems needing addressing.

Question 13: Do you consider that targeted spectrum utilisation measurements could be useful in informing future spectrum management initiatives? What type of specific uses or bands could be the subject of future measurement studies, and why? Please provide evidence in support of your views wherever possible

Arqiva agrees.