

THE FUTURE OF DIGITAL TERRESTRIAL TELEVISION

Purpose of this document

This document sets out the BBC Trust's response to the Ofcom consultation document on the future of digital terrestrial television (DTT).

Context

The Trust's consideration of Ofcom's proposals must take into account a number of different aspects of our remit:

- Our duties under the BBC Charter and Agreement to act as guardian of the licence fee and the public interest, to represent the interests of licence fee payers and to exercise rigorous stewardship of public money
- Our regulatory interest in ensuring the efficient use of spectrum by the BBC
- Our regulatory obligations with respect to any 'non-service' application that might be made to the Trust by the BBC Executive

This response has been prepared with each of those interests in mind.

The Trust welcomes Ofcom's consultation. As noted in our conclusions on the Public Value Test for the BBC Executive's proposed high definition (HD) service, we would like to see the BBC's HD service launched on Freeview as soon as possible. We also recognise that there are advantages, in terms of achieving the critical mass necessary for existing Freeview users to upgrade to HD-compatible equipment, in seeking ways to establish other PSB HD services on the DTT platform in a co-ordinated way. Ofcom shared this view in its MIA work, concluding that the Trust should:

"...ensure that the launch of any BBC HD channel on DTT is considered in the context of the potential delivery of a wider range of HD services on DTT. In particular, we consider it essential that the BBC HD channel is launched in such a way that it does not create barriers to the delivery of a number of HD services on the DTT platform."

Whilst fully supporting Ofcom's objectives, the Trust has a number of concerns about the particular approach outlined by Ofcom in its consultation document. These are explained below.

Regulatory issues

The BBC Charter places specific regulatory responsibilities on the Trust with regard to BBC services. Under these arrangements the BBC Executive secured Trust approval for its new HD service last November following a Public Value Test conducted by the Trust with Ofcom involvement.

Ofcom's consultation proposals appear to us to require the BBC Executive to make a public value case to Ofcom, in a competitive environment, to seek to secure spectrum allocation on Mux B. The Trust is concerned that this might be seen as a regulatory 'double jeopardy'. Indeed, if the terms on which Ofcom was prepared to allocate space to BBC HD differed from those approved by the Trust and set out in the service licence, the BBC Executive could face the prospect of having to return to the Trust to seek approval for a change to its service. We do not believe this would be consistent with our respective responsibilities or with the aspirations we share to minimise any adverse impact of regulation. The Trust is keen to work with Ofcom to ensure that the regulatory framework established for the BBC under the new Charter operates smoothly and without any unnecessary overlaps.

Clearing Multiplex B for conversion to DVB-T2 and MPEG-4 – Trust duty to uphold the interests of licence fee payers

BBC Free To View Ltd secured the rights to Multiplex B in 2002. The BBC, like any other acquirer of spectrum rights, reasonably expected to retain control of the multiplex and allocation of capacity on it for the life of the initial licence period to 2014 and, through the renewal provisions, to 2026.

As one of two DTT multiplexes secured by the BBC for the delivery of public service broadcasting, these rights represent an important and valuable asset for the Corporation, secured with licence fee funding. The Trust has a duty under the terms of the BBC Charter to represent the interests of licence fee payers and to exercise rigorous stewardship of public money. With these duties in mind the Trust is concerned that Ofcom's proposals could have implications for the BBC in terms of the value for money it achieves, ensuring ongoing free to view access to the BBC's existing digital services and ensuring that adequate provision is made for making new or future BBC services accessible to licence fee payers using the DTT platform. The Trust would have concerns about any proposals that could result in the BBC having to invest further in securing spectrum capacity to the detriment of programme investment.

In terms of the BBC's existing digital services (SD, Radio, Interactive) the Trust is concerned to ensure that the BBC Executive has sufficient spectrum capacity to enable it to continue to broadcast its existing digital services. The plans set out by Ofcom appear to reduce the spectrum available to the BBC to transmit its existing digital services and the initial assessment conducted by the BBC Executive suggests that it may not be possible to accommodate all of the existing services adequately if Ofcom proceeds with its proposal. We note that Ofcom has not yet indicated exactly how it would propose to make space for all the BBC Multiplex B services on other multiplexes (if, indeed, it would do so) nor what legal powers would be available to it to put such proposals into effect.

The proposals set out by Ofcom also appear to offer no certainty that BBC Executive would secure capacity on Mux B to transmit the BBC HD channel that the Trust has approved.

The transition for licence fee payers

The Trust is concerned that Ofcom's projections for achieving a critical mass of DVBT-2/MPEG4 receivers could be over optimistic. This is a complex issue affected by technology and marketing considerations as well as by the nature of the HD channel service offerings. Taking particular account of its duty under the terms of the BBC Charter to represent the interests of licence fee payers, the Trust agrees with Ofcom that any transition to the new standards required to create spectrum space for HD services should be achieved in a way which does not adversely affect those with existing set top boxes and creates appropriate incentives for them to upgrade. The Trust is, however, concerned that this transition may take longer than Ofcom appears to anticipate. In particular the Trust is concerned about the impact that Ofcom's proposal to limit its initial allocation of cleared capacity on Mux B to 2014 might have on the business models of set top box makers and commercial broadcasters. Based on a timetable which would not see the full range of PSB HD services up and running until 2012, this is a very tight timeframe within which to expect manufacturers and broadcasters to recoup their investment.

The Trust is particularly concerned about the potential knock-on effects for licence fee payers, in terms of what they have to pay to upgrade to new equipment and also the risk that they might not be prepared to commit to the purchase of new equipment in an environment where the future of HD broadcasts on DTT is not secure beyond 2014. This could have wider implications for the pace at which digital switchover progresses, widespread access to free to view HD services is achieved and potentially for the long term viability of the DTT platform.

Spectrum efficiency

The Trust has a general duty under the BBC Agreement to secure the efficient use of the radio spectrum that is available for use by the BBC or its contractors.

Ofcom suggests, in respect of spectrum efficiency, that for the optimal outcome to obtain, some form of intervention may be necessary. Further, it notes that vertical integration may lead operators to retain capacity rather than sell it to a third party whose service will compete with their own.¹

It is worth noting the context in which the BBC was awarded the Mux B licence in 2002. In awarding the licence the Independent Television Commission was required, under Section 8 of the Broadcasting Act 1996, to have regard to the extent to which the award of the licence would be calculated to promote the development of digital television broadcasting in the UK other than by satellite. Amongst the factors then considered was the ability of the applicant to establish the proposed service and to maintain it throughout the period for which the licence was to be in force (i.e. at least until 2014). The Trust considers the security that the BBC's presence has brought to the DTT platform has been a key factor in its success. Now that the platform is well established, bringing benefits to a large number of licence fee payers, a continued BBC presence through the move to HD and the longer term security for all potential operators that this would deliver is highly desirable from an audience perspective.

The BBC Executive has confirmed to the Trust that it recognises that the success of Freeview has increased demand for DTT capacity, and that it remains committed to further efficiency gains, evidenced by a programme of financial investment to upgrade its infrastructure. Further, its recent work with other PSBs to develop plans to upgrade the compression and transmission standards used on Mux B to create the capacity required to establish a critical mass of HD channels on the DTT platform, as described below, may be considered to demonstrate its willingness not to occupy more spectrum space than the BBC requires to transmit its own services.

The BBC Trust commissioned and published an independent study into the BBC's use of spectrum by Deloitte & Touche LLP in 2007. The study found that the Corporation made reasonable use of the spectrum available to it, acknowledging that decisions taken by the BBC in trading off capacity to achieve a robust broadcast signal for a wider population over the last five years had 'arguably, supported Freeview to a point of critical mass and the commercial success it enjoys today'.

BBC Executive proposals

Noting Ofcom's regulatory principle of avoiding intervention wherever possible, the BBC Executive has taken up Ofcom's invitation² to develop alternative proposals. The Executive has been working together with ITV, Channel 4 and Five to develop an alternative industry-led approach.

The BBC Executive has advised us that it is currently finalising the detail of the proposal with the commercial public service broadcasters. We have had sight of an advanced draft of an application but the formal approvals process has not yet commenced. The Trust considered, at its meeting on 24 January, what the appropriate regulatory process would be for assessing such a proposal from the Executive. We provisionally concluded that a proposal should be treated as a non-service application under the terms of the BBC's Charter and Agreement. The Trust has a specific regulatory remit in relation to such applications. We would need to consider whether a Public Value Test should be conducted. If we decided not to conduct such a test we would need, in any case, to consider the evidence, particularly with respect to market implications and public interest.

¹ Section 5.48, Future of Digital Terrestrial Television, Ofcom, 2007

² Paragraph 1.47 of the Ofcom consultation

The Trust does not expect to be able to complete its assessment of any non-service application made by the BBC Executive before the date on which Ofcom has indicated it wishes to publish its statement in relation to the present consultation. The Trust recognises that timing is critical in relation to any decisions on the future of HD on DTT, and is keen to minimise any delay, but would be likely to require a certain amount of time to collate the views of interested parties and to complete the regulatory assessment of the application that it would be required to undertake. The Trust anticipates that Ofcom will wish to take account of the outcome of the Trust's process in its own process but is ready to work with Ofcom to minimise any impact on Ofcom's planned timetable. We have therefore set the BBC Executive a deadline of Friday 8 February to submit any application to us. The Trust would be prepared to share with Ofcom further details of the final application as soon as it is received.

The Trust has not, at this time, reached a conclusion as to which of these proposals might deliver the better outcome nor whether there might be a further, better alternative. It would be required to assess the Executive's proposal impartially. The Trust is aware, though, that there are some potentially important differences between the proposals in terms of their approach and their implications for licence fee payers.

In addition to the Trust's own comments on your proposals we are enclosing some more detailed technical and other comments supplied to the Trust by the BBC Executive. These are, of course, the views of the BBC Executive and do not necessarily reflect opinions of the Trust. Given the regulatory context, that there may be a related non-service application by the BBC Executive to the Trust, the Trust considers it would be inappropriate now for it to do any more than to share these comments with you..

BBC Trust
4 February 2008

Appendices:

Appendix 1 BBC Executive Responses to Ofcom Consultation Questions

Appendix 1

BBC Executive's Response to Ofcom Consultation Questions

Question 1: Which services are most likely to drive take-up of DTT consumer reception equipment using new technologies? In particular, are HD services the most likely to do so?

The BBC Executive believes that HD services are most likely to drive the adoption of new consumer reception equipment.

1.1 Summary

The BBC Executive strongly believes that HD is the next broadcasting standard and should be provided on all platforms, including DTT. HD has strong appeal for television viewers, who are already investing significantly in HD-ready and full-HD television equipment.

The BBC Executive believes that HD services are most likely to drive the adoption of new equipment.

1.2 HD as the next production and broadcast standard

HD represents the next generation of television broadcasting. Ofcom's Market Impact Assessment (MIA) of the BBC's HD Public Value Test (PVT) application states: "*Most stakeholders told us that HD would be the next major change in television technology and pointed out that consumers were increasingly purchasing HD-ready TV sets.*"³

Despite the proliferation of new ways of receiving and viewing content, the majority of TV consumption, for the foreseeable future, will continue to be via TV screens in audiences' homes. The consumer trend is towards larger screens, with HD delivering a marked improvement over SD in terms of picture quality on both large and small screens.

During the BBC's current Charter period, HD will become the default production standard, as is already the case in the US. Although the BBC has been working on HD for over twenty years, it is only in the last five or so years that worldwide standards have been agreed and reliable broadcast equipment (from cameras to editing systems) have come to market. The final, critical stage in the chain has been the availability of lower-cost domestic screens, together with a means of delivering HD to the home using digital compression techniques.

1.2.1 Growing demand for HD in the UK and internationally

In its Public Value Assessment of the BBC's HD PVT application, the BBC Trust stated that: "*Consumers will increasingly be exposed to HD through (other) entertainment products and will increasingly expect HD quality on television... the increasing penetration of HD-ready TVs and the increasing consumer exposure to HD through premium television services and other*

³ Ofcom, 'Market Impact Assessment of the BBC's HD Television Proposals', Section 3.4.6, September 2007

entertainment products, such as games and DVDs, is likely to increase consumer expectations and demand for HDTV services in the short-term.”⁴

In its MIA of the BBC’s HD PVT application, Ofcom stated that: “Consumers are rapidly taking up HD-related equipment and services, albeit from a low base.”⁵

Major entertainment and sporting events – such as the 2006 FIFA World Cup, the 2007 Rugby World Cup and the 2008 Beijing Olympics – are proving significant demand drivers for HD services. Global HD penetration is increasing, with manufacturers increasingly producing large HD-ready sets at affordable prices. This move reflects consumer demand for high quality screens; producers adopting the HD format for artistic and commercial reasons; and broadcasters demanding more HD programmes to fill new HD channels and satisfy the expectations of HD-enabled audiences.

Although non-UK markets show varying trends – with different drivers of growth and TV consumption – HD take-up is increasing rapidly, with many overseas broadcasters and elements in the supply chain (including retailers and manufacturers) moving from SD to HD – as sales of HD equipment indicate.

1.2.2 HD equipment take-up

UK consumer demand for HD equipment is growing rapidly. By October 2007, cumulative sales of HD-ready TV sets reached 6.8 million. Set prices fell from an average of £1,279 in October 2005, to £580 by October 2007 – resulting in around 78% of TV sets currently sold being HD-ready, compared with 30% in October 2005⁶.

Projections indicate that, by 2012, 37 million HD-ready sets will be in use in the UK – i.e. 1.4 per household – and, by 2010, 79% of the main sets over 26” will be HD-ready (including some replacement of early-purchase HD-ready sets).

While UK consumers can now only buy HD-ready LCD screens over 26”, they are also choosing HD-ready sets for screens under 26”. There is sales growth across screen sizes, showing that consumers value HD quality for all their viewing. For example, UK sales of 15” IDTVs increased from 1.7% of total sales in October 2006 to 11.8% by October 2007; and, at the other end of the scale, sales of 36+” IDTVs increased from 27.6% of total sales to 34.4% across the same period⁷.

Similar trends to the UK are seen across Europe. In April 2007, the following percentages of households had an HD-ready flatscreen TV set – compared with 16.6% in the UK: 13.4% in Switzerland; 12.6% in Sweden; and 11.9% in Spain. From early 2008, there will be three HD channels on DTT in France, with a fourth launching in early 2009 and an additional multiplex, using digital dividend spectrum, also to be allocated to HD. In France, there was an 8.7% increase in native HD programmes broadcast between October and November 2007.⁸

The competing HD-DVD and Blu-Ray Disc formats are also creating demand for HD-ready screens, as around 20% of disc players are expected to be HD-enabled by 2010⁹. The new generation of games consoles are also playing an important role in ensuring that, for younger audiences, HD quality becomes the norm – with both the Xbox 360 and Sony’s PS3 supporting HD resolutions.

⁴ BBC Trust, ‘Public Value Assessment, BBC HDTV Proposal’, Section 1.4, September 2007

⁵ Ofcom, ‘Market Impact Assessment of the BBC’s HD Television Proposals’, Section 3.3.2, September 2007

⁶ Source: GfK Lek Trak, November 2007

⁷ Source: GfK Lek Trak, November 2007

⁸ Les Nouveaux Paysages Audiovisuels, Flash report – L’indicateur TVHD, 13 December 2007

⁹ 2007 Screen Digest presentation, 3rd European HDTV Summit (Western European sales data); 31 October 2006)

Many viewers will become familiar with HD through home film-making. HD consumer camcorders are already available, using mainly high-capacity tape as the storage medium. The value of UK consumer electronics sales (including portable audio, home theatre systems, audio separates such as loudspeakers, televisions, videos, DVD players/recorders and camcorders etc) rose from £5,087 million in 2005 to £5,971 million in 2007¹⁰. By 2010, it is estimated that almost half of the annual consumer camcorder shipments in Europe will be HD-capable¹¹.

All this equipment will educate consumers to HD picture quality and contribute to raising its standards, making current standard definition pictures less acceptable.

1.2.3 HD production

Broadcast equipment manufacturers are also replacing SD with HD products, reserving innovation and improvements for their HD models. Today, the top-end and tapeless cameras (Xdcam, P2 and Infinity) are HD; and all new, high-end, post-production hardware is HD-standard. SD equipment will become harder to acquire and, in a few years, it may become unavailable. As in the consumer market, the price of HD professional equipment is falling.

The trend is towards making HD production affordable – and, a result, HD is likely to become the default production standard. Broadcasters are responding to increasing consumer demand for HD quality by requiring more HD production and launching new services.

This growth in the HD production industry is expected to benefit the UK economy, with the UK Film Council noting that companies which invest in HD equipment certainly have a short-term, competitive advantage¹².

The UK production industry – integrated, as it is, into the global production industry – will suffer if the PSBs do not move now to HD on all platforms. Screen Digest¹³ predicts that: *“American companies will be able to leverage their advance in HD to gain a competitive edge over European producers and, both in European markets and worldwide, creating a challenge to the European programme industry.”* Moving now to HD enables the PSBs to gain competitive advantage and maintain world-class standards.

1.3 The advantages of HD on DTT

There are significant benefits from HD being available on DTT – along with digital cable and digital satellite. DTT is not only the Government’s acknowledged platform leader in achieving switchover, but it can help to drive consumer take-up of digital services.

DTT is the centrepiece of the Government’s strategy for achieving switchover and universal, free-to-air delivery of PSB in an all-digital world. The Government has made a public policy commitment to the continuation of the DTT platform as the main way of ensuring delivery of PSB. In return, the industry and consumers have invested significant sums – over £5 billion – in the DTT transmission infrastructure and DTT receivers¹⁴.

When planning the transition to digital switchover, the Government and Ofcom recognised that there were: *“...compelling arguments in support of the extension of DTT such that, as far as practicable, everyone who currently has access to analogue terrestrial TV would be covered by DTT post-switchover. These arguments reflect Ofcom’s statutory duties and take*

¹⁰ Source: GfK Lek Trak, November 2007

¹¹ Source: Digital Television Group, 2007

¹² UK Film Council, *Statistical Yearbook*; 2005/06

¹³ Screen Digest presentation, 3rd European HDTV Summit (Western European sales data), 31 October 2006

¹⁴ ‘Intervening to secure UHF spectrum for HD PSB, Review of Ofcom’s Market Impact Assessment’, Indepen, 20 March 2007

into account, in particular, the equity, affordability and communications advantages of seeking to ensure that DTT is available to all TV households"¹⁵. The same arguments apply in 2008 to HD on DTT.

The introduction of the MPEG-4¹⁶ and DVB-T2¹⁷ technologies could lead to significant improvements in the efficiency with which DTT spectrum is used. However, new set-top boxes (STBs) will be required to receive services in MPEG-4/DVB-T2. Consumers will, therefore, need a strong incentive to make this additional investment: the prospect of watching their favourite channels in HD over the popular DTT platform could be this key driver and generate an orderly migration to more efficient spectrum use. This could happen in two stages: first, some SD channels might find it economically advantageous to move to MPEG-4, thereby allowing more SD services to be carried on any one multiplex; which would subsequently enable entire multiplexes to move to DVB-T2.

After switchover, the majority of households will receive some or all of their TV (i.e. TV on the main or other sets in the house) via DTT – with it thereby remaining the main delivery platform for meeting PSB objectives (including universality, diversity and plurality). The platform cannot remain in SD as HD becomes the new broadcast/receiving standard. BBC research shows a strong expectation that free-to-view (free-to-air) television should not become 'inferior', with 78% of participants in deliberative research disapproving of the five main PSB channels being available in HD only on a subscription basis¹⁸. In line with consumers' expectations – and in view of the ongoing public policy commitment to the DTT platform – it must remain relevant to consumers. The presence of a strong DTT platform will also help to foster inter-platform competition, thereby benefiting consumers through increased choice.

HD is required for the continued success of the DTT platform, in terms of retaining viewers, maintaining advertising revenues and providing a serious competitor to other platforms (i.e. satellite, cable and broadband).

1.3.1 PSB research during the BBC HD trial: consumers' views

Autumn 2006 PSB research¹⁹ during the BBC HD DTT trial (Figures 1.1, 1.2 and 1.3, below) found that, of those who were aware of HD: 86% expected that the BBC would provide its content in HD in the future; 93% expected BBC HD content to be free-to-air (84% of all respondents); and 95% expected HD to be available on all digital platforms. DTT trial respondents also considered HD as the future of television: 71% believed it is inevitable that HD will become standard for TV in the future²⁰.

¹⁵ Ofcom, Planning Options for Digital Switchover; June 2005, p.4

¹⁶ MPEG-2 and MPEG-4: compression is used to encode a television channel for digital transmission. To reduce the volume of data that needs to be transmitted, and thereby fit more channels onto a multiplex, compression reduces the amount of information that needs to be sent from one second to the next. Information that is constant – e.g. a plain coloured background – can be reduced so that the capacity can be concentrated on changing information. The process by which this has been done hitherto is called MPEG-2. A new, more efficient process called MPEG-4 will be applied to HDTV services on satellite and DTT. Channels encoded in MPEG-2 and MPEG-4 can be transmitted on the same multiplex. But current Freeview set-top boxes are capable of decoding only MPEG-2 services, so consumers would need to upgrade their receiving equipment in order to receive HD channels in MPEG-4 alongside standard MPEG-2 services.

¹⁷ DVB-T and DVB-T2: The technology by which a digital television signal is transmitted is referred to as modulation. The current standard is called DVB-T. A replacement, DVB-T2, is in development. This will allow more efficient use of spectrum capacity. DVB-T and DVB-T2 cannot be mixed on the same multiplex. Current Freeview set-top boxes are compatible only with DVB-T, so consumers would need to upgrade their receiving equipment in order to view channels transmitted using DVB-T2. DVB-T2 equipment is expected to be available to consumers by late 2009.

¹⁸ Human Capital, *op. cit.*

¹⁹ BBC/GfK, *op. cit.*

²⁰ TNS (DTT trial), *op. cit.*

Figure 1.1: Importance of HD availability on Freeview

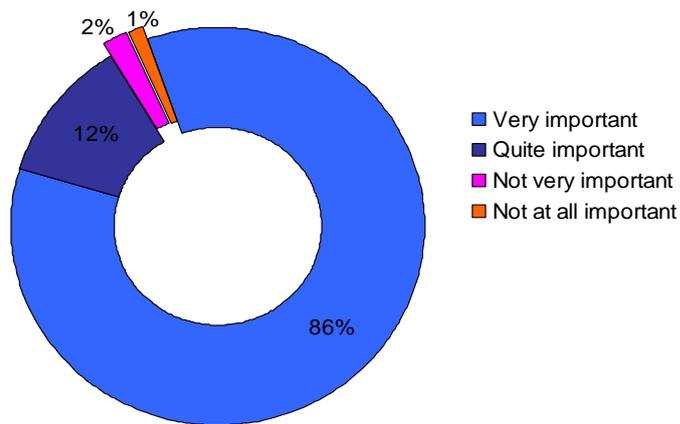


Figure 1.2: Expectation that all programmes from the BBC, ITV, Channel 4 and Five will be shown for free in HD on Freeview in the future

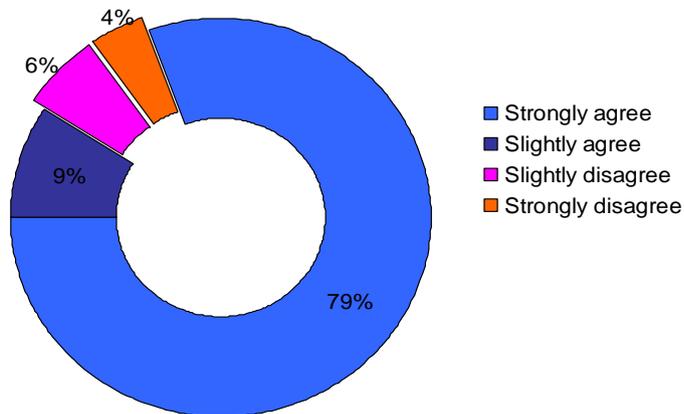
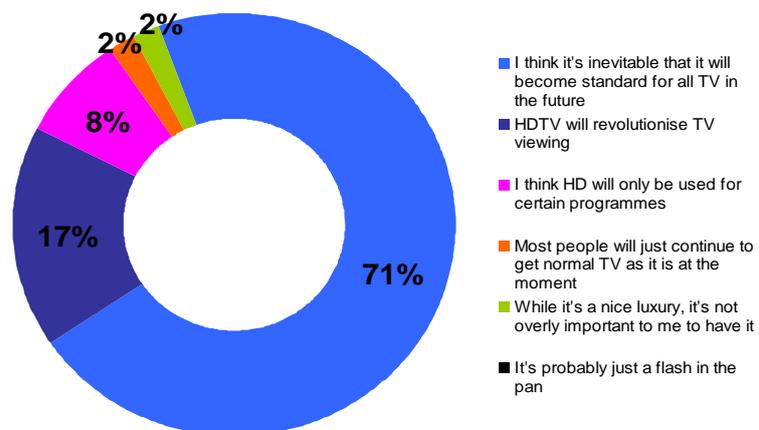
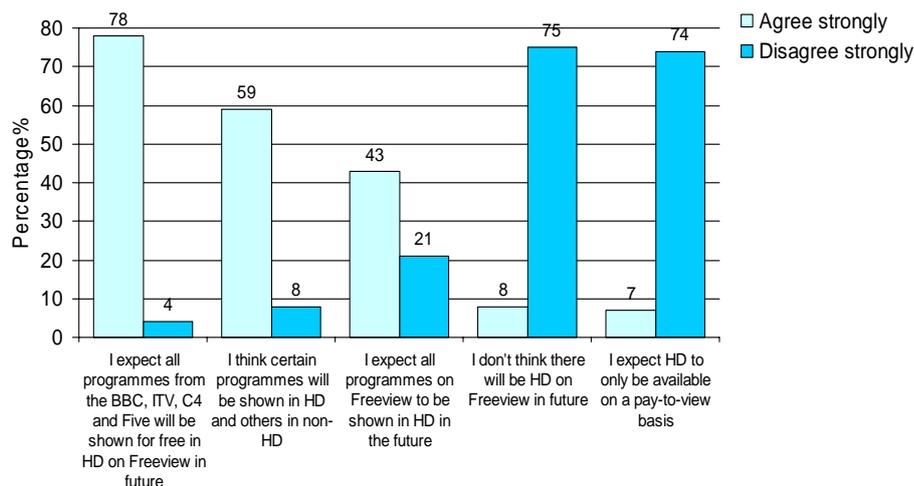


Figure 1.3: HD and the future of TV



Deliberative research also revealed strong support for the universal availability of PSB HD channels²¹. Half of the HD DTT trial respondents said that they would not want to pay extra to access their favourite channels in HD²². 67% disapproved of HD versions of the main public service channels being available only on free satellite and not on Freeview. Meanwhile, 78% of respondents expected all programmes from the BBC, ITV, Channel 4 and Five to be shown in HD on Freeview in the future. Figure 1.4 illustrates trial respondents' expectations around HD content on Freeview.

Figure 1.4: Expectations around HD content from the main terrestrial broadcasters on Freeview



1.3.2 Other research into consumers' views of HD on DTT

The BBC recognises that the HD trial respondents were not wholly representative of the general population, as they were more likely to be male, young and early adopters of new technologies. However, the validity of their responses is reinforced by data from other sources: for example, in one survey, 76% of the HD-ready audience said that the coming of HD was a conscious factor in their purchasing decision²³ (i.e. they were deliberately investing in HD equipment to future-proof their viewing).

BBC HD trial research results are also comparable with research undertaken by BMRB for Digital UK²⁴. These results (see Figure 1.5, below) showed very high awareness of HD, with 81% of the public having heard of HD, and 70% of them being able to accurately describe what it is (a better quality/definition TV picture). Moreover, awareness was consistently high, and did not fall below 60% in any demographic group or even in analogue TV households. Digital UK also tested consumers' current expectations around HD. They asked both why those with HD-ready sets had bought them, and how respondents expected to be able to get HD in the future. Expectations of being able to get HD are running high among users of all digital TV platforms, including DTT. When asked why they had bought an HD-ready television, 70% said that they had done so because they had some intention of getting high definition – either now or, potentially, at some point in the future.

²¹ Human Capital, *op. cit.*

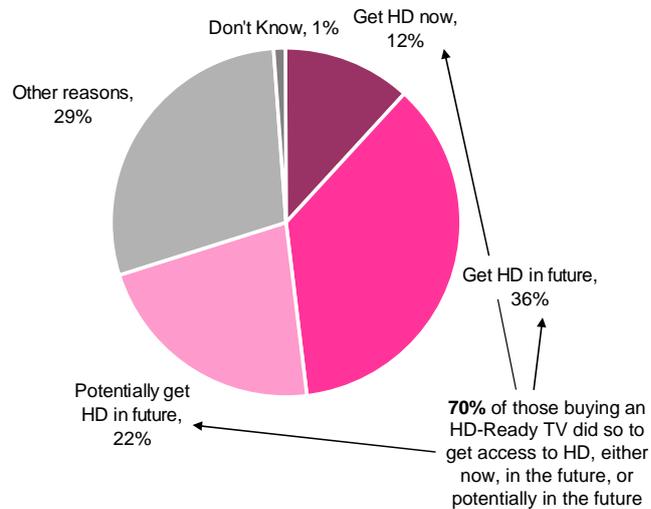
²² TNS (DTT trial), *op. cit.*

²³ TNS for Freeview, February 2007

²⁴ The survey was conducted as part of a CATI (telephone interview) omnibus to a representative sample of 1,010 UK adults over the age of 16 in late January 2007

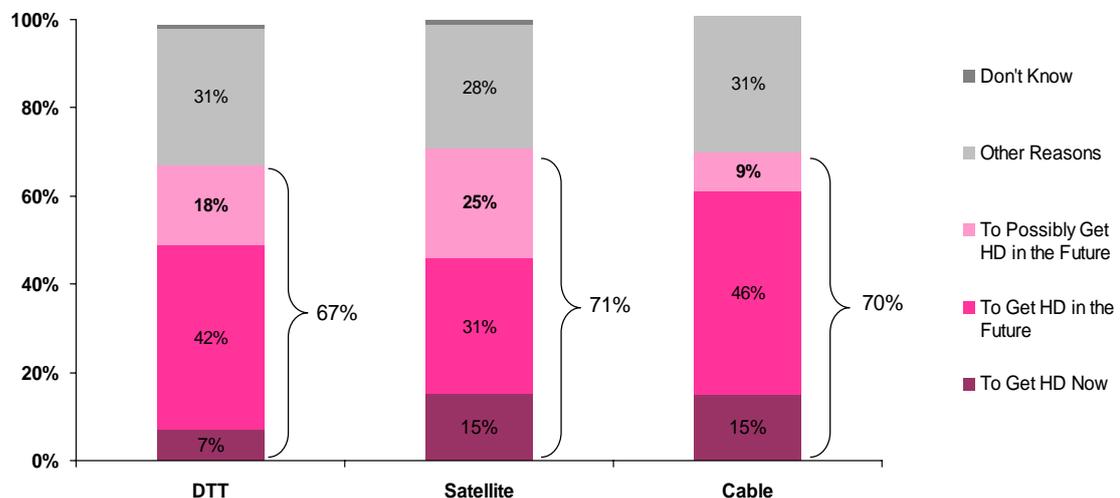
Figure 1.5: Reasons for buying an HD-ready set

“Which of the following best describes your reason for buying an HD-Ready TV?”



These high levels of intentions were extremely consistent across all the digital platforms (see Figure 1.6, below). Although fewer DTT users were planning on getting HD now (7%), more were thinking of getting HD at some point in the future (60%, compared with 56% of satellite users and 55% of cable users).

Figure 1.6: Reasons for buying an HD-ready TV set – by current TV Platform



In view of consumers' expectations, it seems highly appropriate for PSB HD services to be provided on DTT – ahead of switchover – as soon as is feasible. Indeed, in its final conclusions on the HD PVT, the BBC Trust noted that: “There was significant feeling among respondents to our consultation that Freeview was the most important platform on which to provide the channel.”²⁵

While research shows that consumers slightly prefer additional SD services to HD services, these results should be interpreted with caution as they could partly be explained by the

²⁵ BBC Trust, ‘BBC HDTV Public Value Test final conclusions’, Section 3.6, November 2007

currently low awareness and understanding of what HD offers. Also, interviewees might have thought that the extra free-to-air SD services they would get would be of the quality of BBC Three, ITV2 or More 4 – while, in reality, they are more likely to get niche channels. In addition, there could be a very significant difference between the services which people say they would value most and the services which would actually drive them to buy new equipment.

1.3.3 Conclusion

There is evidence of significant and growing consumer demand – not only for HD content and equipment, but also for HD being available on DTT. The BBC believes that the availability of the PSB channels in HD will drive a rapid take-up of equipment compatible with the DVB-T2 and MPEG-4 technologies, allowing more channels to adopt MPEG-4 and, over the longer term, for other multiplex operators to choose DVB-T2.

1.4 PSB HD services will deliver high benefits to viewers

1.4.1 HD on DTT as a driver for consumer take-up of digital technologies

Modelling for the BBC²⁶ suggests that BBC HD could be a significant channel for households that choose to become HD-enabled, at least in the short-term. The BBC's marketing of the HD channel will also improve consumer understanding of HD television. As a result, it is possible that the BBC HD channel could have a substantial, positive effect on the take-up of HD. Indeed, Ofcom's MIA of the BBC's HD proposals stated that: "*The BBC HD channel is likely to deliver consumer benefit through increased take-up of HD.*"²⁷

Question 2: do you agree with Ofcom's assessment that it would be beneficial for the DTT platform to begin to upgrade to new technologies – DVB-T2 and MPEG-4 – to make more efficient use of spectrum and to allow for the introduction of new services?

Yes. The BBC Executive agrees that a well-managed migration to DVB-T2 and MPEG-4 would increase spectrum efficiency on the DTT platform and allow viewers to access a wider range of services, both in HD and in SD.

2.1 Spectrum capacity challenges

The response to question 1 set out the importance of HD services being available on DTT. Current DTT spectrum capacity constraints make it very difficult to provide a critical mass of HD channels on DTT.

Although, at switchover, the move to high power/64QAM (as well as the use of the most up-to-date coding equipment on all multiplexes) should deliver some extra capacity for HD services, there is not enough capacity on the six existing multiplexes (using the existing technologies) for the PSBs to provide a critical mass of HD services, estimated at 4 to 6.

This highlights the need for more DTT capacity and for more efficient use of existing capacity.

²⁶ Oliver & Ohlbaum, Impact of the introduction of HD DTT on UK PSBs, September 2007

²⁷ Ofcom's Market Impact Assessment of the BBC's High Definition Television Proposals, September 2007, paragraph 1.18

Ofcom and the Government have made it clear that they were not prepared to consider the allocation of part of the digital dividend to help the PSBs to provide HD TV services^{28, 29}. However, they have also indicated their support for HD on DTT, and Ofcom have themselves proposed approving new technical standards and a re-organisation of DTT to achieve it.

The BBC Executive has also considered how to respond to the BBC Trust's³⁰ desire to: "...see a change of focus from building the DTT platform to ensuring that it uses its spectrum capacity as efficiently as possible and provides maximum Value for Money to licence payers."

2.2 Factors affecting capacity (with MPEG-2 and DVB-T)

The mode change from 16QAM to 64QAM at switchover will release 6 megabits per second (Mbps) on each of Mux 1, Mux B, Mux C and Mux D multiplexes – giving a total release of 24 Mbps, across the platform.

The latest generation of MPEG-2 encoders and multiplexes (from the move to full statistical multiplexing for BBC One, from Spring 2009) will release a further 2 Mbps.

The larger pool of services subject to statistical multiplexing will create efficiency gains, generating around 0.5 Mbps on each of Mux 1, Mux B, Mux C and Mux D – i.e. a total of 2 Mbps from switchover with the move to 64QAM on high-power multiplexes.

Therefore, in theory, if no other technological changes are made, an additional 28 Mbps would be available from late 2008 in the digital-only regions. This would just be sufficient for two HD services, provided that three conditions were met:

1. The MPEG-4 compression technology allows for an HD service (video, audio and text) to be carried in 10 to 13 Mbps at a constant bitrate (at MPEG-4)
2. All the capacity is used for HD services and
3. Multiplexes are rearranged so that the 28 Mbps are in two blocks of at least 14 Mbps

Although – on these projections – there would not be enough capacity to provide all the PSB services in HD, it could be possible to accommodate a third service if some SD services were taken down and the bitrate for those remaining on the platform was decreased³¹ – although picture quality would be significantly reduced.

However, the conditions under which the theoretically available capacity would be, in practice, rearranged and made available for PSBs appear very difficult (if not impossible) to meet.

Under these circumstances, the simultaneous move to MPEG-4 and DVB-T2 – though it requires new and not yet existing equipment to be purchased by consumers and broadcasters – might well be the only practical solution to deliver a portfolio of HD services and upgrade the platform.

²⁸ Ed Richards' speech and James Purnell's speech at the RTS Convention, September 2007.

²⁹ Digital Dividend Review, regulatory Statement, Ofcom, 14/12/2007, 1.52, <http://www.ofcom.org.uk/consult/condocs/ddr/statement/>

³⁰ BBC's Trust Response to the Deloitte & Touche LLP Value for Money study, 13/12/2007

³¹ For example, by removing 3-4 SD services or reducing the bitrate by around 1.1 Mbps per service (from, say, 2.9 to 1.9 Mbps) on a single multiplex or 0.35 Mbps per service over 3 multiplexes.

Question 3: Ofcom is particularly interested in hearing from multiplex operators and programme providers as to whether they are interested in using DVB-T2 and / or MPEG-4, and whether Ofcom should consider permitting their use on DTT?

The BBC Executive welcomes Ofcom's consultation on whether and how to implement those technologies.

3.1 The new standards

HD on DTT requires the use of an improved video and audio coding compression standard called MPEG-4. The other PSBs will also use MPEG-4 to deliver their services. It is expected that the gains from improvements in MPEG-4 and statistical multiplexing should allow an HD channel to be carried using 10 megabits per second (Mbps) by 2009/2010 and 8 Mbps in 20011/2012 as part of a statistical multiplexing (stat muxing) bundle³² (see Figure 3.1 below).

DVB-T2³³, a new transmission standard, is expected to deliver an increase of at least 30% in the capacity of a DTT multiplex, while maintaining the same coverage. This standard is a development of the existing DVB-T standard, used in the UK since 1998³⁴.

While MPEG-2 and MPEG-4 services can co-exist within a multiplex, the introduction of DVB-T2 requires a whole multiplex to be converted from DVB-T. The use of DVB-T2 means that one multiplex could provide around 32 Mbps of capacity – that is, enough capacity for 3 HD services at 10 Mbps using MPEG-4, and 4 HD services at 8 Mbps³⁵ in a stat mux bundle. However, to achieve this, a complete multiplex needs to be made available – either through allocation of one additional multiplex from the digital dividend, or through a rearrangement of the existing multiplexes. Ofcom and the Government have made it clear that they intend to allocate the digital dividend spectrum through technology- and service-neutral auctions, and will not reserve capacity for PSB HD services. The BBC previously stated it believed that such auctions would not deliver the highest public value³⁶ and that PSBs would be unlikely to secure the necessary spectrum for HD services through technology and service neutral auctions. Nevertheless, it has needed to consider how to achieve the best public value through the sole use of the existing capacity – that is, through a rearrangement of the multiplexes.

3.2 Improving spectrum efficiency by using MPEG-4 and DVB-T2

MPEG-4 is a much more efficient coding system than MPEG-2 which, after over 12 years in operation, is reaching the limit of its development potential. New receivers incorporating MPEG-4 chip-sets will be backward-compatible with existing MPEG-2 services: they will not only enable SD channels to be delivered using this more efficient coding system but will also clear the way for other broadcasters to launch HD services. The widespread adoption of dual-standard MPEG-4/MPEG-2 receivers will create both the opportunity for earlier spectrum efficiency gains and the possibility of a faster transition (if this is the preferred way forward).

Figure 3.1 (below) shows the expected improvements in compression technology – relating to the number of Mbps required for one HD video stream, with projections to 2015. It takes a

³² In statistical multiplexing, a multiplex is divided into a number of variable bit-rate digital channels or data streams. The sharing of capacity is adapted to the instantaneous demands of the channels or data streams. Therefore statistical multiplexing allows for a more efficient use of the capacity than when each channel is broadcast at a constant bit-rate.

³³ DVB-T2 : Digital Video Broadcasting – terrestrial transmission standard version 2

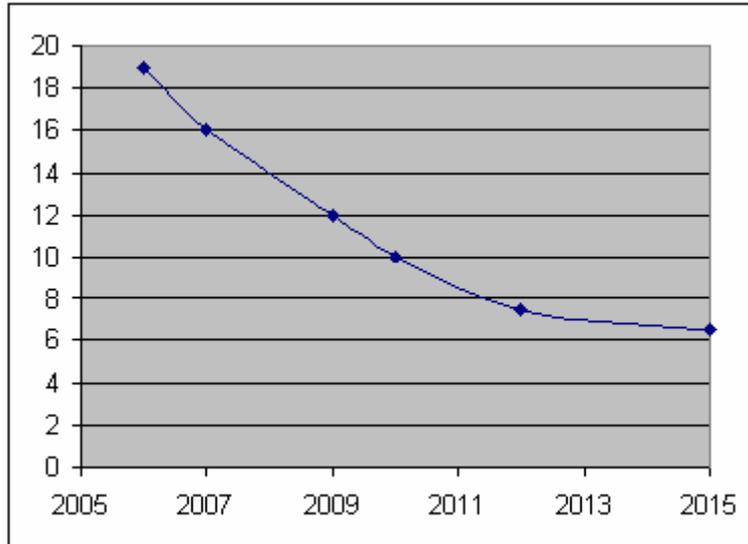
³⁴ DVB-T2 is still undergoing development by DVB in Geneva, but is expected to be finalised in Spring 2008.

³⁵ BBC HD currently runs at 16 Mbps, but as a constant bitrate service.

³⁶ BBC's response to Ofcom's consultation on the Digital Dividend Review, March 2007 in various loci, in particular: the Executive Summary, paragraph 1.2 to 1.8, and Section 5.

position assuming somewhere between conservative and aggressive assumptions of coder improvements, allowing for gains from statistical multiplexing and taking account of 3 services in 2010 and 4 in 2012.

Figure 3.1: Projected compression improvements (Mbps for one HD video stream), 2006-2015



While satellite receivers using MPEG-4 and DVB-S2 technology are available and deployed in the UK, there is currently no strong incentive for manufacturers to produce similar devices for terrestrial transmission using DVB-T2.

As DVB-T2 is not yet standardised, it could take a while for manufacturers to integrate this new technology into their products if no broadcaster were to use it.

The combination of MPEG-4 and DVB-T2 is expected to generate very significant efficiency gains, both immediately and over time.

However, it is worth bearing in mind that DVB-T2 is not yet fully developed and tested. While there is all likelihood that it will deliver against its promises, there has to be some caution around the exact timing of the efficiency gains it is expected to generate. Relevant broadcast and consumer equipment could be available between the end of 2009 and the end of 2010.

This assessment is in line with Ofcom's views that the DVB-T2 technical standard will be finalised by the Digital Video Broadcasting (DVB) group in Spring 2008. The BBC's discussions with the manufacturers of consumer reception equipment indicate that compliant equipment could, therefore, be commercially available in late 2009 (although, given that the technology is still under development it is, of course, possible that availability could be delayed). Ofcom also states that: "...the greater the level of clarity that can be provided regarding the deployment of these technologies, the more action will be focussed by manufacturers and retailers in making it available as soon as possible."³⁷

³⁷ <http://www.Ofcom.org.uk/consult/condocs/dttfuture/dttfuture.pdf>, Section 4.57

Question 4: do you agree that the earliest possible availability and adoption of the technologies is in the interests of consumers and citizens?

DVB-T2 is not yet fully standardised. Its premature adoption could generate confusion among consumers as well as additional costs for them. As with any new technology, it has to be adopted at the optimal time – which might not be the earliest possible time.

Question 5: do you agree with Ofcom's view that DVB-T2 MPEG-4 reception equipment could be commercially available in time for switchover in the Granada region in late 2009?

The implementation of DVB-T2 and MPEG4 requires both the availability of consumer equipment and of broadcast equipment. It is expected that the DVB-T2 standard will be developed by the DVB group by the end of March 2008; and it will then take a few more months for it to be formally standardised by ETSI. While early silicon chips could be available from end 2008/early 2009, it is unlikely that consumers will be able to purchase products before Q4 2009.

It is also worth mentioning that DTT viewers are consumers who have adopted digital technology but are not typical early adopters, as their profile is more conservative. They prefer well-tested and easy-to-use equipment, and they might wait until they have a suitable range of affordable products before buying DVB-T2 equipment rather than purchasing the first option available.

Considering the profile of DTT viewers, there could be significant risks in launching services too early that rely on poorly tested products.

The BBC and the other PSBs have been in discussion with manufacturers; and they have received from Intellect (the UK trade association for the IT, telecoms and electronics industries) a position paper stating that "...*their members' feedback on the realistic timelines for having products on the market with DVB-T2 ranged from Q4 2009 to Q1 2011. However, experience with the development of other technical standards means that many members believe timescales could slip beyond those envisaged by Ofcom. Potential causes of delays put forward include problems in the specification completion of silicon designs, or other problems arising from field tests after the first silicon tests have been finished.*"

The BBC agrees that giving certainty to the industry is helpful, but it would be premature for the regulator to impose a timetable which might not be realistic. Broadcasters and manufacturers are well placed to decide on the optimal time for the introduction of these products. As there will not be a critical mass of HD services on DTT before DVB-T2 is implemented, they will have a strong interest not to delay any longer than is necessary.

Question 7: Do you have any proposals for launching MPEG-4 services on a DTT multiplex using DVB-T in advance of the proposed 2009 timetable; and, if so, can you provide details of how such a service would not undermine the proposed MPEG-4/DVB-T2 launch in 2009?

The BBC would be ready to launch its HD service in MPEG4/DVB-T, in early 2009, should the decision not to adopt DVB-T2 be made.

If DVB-T2 is not adopted, the BBC would be ready to launch its HD service in MPEG4/DVB-T, in early 2009. However, if an early migration to DVB-T2 is agreed, it will be in the interests of consumers to wait – so as to ensure a simultaneous and well co-ordinated migration. If DVB-T2 adoption were not to occur, there would only be space for one PSB HD service (BBC HD) in PSB capacity at the time of switchover.

As mentioned by Ofcom³⁸, the next few years will represent a significant upheaval in the development of DTT. The introduction of new technologies such as MPEG4 and DVB-T2 should be managed in an orderly way, so as to maximise benefits for the platform and minimise inconvenience for consumers. The launch of DVB-T MPEG-4 SD or HD channels in the short-term could jeopardise the success of the transition to a more efficient platform, as it would confuse consumers. It could also generate higher costs for viewers who would have to upgrade their equipment twice instead of once.

Question 8: do you agree with Ofcom's proposed approach for adding SD and HD versions of MPEG-4 and DVB-T2 profiles to the list of permitted standards for DTT in the spring, and that Ofcom's consent must be sought prior to adoption of these standards?

It might be more appropriate to wait until DVB-T2 is formally standardised by ETSI before Ofcom lists it as a permitted standard. Ofcom could then add SD and HD versions of MPEG-4 and DVB-T2 profiles to the list of permitted standards for DTT.

The BBC Executive believes that Ofcom should carefully consider whether to allow MPEG-4 and DVB-T services to be launched before DVB-T2 products are launched, as this might lead consumers inadvertently to buy products which would not receive the DVB-T2 services which then launched a little later. In addition, all DVB-T2 MPEG4 products should be backwards compatible, i.e. they will allow reception of DVB-T/MPEG-2 and DVB-T/MPEG-4 services; and professional bodies such as the DTG (Digital Television Group) should include this in the minimum receiver specifications.

Once the standards are included in Ofcom's relevant technical codes, so that their use is permitted, it should not be necessary to obtain Ofcom's prior consent. The BBC does not see the need for this additional regulatory requirement, but it does understand that existing multiplex licence conditions will need to change to reflect any migration of existing services.

Question 10: do you agree with Ofcom's proposal that all multiplexes should be required to upgrade to 64QAM at switchover in order to make the most efficient use of spectrum (i.e. that the mode change should not merely be optional)?

The BBC Executive does not believe it appropriate to use 64QAM in advance of digital switchover, as this would mean a loss of services for some consumers, and it would generate confusion. However, at switchover, the use of high power transmission will allow multiplex operators to move to 64QAM, while coverage is significantly increased. The capacity thus gained will allow an increase in the number of services available on the platform and/or enable then provision of HD channels to viewers. This will ensure that the DTT platform remains competitive and delivers increased choice and quality for consumers.

From switchover, the BBC is committed to using DVB-T 64QAM on Mux 1, and it plans to use DVB-T2³⁹ on Mux B as switchover rolls out in each region. Mux 2 and Mux A are already using 64QAM.

As far as the two remaining multiplexes are concerned: the BBC believes that this is a matter for NGW, and that this commercial operator should be given the responsibility to decide how best to operate the multiplexes it controls. It has a strong commercial incentive to maximise the use of its capacity and is best placed to determine how to do so, in liaison with its clients.

³⁸ Ofcom, consultation document, 3.14 sqq

³⁹ It is yet unknown which mode will be used on a DVB-T2 multiplex (e.g.64QAM or 256QAM).

Question 12: do you agree with our assessment that nine SD services can operate on Multiplex 2? If not, do you have an alternative proposal?

The BBC Executive believes that the Multiplex 2 operator should be left to decide how best to use its capacity. It has very clear financial incentives to maximise its utilisation of capacity, but it also has to ensure the optimal balance between picture quality and the number of services carried.

Assembling a multiplex is a complicated technical process, and optimising the configuration and settings requires 'real-world' modelling based on representative content and using hardware coders and multiplexers. The theoretical modelling used in Ofcom's technical analysis is, at best, only an approximation and can be unrealistic for a variety of reasons – e.g. for the high quality, multi-genre content typical of PSB channels, or when taking account of the fixed bitrate allocation for audio and interactive services and for multiplex support.

It is worth noting that, following reorganisation of the multiplexes, Multiplex 2 will carry four public service channels in England (ITV, C4, five and BBCi multi screen) and a fifth one in each of Wales and Northern Ireland. These need to operate at a high bitrate and will routinely provide simultaneously hard-to-code programmes.

The BBC has not carried out a real-world test of the possibilities for Mux 2, as it is not aware of the exact configuration of the technology used on Mux 2. However, the BBC is aware that ITV and C4 have carried out such a test, and it has been reported that the testing demonstrated a likely shortfall of around 1 Mbps on the multiplex to maintain existing picture quality, even if full statistical multiplexing were to be applied across all nine services. In order to accommodate this 1 Mbps shortfall, it would be necessary to drop picture quality across the services, or sound quality, or the performance of interactive services. While future coder improvements may be considered as accommodating this 1 Mbps shortfall, all evidence available to the BBC is that future MPEG-2 coder improvements are likely to be minimal.

The BBC is also aware that applying full statistical multiplexing across all services on Mux 2 would have significant cost and timescale issues, with implementation going into switchover.

Therefore, while adding a ninth television service to Mux 2 should not be ruled out as a future possibility, the BBC believes that two options should be considered at this stage:

- The Nations' services could be carried on the SDN multiplex, with roll-out to the necessary level of coverage using additional relay transmitters in the Nations' regions; or
- A service carried on Mux 2 could be temporarily be displaced to the SDN multiplex in the appropriate Nation, to make way for the Nations' service while SDN coverage is being increased subject to a satisfactory carriage agreement.

The BBC understands tests will be carried out by Digital 3 and 4 Ltd to assess the feasibility of this ninth stream, and that Ofcom will be invited to attend a technical demonstration.

Question 15: Do you have an alternative proposal for the reorganisation process? If yes, please provide details.

The BBC Executive is working with other PSBs to develop its own proposals for delivering HD services on DTT, which it will submit to the BBC Trust for consideration

Question 17: do you agree with the proposal that HD broadcasting on the DTT platform should use the more efficient progressive format, rather than the interlaced format?

It should be left to channel providers to decide which format delivers the best picture quality to the viewer, given allocated capacity.

In the long term, it is likely that production will migrate to 1080p50. If that is the case, the best long-term solution for emission coding is likely to be 720p50 (to ensure backwards compatible support for existing EICTA 'HD Ready/HDTV' receivers) with a possible additional SVC layer to support 1080p50 (if coder performance reaches the necessary levels for this advance).

European Broadcasting Union (EBU) studies have shown that the progressive format is generally easier to code than the interlaced format. So, where the emission bandwidth is constrained, progressive format (for the same equivalent picture content) will generally give better picture quality for a given capacity (or will require a lower capacity for a given picture quality). However, programmes can come from a variety of sources – e.g. up converted SD 576i25; 1080psf25 from film; and many sources of production equipment currently originate in 1080i25. Therefore, different programmes have different bitrate requirements, depending on their genre and origination etc (e.g. sport or film).

In the short term, it would seem inappropriate to pick one standard over another (provided that any standard used is compatible with existing EICTA 'HD Ready/HDTV' receivers).

Nevertheless in assembling Mux B for 3/4 HD services, it will be necessary to ensure that an equivalent mean bitrate is available to each channel provider. It is envisaged that this will be achieved by appropriate coder/multiplexer settings in the configuration of the multiplex. Each HD channel provider would then have to make a commercial decision on whether to provide the highest possible spatial resolution (currently 1080i25), with greater coding artefacts, or a lower spatial resolution but with less noticeable coding artefacts and better motion portrayal (with 720p50). This commercial decision would be based on the dominant type of content and the major source or origination for each channel.

It should be remembered that any complicated format conversion is usually best achieved in professional equipment in the broadcaster equipment chain rather than in domestic equipment.

It is, therefore, inappropriate to mandate only a progressive emission format in the short-term – although it should be a longer-term ambition to achieve it (but not by mandate).

In the end, it should be left to the channel providers to decide which format delivers the best picture quality to the viewer for its allocated capacity (as currently happens for SD).